
Science Fest
Learn it. Share it.Celebrate it.
December 2016

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DAWSON COLLEGE

Welcome

Welcome to the 2nd annual ScienceFest! You have all worked very hard all semester - planning, discussing, building, planting, observing, growing, tabulating, calculating, writing, and all your hard work has culminated to this point. Congratulations for making it this far.

A large part of scientific research is being able to communicate your experiment and results to others. We hope you enjoy the variety of the projects on display and take the oportunity to socialize and dicuss your projects with each other as well as with other members of the Dawson community.

I would like to take this opportunity to thank all the presenters and participants, for taking part in this event. Thank you for sharing your knowledge and passion for science.

Cover Design is an excerpt from the ScienceFest 2016 poster designed by 3rd year Illustration and Design student Yu Xiang Ren

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Instructions to Participants

Your posters can be attached directly to the wall using sticky-tack or specialized poster hangers. They can be intalled anywhere along the 5C East hallway (opposite the library entrance, in the hallway closer to the Biology labs).

Poster set-up – as of Monday, December 5, 9am. All posters should be up no later than noon on Tuesday.
Poster take-down – by Monday, December 12, 5pm.

Your teachers may have specific instructions/assignments linked to the presentation of your poster. Please consult with them for any evaluations. Although it is not absolutely necessary for candidates to be constantly present, students are encouraged to spend time at their poster and answer any questions observers may have.

Project Abstracts – French CE

*Projects appear in alphabetical order according project title.

Effets Biologiques des rayons X
Beligh Ben Amor
Teacher: Marie-Josée Roy

Les rayons X sont des rayonnements électromagnétiques utilises dans l'imagerie médicale pour permettre au médecin d'avoir un diagnostic précis d'une maladie. Ils ont une énergie élevée qui cause divers effets biologiques quand ils sont exposés au corps humain. Ces effets peuvent être déterministes qui apparaissent dans un court terme ou stochastiques qui prennent plus de temps pour apparaître . D'où vient la nécessité de la radioprotection qui désigne l'ensemble des mesures destinées à prévenir ou à réduire les effets des rayons ionisants afin de protéger les populations et les travailleurs qui y sont exposés

Fibrodysplasie Ossifiante Progressive
Viviane Tran-Le
Teacher: Marie-Josée Roy

Dans le cadre des maladies rares, se trouve la fibrodysplasie ossifiante progressive. C'est une maladie mortelle qui frappe dès la naissance et qui achève les malades à un jeune âge. Paralysant les malades en transformant les muscles en os, le malade se voit lentement devenir une statue humaine, mais de l'intérieur. Ce projet explore les différents aspects de cette maladie mystérieuse et peu connue par le public. On découvre donc les symptômes, les causes, ainsi que les traitements disponibles pour contrer ce mal.

Guérir ou détruire: telle est la question
William Asselin
Teacher: Marie-Josée Roy

Au jour de technologies en mouvance perpétuelle, on interroge la valeur et l'impact du savoir pris pour acquis. Dans ce travail de vulgarisation, nous tentons de comprendre et d'expliquer le mécanisme de fonctionnement du blocage nerveux, déjà une facette méconnue pour le grand public du monde médical, ainsi que des armes chimiques de type gaz neurotoxiques comme le sarin. Il nous apparaît que les neurotransmetteurs, particulièrement l'acétylcholine, jouent un rôle clé quant au mécanisme d'action de ces deux technologies. Une recherche raffinée par des consultations avec des experts nous permet de conclure que ces deux technologies, aux résultats radicalement différents, sont issues d'une même compréhension du corps humain et elles ont un mécanisme d'action similaire à quelques différences clés. Comme quoi les technologies ne sont pas intrinsèquement ni bons ni mauvais et il en retombe d'un devoir citoyen de les comprendre, surtout si elles jouent un rôle dans l'arène politique ou sociale.

L'exploitation de l'énergie solaire est-elle une solution envisageable pour régler les problèmes énergétique mondiaux?
Chakib Rekabi
Teacher: Marie-Josée Roy

Le réchauffement climatique est un enjeu planétaire qui suscite l'intérêt de nombreux spécialistes à la recherche de nouveaux moyens pour réduire nos émissions néfastes à notre planète. Aussi, de nombreuses régions dans le monde n'arrivent plus à subvenir à leur besoins en matière d'énergie. La diminution des énergies fossiles dans les prochaines ne fera qu'aggraver ce problème. Les énergies renouvelables telles que le solaire font partie des solutions potentielles.

Le développement de cette forme d'énergie aux cours des dernières années nous pousse à nous demander si l'exploitation de cette ressource, par l'entremise de panneaux solaires, permettrait de régler nos problèmes énergétiques et environnementaux.

Pour ce faire, il est important de comprendre le fonctionnement global de l'énergie solaire dans tous ses aspects et aussi les politiques énergétiques sur quoi dépendent essentiellement l'installation de cette énergie.

La Biodynamie
Sofia Mucci and Chloe Jonas
Teacher: Marie-Josée Roy

Our project explains the fundamentals of biodynamic agriculture and explores the possibility of applying as a global scale practice.

La crème solaire est-elle dangereuse pour la santé?
Claudia Keurdjekian
Teacher: Marie-Josée Roy

Depuis fort longtemps, les dermatologues nous répètent qu'il faut appliquer de la crème solaire afin de se protéger du cancer et du vieillissement prématuré de la peau. Or, des études réalisées par des chercheurs démontrent que les ingrédients contenus dans les produits solaires seraient néfastes, voire même dangereux pour notre santé. Cela nous amène à nous demander la question suivante: la crème solaire est-elle dangereuse pour notre santé? Nous protège-t-elle réellement des effets nuisibles des ultraviolets? Pour arriver à répondre à cette question, il faut d'abord savoir qu'est-ce qu'une crème solaire ainsi que sa fonction, les types de filtres ultraviolets, et puis les effets des ingrédients contenus dans la crème solaire sur la santé.

La faim dans le monde
Mia Vu
Teacher: Marie-Josée Roy

Depuis plusieurs années, la faim est un problème important à l'échelle mondiale. Selon la FAO, sur la planète, une personne sur huit ne mange pas à sa faim. Plus précisément, 842 millions de personnes en Asie (2011-2013) et 21 pour cent de la population africaine. Ainsi, depuis un certain temps, plusieurs tentent de trouver une solution à cette problématique. Certains décident donc d'ouvrir des organismes à but non lucratif, tandis que d'autres tenteront de trouver une solution à l'aide de la science. Entre autres, une des solutions trouvées viendrait de l'utilisation de plantes génétiquement modifiées. Cela nous pousse à nous questionner: «Les plantes génétiquement modifiées pourraient-elles contribuer au développement durable dans le but de contrer la faim dans le monde?»

La Phagothérapie
Cedric Hupperetz
Teacher: Marie-Josée Roy

La phagothérapie est l'utilisation de bactériophages lytiques afin d'éliminer une infection bactérienne en totalité. Comment peut-elle contribuer à la formation du futur de la médecine en combattant les bactéries multi-résistantes? Simplement, avec l'introduction de cette méthode en parallèle avec les antibiotiques. Bien que la phagothérapie ne soit surtout pas, à elle seule, le futur de la médecine, elle propose une alternative qui a été présentée et abolie dans les années 1900s avec l'introduction de l'antibiothérapie. Les avantages des bactériophages sont très nombreux, avec l'élimination de beaucoup de risques qu'amènent les antibiotiques. La phagothérapie est une solution temporaire à la crise croissante d'antibiorésistance et les coûts de développement en conséquence. De plus, elle peut diminuer les taux d'infections nosocomiales dévastateurs dans de nombreux pays et agir encore plus efficacement que les antibiotiques, due à sa méthode de réplique sophistiquée. L'absence d'effets secondaires associés avec les bactériophages est très favorable aux patients avec des allergies aux antibiotiques. Étant dans la lutte éternelle contre l'augmentation de bactéries multi-résistantes, pourquoi ne pas donner la chance à cette thérapie quasi abandonnée, afin d'avoir une autre méthode de défense en dernier espoir?

Le Trouble Envahissant du Developpement
Ilyas Mohamed
Teacher: Marie-Josée Roy

Le trouble envahissant du développement se caractérise par une déficience fonctionnelle dans trois zones : la communication, l'interaction social et le comportement. En effet, il est essentiel de savoir que les troubles envahissants du développement se ramifient en cinq troubles plus ou moins populaires ; l'autisme, le syndrome d'Asperger, le trouble envahissant du développement non spécifié, le syndrome de Rett et le trouble désintégratif de l'enfance (syndrome de Heller). Parmi ces cinq troubles, l'autisme est celui qui demeure le plus discuter. A la fin des années 1990, l'autisme était un syndrome méconnu. On estimait que seulement 2 à 5 enfants sur 10 000 étaient atteints. Actuellement, on estime qu'un enfant sur 1 000 est atteint d'autisme. La cause expliquant l'augmentation de cette prévalence demeure un mystère. Ce qui mène à des questions fondamentales : Qu'est-ce que l'autisme et pourquoi les jeunes d'aujourd'hui sont plus susceptible d'être atteints de ce trouble envahissant du développement (TED) ? Quel rôle joue la technologie au sein des enfants atteints du TED ? Afin de répondre à ces questions, je vais d'abord définir l'autisme. Ensuite, je me pencherai sur le diagnostic, la procédure et l'approche médicale pour enfin terminer avec les progrès dans la neurobiologie pouvant expliquer les causes possibles de l'autisme.

Les aliments biologiques: En valent-ils la peine?
Jamie Beaulieu
Teacher: Marie-Josée Roy

L'agriculture biologique est une forme de production alimentaire provenant d'un mouvement qui prône le respect environnemental et humanitaire. Au cours des années, plusieurs recherches ont discrédité des avantages s'y rattachant. Malgré leurs prix exorbitants, un grand nombre de consommateurs en justifiaient leur achat en raison de ceux-ci. Il est donc venu le temps de se poser la question : Les aliments biologiques modernes méritent-ils encore une attention prééminente?

Un gratte-ciel plus haut que le Burj Khalifa: Est-ce possible?

David Nunez
Teacher: Marie-Josée Roy

À chaque année, des nouveaux records sont atteints à travers le monde. Cela est du au fait que l'être humain cherche toujours à dépasser ses limites, ce qui m'amène a me poser la question : Est-ce possible de construire un gratte-ciel plus haut que le Burj Khalifa? En considérant cette question, il est important de prendre en compte des paramètres essentiels pour le construire, tels que le vent, la conception et les séismes. De plus, les moyens à prendre en considération pour construire le Burj khalifa ne doivent pas passer inaperçus aux yeux des ingénieurs. Pour nous guider à répondre à mon hypothèse, l'introduction d'un nouveau projet, spécifiquement celui du Kingdom Tower, me sera de grande aide.

Une mémoire anormale après le coma?

Amanda Yu
Teacher: Marie-Josée Roy

Suite à une lésion cérébrale grave, une personne peut tomber dans le coma. Ce dernier se définit par une absence d'éveil et de conscience. Les différents niveaux de conscience permettent de savoir si le patient est dans le coma, dans l'état végétatif ou dans une conscience minimale. Certains patients qui se récupèrent du coma pensent avoir accumulé des souvenirs pendant qu'ils étaient inconscients. Puisque la conscience semble essentielle à la mémoire, comment est-il possible qu'ils peuvent obtenir de nouveaux souvenirs sans la présence de perception consciente?

Project Abstracts – Biology NYA CE

*Projects appear in alphabetical order according project title.

5 seconds rule
Camille Roy, Xuan Daphné Garneau-Wang, Lara Kollokian
Teacher: Annie-Hélène Samson

We wanted to determine if there was a difference in the amount of bacteria found on a food sample depending on the time of contact with a contaminated surface. The way we proceeded was that we dropped slices of cucumber on a cafeteria table for predetermined amounts of time and then swabbed the surface of the cucumber onto an agar plate. After incubating, we evaluated the amount of bacteria and mold on the surface of the agar.

A Natural Air Quality Detector? We're Lichen It!
Ouiam Meftah, Olivia Roose, Jade Boutot
Teacher: Brian Mader

Over the last decade, air pollution has become an ever growing concern as we are unfortunately witnessing its obnoxious effects all over the world. However nature has offered us a way of estimating the rate of pollution of an area only by taking a look at its trees. In fact, the lichen(a symbiotic organism) found on trees is an excellent air pollution detector as it is very sensitive to air contaminants. Previous studies conducted in Israel, Spain and even Montreal (in 1970), showed that there is a relationship between industrialization and the growth and dispersion of lichen. We thought it would be a great idea to update that information since the environment has definitely changed over the past 50 years in our city. To do so, we selected 5 trees in an urban area (Campus of Dawson College, Downtown Montreal) and 5 trees from a rural area (National Oka Park) to study their trees, hoping to see a larger amount of lichen in the urban area than in Montreal City. In Montreal, 7,51 % of the tree's surface area was covered in lichen (± SE 1.91, n=5) compared to 29.02% (± SE 5.12, n=5) in the rural area. The experiment showed that in fact, the two areas were significantly different since the gap between the two is 14.5 which is greater than twice the average standard error from each group (3.52) Therefore, our hypothesis is supported. We can conclude that there is indeed a much larger amount of lichen in the trees in Oka than in Montreal which tells us a lot about the severity of air pollution in urban areas.

Bacterial Growth in Aquatic Environment
Cassandra Castro-B, Elizabeth Symboli, Sophie Tsoller, Adam Diallo
Teacher: Brid Nic Niocaill

This experiment has for goal to observe the differences between the microorganisms present in two different soil samples from the same river, one of the sample received more cellulose than the other We will observe which communities of bacteria are more present. This experiment can be used to study the influence of the surrounding environment on the soil and its microorganisms. We used Winogradsky columns to see how the bacteria in the soil develop and we noticed that the column with more cellulose has more bacteria than the one with less cellulose, although we can find rust-colored bacteria in both. We concluded that the cellulose plays a big role in bacterial growth.

Bean There, Drank That!

Émilie Brisson, Michael Carioti, Jin Tuan Huang & Sabrina Rahman
Teacher: Brid Nic Niocaill

It is well known that coffee, more specifically caffeine, plays an integral role in keeping an individual awake. Coffee is a common drink consumed amongst many students for its role in keeping an individual awake, but what if caffeine could also play a role on how effective one's memory is? Students are constantly taking in new information from the time they step into the classroom and the time they leave. A key factor that helps students retain all the information that they have seen is memory. This is why the aim of our experiment was to test the effect of caffeine on students' memory. In the experiment, we tested 3 groups of 10 participants each: one group was given regular coffee, one decaffeinated coffee and the other green tea. They were then asked to take a memory test, which consisted in memorizing the position of tiles. As the levels got higher, the number of tiles to memorize increased. Each participant had 3 lives. Their score was recorded after the 3 lives were lost. The participants were asked to take the test once without drinking the beverage, 15 minutes after drinking the beverage, and 2 hours later. The experiment was repeated by the participants 5 times, over the course of 5 consecutive days. The results from the experiment have shown that regular coffee improved memory retention 15 minutes after drinking the decaffeinated drink, and green tea improved memory retention for a longer period of time, that is, 2 hours after drinking the green tea. From the results obtained, we can conclude that caffeine improves memory and that green tea is a better option than regular coffee since its effects last longer.

Bright Memory

Hersi Nur, Najim Ghafourzadeh, Moustafa Jiha
Teacher: Francesca Thériault

Information retention is a process which demands to commit something to memory. All human beings continuously memorize what they experience either by short term memory or long term memory. In addition, the type of lighting is an important factor in memorizing. We have experimented 10 participants' memory by exposing them to two different lights, a yellowish/warm light and a white light and gave them a series of word (different series for each light). We recorded their short-term memory performance in relation to the two lights. Our results show that the white light has a positive effect on memory performance; t-test statistics for the number of words memorized and the type of light exposed showed a significant difference between the effect of the two lights (Under white light; Mean: 12.2, St. deviation: 2.201, Under yellowish light; Mean: 9.8, St. deviation: 2.440 and P-value: $0.03299 < 0.05$). There are more words memorized under white light than the warm light. Therefore, this has important implications in the performance of the students to retain information, since it could potentially enable students to have better grades.

Can Frozen Beans Sprout?

Hyoyeon Son and Samuel Guy
Teacher: Francesca Thériault

Plants can grow differently at different temperatures, but we hypothesized that freezing beans would stop them from growing since freezing an organism makes it keep its original state. We compared the growth of 10 beans for each of the following temperatures: room temperature (20°C), refrigerator temperature (1°C) and freezer temperature (-20°C). We left all of them at these different temperatures for 24 hours, and we then let all of them grow at room temperature to see which would grow. Our results indicated that frozen beans can sprout, but the fact that they were initially frozen did affect the way they grew. Frozen beans had a mean height of 15.25 cm, with a standard deviation of 12.26, while the ones at room temperature had a mean height of 27.75 cm, with a standard deviation of 11.06. We calculated a P-value, which resulted in 0.1174. This information may help for the preservation of seedlings.

Comparison between men and women of hand washing habits and illnesses

Tudor Chira, Qusay Ziad Mohamed Said Kadhim, Mohib Hossain
Teacher: Brid Nic Niocaill

The general topic of this study is the correlation of illnesses, diseases and presence of bacteria with hand hygiene practices compared between female and males. Time was used as a measure of thoroughness of hand washing for both females and males. All data were collected discreetly. Surveys were given to measure frequency of hand washing and illness. Door knobs were swabbed to measure presence of bacteria. Results obtained supported our hypothesis and it was concluded due to the similar habits between females and males, they are similar in illness per year.

Comparison of Ripening Time of Organic and Non-Organic Bananas

Jerry Huang, Jason Brownrigg, Alice Trudeau, Daniel Radeschi, Andrew Morantz
Teacher: Jeffrey Eng

Ethylene, a chemical reagent released by fruit when it begins to ripen, is responsible for a change in colour, texture, softening, and causes the plant to die. Given that organic and non-organic bananas produce contrasting amounts of ethylene, the purpose of the project was to determine whether there was a difference in ripening times between the two types of bananas. The working hypothesis for the experiment was that organic bananas would change colour, and thus ripen, faster than the non-organic bananas. Eighteen unripe organic bananas and eighteen unripe non-organic bananas were split into three groups of six bananas each, and left uncovered to ripen, in the same room, and on the same counter space. The bananas were left to ripen at the same level humidity, and with the same amount light exposure, at the same temperature. The bananas were then deemed ripe when their colour and appearance matched that of stage 7 on a photographic ripening scale. The ripening time of a banana was recorded immediately once the banana had reached this stage, and was then repeated with each banana until all thirty-six were recorded. The organic bananas were found to change colour, from green to yellow, in less days than the non-organic bananas, and with the use of the T-test, the results obtained were shown to be statistically significant, and support the original hypothesis that organic bananas ripen faster than non-organic bananas.

Creation of False Memory in Young Adult and Adults

Matthew Kevork, Steven Gringras, Laurent Lachaussée
Teacher: Francesca Thériault

The creation of false memory is the phenomenon by which an individual distinctly remembers an event or detail that never actually happened. Many memory researcher assert that the susceptibility to false memory decreases from childhood to adulthood . We hypothesized that susceptibility to false memory would therefore decrease further from young adulthood to middle age. We used a standard DMR paradigm, which consists of remembering a list of related words, to observe the susceptibility of 10 subjects between the age of 15-20 and 10 subjects between the age of 45-55 to false memory. Our observations indicate that there is not statistically significant difference in false memory creation between the 15-20 and 45-55 age range; 15-20, mean extralist intrusion: 2,7 (Standard deviation: 1,85) 45-55, mean extralist intrusions: 2,2 (Standard deviation: 0.63) p-value: 0,4324. There is no observable increase in susceptibility to false memory between adults and older individuals. This is relevant in the legal profession where older witnesses can be discretized on the account of their memory.

Cutting into the Facts: Examining the Effectiveness of Household Cleaners at Hindering Bacterial Growth on Cutting Boards

Sofia Di Caprio, Noah Adessky and Soniya Begum Mosammat
Teacher: Brid Nic Niocaill

Bacteria occupy almost every possible surface with which we come into contact. In our kitchens, bacteria can live on our cooking instruments, such as our cutting boards, and lead these utensils to be less sanitary. Several cleaners exist in hope of diminishing the growth of bacteria on surfaces; however, no consensus has been reached on whether these products are more or less effective on wooden or plastic surfaces and overall, which sort of cutting board is most sanitary. To test this, wooden and plastic cutting boards were cleaned with sterilized water and then with a mixture of soap and sterilized water, vinegar and sterilized water, and bleach and sterilized water in order to determine the effectiveness of these hindering bacterial growth on the different surfaces. The results attained showed that 155+13, 12+6.56, 26.33+8.02, 0.33+0.58 bacterial colonies from the wooden cutting were extracted from the wooden cutting board following cleaning with sterilized water, soap, vinegar and bleach, respectively. On the plastic cutting boards, results of 11.33+0.58, 1.67+0.58, 11.33+0.58, 9.33+2.08 bacterial colonies were attained for the water, soap, vinegar and bleach treatments, respectively. The t-tests performed on the data showed that more cleaners are effective on wooden cutting boards and thus wooden cutting boards are more sanitary for use in a kitchen.

Do Brown eyes or Blue eyes have a greater perception of Colour?

Michael-Anthony Mastroianni, Nicholas Santoianni
Teacher: Francesca Thériault

Color vision is necessary in many of life's tasks from diffusing bombs to driving a car. Previous studies have indicated that perception of color is different in humans who have dark eyes or light eyes and that people with light eyes possess more sensitive photoreceptors than dark eyes, giving them an advantage in dim environments (Higuchi S. et. al). We hypothesized that blue eyes would have a greater perception of color when compared to brown eyes in dim lighting when performing an Ishihara color blind test. Ten blue eyed and 10 brown eyed 18-year old males with no visual problems performed the test with 15 color plates. Our observations showed no correlation between perception of color and the subject's eye color. Chi-square tests showed no significant difference between the two eye colors (Brown: 0.5, +/-1.08; Blue: 0.3, +/-0.67; $p = 0.4433$). This result, though not in agreement with previous findings, would indicate that color blindness in 18 year-old males is not correlated with eye color. This has important life applications because a color vision is required in most areas of the workforce and for general safety.

Does a weak magnetic field affect the growth and germination rate of the bean plant?

Piero Campopiano, Cristina Della Valle, Jovan Kostenov, Anthony Santoianni
Teacher: Jeffrey Eng

The purpose of this experiment was to determine if a weak magnetic field has an effect on the germination rate and final height of bean plants (*Phaseolus vulgaris*). A total of thirty bean seeds were planted in individual containers that were subjected to the same amount of sunlight and water. Fifteen of the plants were used for the experimental group and had magnets glued on opposing sides of the container. The magnets were placed in such a way that the attracting poles were facing each other. The remaining fifteen plants acted as the control group without magnets. The germination time and height was measured daily for four weeks. It was observed that the weak magnetic field had no significant effect on germination rate or final plant height in comparison to the control group.

Drafting and Statistical Insight to its Effect on Cycling Performance

Brie-Anna Gerardi, Jorge Luis Khouri, Samuel Carmel
Teacher: Francesca Thériault

Drafting is a technique that is widely used to increase an athletes performance. Christophe Hausswirth experiment on the effect of two drafting modalities in cycling on running also examined drafting effects. We hypothesized that cyclists exposed to a draft will have a lower heart rate compared to their heart rate without drafting. We monitored the heart rates of the ten members of the control group during one lap without drafting, around the Circuit Gilles-Villeneuve. The control group then became the experimental group. Their heart rates were measured during one lap while drafting always at a speed on 30km/h. Our observations indicated that drafting had a stimulating effect on the heart rate of the cyclists; t-test statistics for the effect of drafting on heart rate in cycling showed a significant difference between the two groups. The mean value and standard deviation for the control were 158.18bpm and 16.35, whereas the mean and standard deviation for the experimental were 138.64bpm and 15.45 respectively. The p-value for this experiment was < 0.0001. The heart rate of the cyclists was lower when subjected to drafting. This has important implications for athlete's training and/or racing strategies.

Effect of different colors on human to human perception

Miriam Continelli, Kim Nguyen, Matéo Palomino
Teacher: Francesca Thériault

When we go to an interview, we are always sized up the very minute the employer lays their eyes on us. This made us hypothesize would the color of our shirt worn to an interview affect one's chance at employment. We asked 16 random female students (for continuity purposes) around campus to fill out a form showing a person wearing 5 different colors and had a list of 5 adjectives. It was their task to associate one color to one adjective, the only information we gave them pertaining to the experiment was they're an employer employing someone to work for them. The results and Chi-square Test obtained were insignificant and showed no correlation throughout the experiment. The color worn to a job interview does not influence the employer's decision. Therefore, the importance of wearing a specific color to a job interview is not valid.

Effect of light color on plant growth

Leila Bencherif, Olivia-Maude Ouattara and David Benabou
Teacher: Jeffrey Eng

Light is the principal source of energy for plants. This is what allow the process of photosynthesis to occur in plants' leafs and thus, the production of their own food. White light itself is a mixture of different colors, from red with the longest wavelength to violet with the shortest one. Several studies have been done on whether these different colors would individually affect plants' growth in a specific way. The results obtained show that in fact, each light color does have a specific effect on the development of plants. This experiment has been designed to observe the effect of the red, green, blue, violet and white light on the growth of simple beans with 3 plants growing under each light and the white being the control group. The T-test did show a difference between the group of plants growing under white light and the ones growing under the other light colors. The difference is not so drastic, but still considerable, enough to say that light color has indeed an effect on plant growth.

Effect of Soils and Watering Technique on Radish Growth

Isabela Dragomir, Julien Otis-Laperrière, Mihaela Talpos
Teacher: Annie-Hélène Samson

The objective of our experiment was to determine the most efficient combination of soil compaction and irrigation technique for the growth of radish. We were specifically interested in watering with smaller volumes of water at smaller time intervals (i.e. drip irrigation) as opposed to watering with bigger volumes of water at bigger time intervals (i.e. traditional irrigation). Our hypothesis is that watering a low water retention level soil by a dripping technique would be the most favorable combination for the growth of the radish plant because it will be able to take as much as it needs while there might still be some excess water. A total of 4 experimental groups, each composed of 7 individuals (i.e. radish plants), were grown for a month in different combinations of soil compaction and irrigation frequency and intensity. All of the four experimental groups had the same quantity of soil in each pot, although two of those groups (i.e. 14 pots) were compacted by 1.27 cm while the two other were left uncompacted. For the first two weeks of growth, we watered 120 ml over two days for all 28 pots. It then took two weeks for the soil to be dry enough to begin our different watering techniques. For the remaining two weeks, two groups with different soil compaction levels were then watered once every four days with 40 ml of water, while the remaining two groups were watered twice per day (i.e. morning and night) with 5 ml of water. To ensure that only these factors would affect the growth of the plants, all 28 pots were placed in identical lighting, temperature and ambient humidity conditions. Preliminary observations show that plants grown in compacted soil took longer to germinate and emerge out of the soil, whereas no obvious difference was noted between the different watering techniques.

Effects of aerobic versus anaerobic exercise on reaction time

Omid Gholami-Shabani , William Quisias
Teacher: Francesca Thériault

Reaction time or more precisely the elapsed time from the display of a stimulus to a physical response is an important aspect of cognitive function. We had hypothesized that specific types of exercises, namely aerobic and anaerobic have an effect on physical reaction time. More specifically that aerobic exercise will cause a reduction in reaction time because of the increase in heart rate and blood flow to the brain and that anaerobic exercise will increase reaction time because it will cause muscular fatigue plus a buildup of lactic acid in the muscles. We observed through our experiment that the subjects who performed muscular strength exercises had very similar mean reaction times as the control who were tested in a gym environment without any prior exercise, (378.25ms vs 380.40ms). The statistical significance was determined with an un-paired t-test with p- value of 0.8875, standard deviation for control group (n=20) was 32.6, that of the experimental (n=20) was 59.1. Same un-paired t-test with p-value of 0.0003 was used for the experimental group (n=20) when they performed aerobic exercise, cycling in this case, the mean was 321.45ms with a standard deviation 57.8. Our conclusion is that aerobic exercise causes a reduction in reaction times and anaerobic exercise causes no noticeable effect. Since reaction time is a substantially important part of our daily life, whether it be related to a job, sport or even something as simple as avoiding a car accident, finding ways to make it faster can have positive impacts on our lives.

Effects of Caffeine On Learning and Memory on Humans

Maxime Lapointe-Gagner, Alejandro Lacasia, Timothy Piggott, Davin Miller
Teacher: Brid Nic Niocaill

Many students drink coffee and therefore consume caffeine, but little research has been done on its effects on memory. Like the rat experiment, this experiment divided participants into two groups: coffee drinkers before and after a training session, and their results were compared with a follow-up testing session. 16 students between 18 and 24 years old drank coffee either before or after a training session 24 hours before a test session to determine the effects of caffeine on memory. Similar research has been done on rats (Angelucci et al. 2002), but not on humans. This study concluded that drinking coffee before training was found to help with memory retention more so than drinking coffee after training. Understanding how caffeine affects one's memory is essential to being able to take advantage of the substance.

Effects of Synthetic Fertilizer vs. Kelp Fertilizers on Arugula and Their Environmental Impact

Sarah Waldron, Samantha Attias, Michael Cristiano, Gerassimos Nikolopoulos
Teacher: Brian Mader

Fertilizers are used in agriculture to improve plant quality and crop yield. Through out the course of five weeks three groups of six baby arugula seedling were grown in a nutrient enriched organic soil using Miracle Gro plant fertilizer, a kelp based foliage spray fertilizer and just water. The height and number of leaves were measured and counted aver seven to ten days and were watered on a regular basis. The pH, nitrate and phosphate levels were also measured to determine the effects the different fertilizers had on the soil. The control plants that were given just water showed little growth and did not yield a large amount of leaves, were as the arugula that were fertilized showed significant growth and leaf yield. The kelp fertilized plants and the Miracle Gro fertilized plants were close in results. The Miracle Gro fertilized arugula had a larger leaf yield and grew to almost the same height as the kelp fertilized plants but look unhealthy and weak. The kelp-fertilized plants showed both significant growth and yield and over all looked much healthier. Fertilizers have a large impact on the environment, often times negative, causing soil degradation and large amounts of harmful runoff into nearby water sources. It is important to test which types of fertilizers are the least harmful but still produce the same quality and quantity as the more harmful synthetic fertilizers.

Evaluating the Effect of 200mg of Caffeine on Reaction Time

Nicolas Laporte, Vincent Bonetto, Minhajul Hoque
Teacher: Annie-Hélène Samson

By mimicking the structure of adenosine, caffeine decreases the symptoms of fatigue. The goal of our experiment is to determine whether 200 mg of caffeine has a significant effect on individuals after 20 minutes. The difference in the reactions times of the experimental group (caffeine) and the control group (placebo) would be measured by performing a ruler drop test. The results demonstrate that 200 mg of caffeine improves the reactions time of subjects by a statically significant margin. This is due to the similar molecular shape of caffeine and adenosine, which allows caffeine to block off receptors critical to triggering symptoms of fatigue.

H2placebO : A study of the placebo effect on the preference of water

Diego Figueroa-Goetschi, Anthony Fiorilli, Sabrina Lalli, Sara Palazzese
Teacher: Caroline Robert

A research published in 1981 by A. Branthwaite and P. Cooper stated that “compounds have been found to be more powerful if they are branded than when they are unbranded” (Branthwaite & Cooper, 1981, p.1). The placebo effect has also been proven on many occasions to have a more powerful effect when the placebo is being perceived as the better option to the user, as stated by Sundararajan Rajagopal in the BJPsych Bulletin. The goal of this experiment was to determine whether information known about a certain water sample (Fiji water) would affect the subject’s perception of its flavor and influence their preference when being compared to regular tap water. The subjects who were being experimented on were exposed to two water samples, each labeled differently, but containing the same sample. One of the water samples would be labeled as Fiji water, while the other sample would be labeled as regular tap water. Subjects were also given a short written explanation as to why Fiji water is considered better prior to the tasting. It was hypothesized that the branding of the water and the short written explanation would cause a placebo effect, causing the subject to prefer the taste of the Fiji branded water rather than the water without a brand, even though they were both the same. The chosen sample size was 50 subjects. The statistical analysis test used was the chi square test. The calculated chi square was equal to 6.31 when α was 0.05, which means that the results were significant as it was greater than the critical value of 5.99. The conclusion was that more subjects preferred the “Fiji” water over the tap water.

Highlight The Right Way: A Study on the Correlation between Color and Short-term Memory

Massimo Vatistas, Panagiotis Retsinas, Daniel Broomberg, and Arman Khachaturyan
Teacher: Caroline Robert

It is widely accepted in the science sector that half of the information gathered by the brain is derived from visual input. The purpose of this study is to determine which visual elements allow for more effective memorization. To test the effect that colors have on our memory, a group of test subjects was gathered and shown two presentations, one featuring words highlighted with five different colors, and the other with uncolored words which differed from the first one. Following each presentation, the test subjects were asked to submit the words they remembered. This process aimed to determine whether color significantly affects memory and if so, which colors allowed for the strongest memorization ability.

Hotline Bean

Emily McIsaac, Alexandra Zajda, Jared Cohen
Teacher: Annie-Hélène Samson

It has previously been shown that caffeine increases the growth rate of sunflower plants (Khursheed, 2009). We therefore hypothesized that watering mung beans (*Vigna radiata*) with a solution of caffeine would increase their growth rate. To test this, we planted and watered 5 pots of mung beans with a 0.25% caffeine solution and 5 pots with water. On average, the beans treated with caffeine had shorter stem lengths and slower daily growth rates than those in the control treatment. These results were found to be significant but did not support our hypothesis. Our experiment has instead shown the detrimental effect of caffeine on the growth of mung beans.

Is Exercise a Good Way to Jog Your Memory?
Aurélie Bouskila, Fariha Chowdhury, Claudia Mangiola & Florecie Régis
Teacher: Caroline Robert

Various research has shown that physical exercise may help improve memory retention. This experiment was conducted to test if the short term memory of adolescents is affected by short periods of exercise. It was hypothesized that students will score higher on the memory test after performing physical activity, rather than when they were inactive. A group of 37 students underwent a word retention test after a ten minute rest period. Subsequently, the same group of students underwent a second word retention test after ten minutes of physical activity. Preliminary results demonstrated that there was a slight increase in the number of words remembered after the exercise period.

Linguistics and Brainwaves: The Effects of Spoken Languages on Brain Waves in Humans
Clara Scattolin, Eitan Gabbay, Robert Fercal, Chelsea Chisholm
Teacher: Annie-Hélène Samson

Language and pitch are processed in different hemispheres of the brain; language comprehension is processed in the left temporal lobe while pitch is processed in the right hemisphere. Tonal language speakers, who use tone in order to discriminate words, and atonal language speakers were compared to determine whether they exhibit functional differences in brain waves. More specifically, since tonal language speakers, whom are said to use the musical pitch related regions when speaking, theta brain waves, which are associated with musicality, were being studied for functional differences between the two language speakers. Our hypothesis was that if tonal language speakers exhibit a musical aptitude, a difference in theta brain waves will detected between tonal and atonal speakers. To answer the question, we used a single channel EEG, or electroencephalogram, to measure the brain waves exhibited by tonal and atonal speakers. Subjects from both groups listened to pseudo-Mandarin Chinese, pseudo-English sentences, and an excerpt of a musical score with their eyes closed in a room devoid of additional auditory stimulus. The three stimuli determine whether any functional differences can be attributed to atonal and tonal speakers, themselves, the languages, or music. The brain waves were then exported to excel where the ratio between theta and delta waves were graphed and examined for a patterned ratio at the times where stimulus was introduced.

Memorization Capabilities of Students using Screens as opposed to Paper
Jonas Langer, Tal Elbaz, Mark Mambo, Luca Marano
Teacher: Caroline Robert

With screens becoming the standard reading medium, it is worth wondering whether this new change is actually benefitting us. This is especially important for students, because the majority of students learn off of either a laptop or computer screen. We decided to test the memorization capabilities of both students who were using paper as their reading medium, and students who were using a screen as their reading medium, and hypothesized that it would be more difficult to memorize off of a screen. We asked a total of 40 students to participate, and split them evenly in either group A (where they would memorize off of paper) or group B (where they would memorize off of a screen. Each student from their respective group (made up of twenty cegep students) was given a 15 word piece of paper, and was asked to memorize as many words as they could. After twenty seconds, they would have the paper taken away from them, and they would have to recite all the words that they were able to remember. In this experiment, the independent variable was the medium (paper or screen), and the dependant variable was the number of words a student was able to memorize. We held the words, age, and time of day constant. We found that the average number of words that the students from group A (using paper) were able to memorize was 6.7, and for group B it was 6.55. This supports our hypothesis that it would be more difficult to memorize off of a screen then off of paper, but since the results are so close, it is hard to say whether there a difference between the two reading mediums.

Music on Heart Rate

Vanessa Tedeschi, Emanuel Sharma, Sarah Lavecchia, Marc Seccareccia
Teacher: Jeffrey Eng

The purpose of this project is to determine whether there is a relationship between the human heart rate and the tempo of music. To test the hypothesis, the heart rate of participants was taken prior to and after listening to 3 separate classical songs, each of different tempo. The tempos chosen were Andante, Allegro and Vivace. The participants listened to each song for a duration of one minute and were given a 30 second break between each listen. An iHealth blood pressure monitor was used to calculate the participants pulse, and an app that connected to the device through Bluetooth stored the data obtained. The results showed that there was an average decrease in heart rate after each song, compared to the initial heart rate. This supports the hypothesis, which states that if participants listened to classical music of different tempos, a change in heart rate would be observed.

Neogregarine Parasitized Mortality in *Danaus plexippus*

Anais Charbonneau-Poitras, Emily Morin-Lyons, and Maya Zivkovic
Teacher: Brian Mader

The development of *Danaus Plexipppus* infected with *Ophryocystis elektroskirrha* is directly affected by the protozoan parasite's growth cycle and relation to its host. 328 caterpillars and 70 chrysalises were observed in Dawson laboratories and nurseries, creating 71 butterflies from caterpillars and 61 from chrysalises. The morality rate was of 71.35%, comparatively to an average mortality of 91.08% for those reared in nature. Error bar analysis test statistics comparing the mortality rates revealed a significant difference between lab and naturally reared butterflies. The Dawson lab reared monarch mortality rate was lower than that of monarchs grown in nature, leading to the conclusion that the former is free from predation in a laboratory environment. This data will allow to adjust the Dawson Monarch Nursery Project's treatment of infected caterpillars with regards to the use of infected plants and equipment, as well as releasing them into nature to potentially avoid further infection.

Parasites found in Goldfish

Giovanna Taormina, Stef Petrella, Elias Liopoulos, Angelie Menard
Teacher: Brian Mader

Intestinal parasites are dangerous to organisms owning a digestive system because they take full advantage of their host (often causing death), but they can also be inoffensive. This experiment found the difference of parasites in the digestive system of goldfish from two different water sites: a pond and a pet store. For the research, the intestines of the 6 fishes (3 from a store and 3 from a pond) were examined. As a result, a mean of 8 parasites were found for the shop fish and 14 for the pond fish. The gap in the amount of parasites was 4.8707 which means the results are significantly different from each other. All types of parasites were counted together because the experiment was only based on the quantity, not the different types. The statistics obtained in the experiment are significant because the parasites were found in the digestive system of the fishes. The conclusion is that more parasites were present in the pond fish than the shop fish, due to their different environment. The results support the hypothesis presented because they are significantly different from each other. This experiment is biologically important because it demonstrates the environment's effect on parasites in an organism.

Peak Your Interest

William Goodman, Jared Fried, Amanda Ohayon, Rebecca Weill
Teacher: Caroline Robert

The aim of this experiment was to determine whether or not the Peak-End rule had any merit, since it has an enormous effect on our day to day lives. The Peak-End rule states that humans remember an overall experience as how they experienced it during the peak and end times. In our experiment we tested two different groups, control and experimental, giving them the exact same questions in two different orders. In the experimental test, the harder questions were asked at the end, in an effort to have the test taker "tricked" into believing the test was harder than it actually was. We found that given our relative sample size, the insignificant variance of our control and experimental results were unable to prove the Peak-End rule as there was overlap between their means and confidence intervals.

Peripheral Vision Capacity with Relation to Eye Pigmentation

Yan Arsenault, Corbin Patterson, Michael Djabauri, Dragos Manailoiu
Teacher: Caroline Robert

Eye color does not impact eye sight, but does affect the eye's sensibility to light. The aim of this experiment was to determine whether eye color affects peripheral vision. Fifteen individuals with light eyes (blue, green) and 15 with dark eyes (brown, black) peripheral vision were tested. The test involved passing a piece of cardboard with either one or two dots on the left and right side in a circular fashion, and measuring the angle when the dots were perceived. After testing the sample group, the collected data showed that the average range of peripheral sight was between 15 and 20 degrees for both eye color groups. The T test indicated that there was no difference in peripheral vision between the two eye colour groups.

Prevention Method of Spreading *Ophryocystis elektroscirrha* Spores in Laboratory Reared Monarch (*Danaus plexippus*) Population

Maggie Blondeau, Nicholas Danopoulos, Alexandre Pham, Suthan Sinnathurai
Teacher: Brian Mader

1) Because of the 78.35% mortality rate of monarch butterflies in the 2016 Monarch Project at Dawson College, a solution to reduce the cross contamination of the sporing parasite (*Ophryocystis elektroscirrha*; OE) causing the deaths was found. We believe washing hands with common soap will reduce the number of OE spores found on human skin.
2) OE is a protozoan parasite that, as a spore on the wings and body of a grown butterfly, is introduced to milkweed plants when the monarch lands on it. OE either kills monarch pupas during metamorphosis, or the monarch emerges with other OE induced consequences (e.g. disfigurement).
3) 3 trials of washing hands after handling OE infected monarchs to reduce the amount of spores attached to the skin were performed.
4) The average amount of OE spores present on fingers before hand wash and after hand wash were 488.3 and 0.66 spores per millimetre squared respectively.
5) There is a significant difference between the amount of spores per millimetre squared before washing hands versus after. This shows how using common hand soap can reduce spores found on fingers by 99.9986%, helping to reduce the cross contamination of OE spores due to human contact.

Reading Speed of Scrambled Words with Regards to Age

Noah Ruscica, Nathan Ziri
Teacher: Francesca Thériault

Cognitive abilities are skills that humans and all other creatures need in order to complete both complex and simple tasks, and as we age, cognitive abilities increase and peak midlife, and then begin to decline (Fillit and Butler, 11). An experiment was conducted regarding cognitive abilities, more precisely, reading speed with regards to age, as it was hypothesized that there is a difference in reading speed between people of younger and older demographics. Reading speed was measured in an experimental group of ten people between ages 40 to 60 and in a control group of ten people between the ages of 17 to 19, who were all required to read a short text in which the words are scrambled, except the first and last letter of each word. Results indicated that age might very well be a significant factor in people's reading speed, as the t- test statistics for the average reading speeds of participants showed a difference between the two age groups (younger group: 103.593 seconds, s = 22.702; older group: 128.793 seconds, s = 22.438, p = 0.0225). The average time it took participants of the younger group to read the short text was lower than that of the older group, indicating an overall slower reading speed in the latter group. This may be indicative of differences in cognitive abilities in language processing as well as in people's ability to decipher words with regards to age, which can be pertinent in assessing everyday life situations.

Relationship Between the Olfactory System and the Ability to Distinguish Flavors in Humans

Jessica Nguyen, Roosevelt-Humberto Quiel-Fossatty, Brandon Ruffolo
Teacher: Caroline Robert

This experiment explores the hypothesis that stimulating the nose with a separate odor stimulus can be more effective than blocking the nose at confusing flavor. The experiment classifies confusing flavour as the inability to identify a usually easily distinguishable flavor. Thirty four individuals participated in the experiment. Their ability to identify common food flavors was tested with the nose unimpeded, the nose blocked, and the nose stimulated by a separate odor stimuli.

***Saccharomyces Cerevisiae*: A Pretty Fungi**

William Asselin, Andrew Boeckh, William Harris
Teacher: Annie-Hélène Samson

Yeast is a eukaryote with a range of applications in industry and our daily lives. Yeast has been used for thousands of years to make alcohol such as beer and wine and is now used for a plethora of products ranging from bread to fuel in the form of ethyl alcohol (ethanol). Optimizing growth of yeast is a crucial step towards optmizating production efficacy, and this is the topic covered in this research. Much is known about yeast, particularly the species used in this experiment *Saccharomyces Cerevisiae*, and how it reacts to various sugars, temperatures, pHs and nutrients. We considered a somewhat new variable to encourage yeast growth: the use of audible frequencies. Previous research has demonstrated that frequencies can have different effects on the living organisms exposed to them. Researchers from Goenka University found that soft melodious music has positive effect on growth, whilst louder Rock & Roll stumped growth. However, their research was conducted on plants, and so we attempt to transpose the idea to observe the effects of sound waves on yeast. In our experiment, different replicate groups of yeast were exposed to frequencies of 440Hz and 880Hz as well as a control silent treatment. Measurements of yeast density were then taken at regular intervals to obtain quantifiable information on the growth process. In order to obtain accurate results, hemocytometers were used to track the yeast density of the samples. We then analyse the data and infer a conclusion.

Scraps=Electricity

Christopher Hansen-Barkun, Vy-Phuong Nguyen, Taira Demisheva, Veronica Ligia Lazo Argueta
Teacher: Brian Mader

We aspire to determine whether soil mixed with compost will produce more electricity than soil without compost. The experiment was performed using six equal volume containers and an electrometer. Containers were divided into sample, and test groups. The test group included three containers holding 400g of regular soil, mixed with 400g of test compost. The control group included three containers holding 800g of regular soil. After 7 days 200ml of water were added and the samples were tested for electrical voltage. The conductivity measured in the mixed compost was higher than the soil group with respective means of 109.7 mV and 22.47 mV, respectively. Error bar analysis showed an increase of conductivity with 107.86mV for the test group, and 13.39mV for the control group, for a gap of 108.96mV. These results provide enough information to conclude that the compost significantly affects the level of conductivity in soil, and that this experiment can be expanded to a greater scale.

Testing the Effectiveness of Homemade Slow Sand Filters in Eliminating Bacteria from Contaminated Water

Aliza Dworkind, Matthew Acel, Kia St-Pierre and Dimitrios Markou
Teacher: Brian Mader

The lack of potable water on a global scale, and especially in developing countries; raises the issue of finding safe, affordable and clean drinking water through a diversity of water filtration techniques. Among these techniques: the slow sand filtration method. In an effort to evaluate the effectiveness of a slow sand filter made of gravel and sand, favoured due to its simplicity, small size and affordability, we passed water sources collected from Lac St.Louis, Lachine through 3 identically organized sand filters, and cultured the bacteria found in the water before and after filtration. We hypothesized that the homemade slow sand filter would be an effective way of eliminate bacteria from water. [Results are not finalized]. We expected to have a significantly smaller quantity of bacteria in the sample collected that was passed through the filter. If this is true our hypothesis will be supported and we can conclude that our slow sand filter was effective. Testing for the effectiveness of the filter allows us to determine if our slow sand filter design would be a legitimate method of providing clean drinking water.

The 5-Second Rule

Yossi Cohen & Noam Suissa
Teacher: Jeffrey Eng

The “5 second rule” states that food that has been dropped on any surface can be safely eaten within the first 5 seconds, without being contaminated by bacteria. To test this theory, we analyzed the accumulation of bacteria on different foods; apples and bread. We dropped an apple slice and a piece of bread on the floor for three different time intervals (0 seconds being the control, 5 seconds and 15 seconds). The foods were then pressed on separate petri dishes that were split into 3 sections, one for every time frame. A total of 6 petri dishes were used; 3 for apples and 3 for bread. The amount of bacterial colonies produced within each time frame was computed. The data was then analyzed using significance testing with a T-test. Given that we obtained a p- value < 0.05, the differences in the mean amounts of bacterial colonies formed in the apples and bread are not significant.

The Difference in Productivity of Soil and Hydroponic Cultures on Lettuce Seeds
Roxanne Lebel-Guérin, Élissa Sanson, Pamela Desrosiers
Teacher: Brid Nic Niocaill

The aims of our experiment was to observe the productivity of a hydroponic system (growing plants without soil) and a soil system to find out which one was more productive. To do that, the growth of 12 lettuce plants (6 in each system) was recorded over the course of 13 days. The one grown the traditional way were all put in soil while the plants grown in the hydroponic system were put in a large container filed with water and nutrients. The mean of the height of the plants for both systems were similar at the end of the experiment. The variance was 20.6 (hydroponic system) and 17.6 (soil system) and the standard deviation was 4.54 (hydroponic system) and 4.19 (soil system). From this results, the conclusion that this experiment was inconclusive was drawn.

The effect cell phones have on the reaction time of drivers operating a vehicle.
Eden Ovadia, Matthew Zoltak, Arielle Lasry
Teacher: Francesca Thériault

Cell phone reaction time is a very important and controversial topic in modern society, given the huge boom in cell phone use in recent years. There has been a lot of research in this area in recent years as a result of the monumental increase in cell phone usage while driving. Our goal was to determine the extent of the effect cell phone usage has on the reflexes and reaction time of drivers.

The Effect of Being a Twin on the Number of Cards Answered Similarly on the Rorschach Test
Vanessa Bonomo, Alexia Lucifero, Ivana Rebuli
Teacher: Francesca Thériault

Twins have a more solid mutual understanding of each other compared to non-twin siblings since they are the same age and are likely to share more experiences together (1). We hypothesized that twins think more alike than non-twin siblings. We conducted a Rorschach Test on five pairs of twins where each sibling had to say the first thing that came to their mind for ten cards containing inkblots. Our control group consisted of five pairs of non-twin like siblings that were tested in the same way as the experimental group. Our observations indicated that non-twin siblings had a greater number of similar answers; chi-square statistics for the number of individuals and similar answers did not show a significant difference between the two groups of siblings. The number of cards answered similarly were higher for the non-twin siblings compared to the twins. This has important implications for studies, since twin studies show how the environment and genetics, also known as “nature vs. nurture”, play a role in their thought process.

The effect of eco-friendly cleaning products on the environment
Breanna Pevec, Carly Turner, Mairead Maloney, Elizabeth Shimotakahara
Teacher: Brian Mader

Nitrate and phosphate are two substances critical to algal growth which can often be found in household cleaning products. The purpose of this experiment was to determine if environmentally friendly cleaning products really do have an eco-friendly impact on water quality when compared to a non eco-friendly product. This was evaluated by comparing the algal growth between water samples given 5 mL of an eco-friendly cleaning product versus water samples given 5 mL of a generic brand. These results showed that there was a significant difference between the algae produced by the samples containing Windex and the control and between the no name product and the control. However, there was not a significant difference in the algae produced by the two cleaning products. The results found from this experiment are important as they demonstrate that products marketed as environmentally friendly are actually not that different from regular products. However, they demonstrate that cleaning products do have an effect on algal growth overall.

The Effect of Electric Current on the Shelf-Life of Fruits and Vegetables

Alexander Dimitrakopoulos, Daniel Iarrera, James Baggio, Derek Harvey-Paul, Boris Kirimidtchiev
Teacher: Jeffrey Eng

The purpose of this project was to determine if electric currents have any effect on the shelf-life of edible products such as fruits and vegetables. In this project, the products that were experimented on are potatoes, carrots and bananas. A potato, a carrot and a banana were each placed in a series circuit, with a constant voltage of 18V, for a duration of four hours. This setup was repeated three times, leading to a total of three bananas, three carrots and three potatoes that have been exposed to an electric current. Their structural changes were observed during the following two weeks. The experimental group of bananas' shelf-life turned out to be longer than the bananas of the control group. Regarding the carrots, the results were the exact opposite as the carrots from the experimental group went bad at a faster rate. As for the potatoes, the results were inconclusive, since no changes were observed for the experimental and the control group. The data was analyzed and the conclusion was drawn that exposing edible products, like fruits and vegetables, to an electric current does not necessarily increase their shelf-life.

The Effect of Exercise on Blood Pressure

Nadia Glen-Walker & Nicholas Powroznyk
Teacher: Brid Nic Niocaill

The aims of this experiment are to evaluate blood pressure levels in athletes and none-athletes and analyse how physical activity can have a positive effect on the cardiovascular system. In order to collect data, the blood pressure (diastolic and systolic) at resting heart was taken from male and female non-athletes and athletes and then taken after mild exercise; 15 burpees. The main results obtained consisted of both female and male athletes having a lower blood pressure at resting heart rate and also after doing mild exercise. It can be concluded that physical activity can benefit the cardiovascular system by decreasing blood pressure at resting heart rate.

The Effect of Fear on the Human Pupil

Spencer Meltzer, William Tamburri, Omar-Tarik Taufeek,
Teacher: Caroline Robert

The goal of our experiment was to observe the effect fear has on pupil dilation. We hypothesize that human pupils dilate when one experiences fear in order to allow more light to shine on the retina. This is an evolutionary adaptation that enables one to see the threat better. The control video shown to the subjects contains a car driving down a hill peacefully. The experimental video shown afterwards is the same video, but with a monster that jumps into view suddenly in order to induce a fear response in the subjects. The subject's pupils were measured before each viewing of the video, and then their eyes were filmed in slow motion while they were watching the two videos. Twenty-five people were filmed for the experiment, but only thirteen of the videos produced clear and analyzable footage. Only people with dark colored eyes were used as test subjects because light colored eyes are more sensitive to changes in light. The results showed that while watching the control video, there was no change in pupil size. However, when they were shown the fear inducing experimental video, the pupil dilated by an average of 0.73846 mm. The T-test showed that our results were statically significant. In conclusion, the results of the experiment support the hypothesis. Therefore the experiment could be considered a success.

The Effect of Inverted Vision on Brain Adaptation at Various Ages

Kaarthipan Kulasegarampillai & William Roper
Teacher: Francesca Thériault

The human brain is extremely complex such that little scientific knowledge on the subject of brain adaptation with age is known. In this experiment, a pair of inversion goggles were used to flip the test subjects' vision. These subjects were assigned with a simple task of pouring water from a cup into the spout of an open soda bottle, with and without the goggles. The results were observed for age groups 18-24 and 41-60, and the calculations read a much greater average difference in time to complete said task with and without the goggles in the age group 41-60. These results provide insight into the vastly mysterious workings of the brain and how it adapts differently with age.

The Effect of Study Time on Medium Term Memory

Anthony Anastasopoulos and Melanie Kobayati
Teacher: Francesca Thériault

Time is an important factor in having a good memory, since it allows the subject to retain the information at a more comfortable pace. We hypothesized that subjects given ample time to study would have a better medium term memory, that is memory lasting over a 24-hour period, than subjects who were given just enough time. We looked at the test results of an experimental group of 10 subjects given 13 minutes to read a text, and of a control group of 10 different students given 7 minutes to read the same text, both of which were tested on said text the following day. We observed that when additional time was given, the results obtained were better; the experimental group had a mean of 68.2% with a standard deviation of 17.9, whereas the control group had a mean of 59.2% with a standard deviation of 11.8. Therefore, the medium term memory of the subjects given ample time to read was better seeing as they obtained a better result when tested. This conclusion is important for students everywhere, as it will encourage them to take as much time as possible to study in order to obtain better grades.

The Effect of the Visual Element of a Video of Human Vocalization on the Perception of That Vocal Sound in Humans

Natchev, Keanu and Nunez, Matteo
Teacher: Francesca Thériault

Eyesight has been shown to affect the perception of an object's size and structure because it dominates over the sense of touch (Posner, Michael I., Mary J. Nissen, and Raymond M. Klein. "Visual dominance: an information-processing account of its origins and significance." Psychological review 83.2 (1976): 157.). This gave rise to the question of whether or not eyesight also dominates over the hearing of human vocal sounds. We hypothesized that looking at the movement of a person's lips will affect what an observer will hear. We asked a group of 13 men between the age of 18 and 19 to tell us what they heard for two videos where the sound remained the same, but the video clip changed. Our observations indicated that what the subjects saw in the video clips dominated over what they heard; chi-test statistics for the number of people who heard the correct word showed a significance difference between the two groups ($M1 = 9.31$, $M2 = 0.31$; $SD1 = 1.20$, $SD2 = 0.51$; $P = 0.01 < 0.05$). Eyesight was dominant over hearing in regards to human vocal sounds. This has important implications for public speaking, face-to-face conversations and video editing since the image perceived by the listener can affect the understanding of the content.

The effect of temperature on *Saccharomyces cerevisiae*'s growth

Nghi Huynh
Teacher: Jeffrey Eng

Saccharomyces cerevisiae is a species of yeast. This experiment is designed to measure the effect of temperature on its growth.

THE EFFECT OF TRIAZA 1 AZONIA ADAMANTANE CHLORIDE ON BEAN SPROUT GROWTH AND GARDEN SNAIL EATING HABITS

Roxana Baloiu, Kahsennaro Roks Deom, Morgane Meyer
Teacher: Brian Mader

Organochlorines are chemicals that can cause a lot of damage in organisms such as infertility. This experiment looks at the effects of excessive use of triaza 1 azonia adamantine chloride on bean sprouts germination, shoot growth and its effects on eating habits of consumers (in this case snails). The hypothesis is that an excessive amount of this organochlorine speeds up the growth and germination of bean sprouts and that snails will stay away from the infected food. The experiment was conducted in the interval of a week. It included an experimental group of beans sprayed with a fungicide every day and a control group that was sprayed with excess water. Each group consisted of 3 samples that had 50 bean seeds each. The results of the experiment showed that the average height of the control group was 0.66 inches and 2.2 inches for the experimental group. The average germination percentage of the control group was 78.33% and 90% for the experimental group. The gap between the two groups for average height was 0.196 and 4.23 for average germination percentage. The snails (2 in experimental group and 1 in control group) were given either an infected leaf every 2 days or a regular leaf. Observations revealed that the snails ate the same amount in both groups. The results also showed that this fungicide does not increase growth and germination.It is significant to do this experiment because there is little research on the effects of this organochlorine on plant life.

The Effects of Allergens on Infants

Miriam Abadi, Anthony Koukoulomatis, Jason Mercuri
Teacher: Brid Nic Niocaill

The purpose of the experiment is to study how the introduction of allergens to infants affects their susceptibility to the same allergens once they become adults. Through the use of a survey on a random population the results were acquired to complete this experiment. It was found that, as predicted, there is a correlation between being exposed to certain allergens at a young age and being allergic to those allergens as an adult. Through this experiment it was concluded that the null hypothesis was correct, therefore the test followed the hypothesis, infants that are exposed to allergens will be more resilient to those allergens once they are older.

The Effects of Blue Light on Human Peripheral Vision
Angelo Guedes, Joshua Wasserlauf
Teacher: Brid Nic Niocaill

The objective of this experiment was to determine if blue light emanating from digital screens influences human peripheral vision. High-energy light waves such as those found in digital monitors are found to have a 400-500nm wavelength, and prolonged exposure to these wavelengths is said to affect a person's vision, therefore we can verify the hypothesis, being that blue light will alter motion perception in one's peripheral vision, by using the scientific method and a properly conducted experiment. Fifteen participants were shown a peripheral drift illusion before and after being exposed to five minutes of continuous exposure to blue light from digital screens and were asked whether they perceived motion in the dark-to-light direction, light-to-dark direction, or no motion at all. After blue light exposure, the results showed that all fifteen participants experienced motion in the dark-to-light direction, compared to only thirteen who reported motion in the dark-to-light direction during the control test. These results suggest that high energy visible light does influence the human peripheral visual field, thus supporting the original hypothesis.

The Effects of Caffeine on Pinto Beans
Shannan Caza, Estefania Cordova, Amanda Feth, & Ketna Patel
Teacher: Jeffrey Eng

The purpose of this experiment was to determine if caffeine increases the growth of Pinto bean plants. The stem growth was observed for three different groups of seeds two of which were irrigated with different concentrations of a caffeine solution and one was irrigated only with tap water. Growth was only observed in the plants hydrated solely with water. Therefore it was concluded that caffeine inhibits the growth and development of Pinto bean seeds.

The Effects of Climate Change on the Sexual Behaviour of *Acheta Domesticus*
AKM Haque, Amanda Bucci, Nicholas Tokawa, Sarah Coculuzzi-Lorenzetti
Teacher: Brian Mader

Ever wonder if global warming will affect sex in animals? Our experiment looked to discover if the conditions of climate change will alter the sexual behaviour of the common house cricket which served as our model organism. We hypothesized that crickets would chirp more significantly and be more sexually aroused as climate change increases due to more favourable conditions for these exothermic organisms. The control group was exposed to normal, healthy environmental conditions which consisted of room temperature, room humidity, open air (normal air) and rain water with a pH of 7. The experimental group was put in a changed climate which consisted of slightly warmer temperatures, higher humidity, closed air (limited oxygen) and acid rain with a pH of 6.2. Each of 3 experiments had 1 male and 1 female and were monitored and recorded daily for 3 days. Sound waves of the control and experimental were recorded and analysed; the average number of chirps in 30 second intervals were compared. The number of chirps in the experimental seemed to exceed that of the control group; the sound waves had smaller wavelengths and higher frequencies, and were more rapid. The results would suggest that the crickets increased their sexual behaviour when under climate change conditions. A more interesting result that came from the recordings was that the crickets in the experimental group seemed to change the tone and song of their chirps. This research is a crucial stepping-stone into understanding the full extent of consequences that climate change imposes on reproductive behaviour of the Kingdom Animalia. Our research focused on common house crickets but with more sample sizes and further research, our experiment can support the basis of hypotheses into the correlation between increased population growth and changes in the climate.

The Effects of Lead on the Growth of Sunflowers

Charlotte Vézina-Dufresne, Vanessa Poirier, Élizabeth Melis and Amaya Ailin Pinto Vera
Teacher: Brian Mader

Lead is one of the most common metals on Earth, despite this fact it is also very toxic to many organisms, such as plants. By analyzing stem growth in a control and an experimental group of 3 sunflowers each, it was deduced that the metal had a slight effect on the growth of the plants. Standard deviation and error demonstrated that the growth rate was somewhat higher in the control group than in the test group. Therefore, the toxic metal doesn't have a big impact on growth of sunflowers, but perhaps it affects other plants or other parameters.

The Effects on Different Intensity Exercises on Thinking Skills

Marco Forlini, Francesco Tummillo, Marco Pietrantonio, Tanya Guzelian
Teacher: Caroline Robert

The goal of this experiment was to determine whether the effects of high-intensity exercise will increase the efficiency of males aged 17-19 to answer basic math problems when compared to low-intensity exercise. The chosen sample size of 20 subjects who were being experimented on underwent five minutes of low-intensity physical activity (walking) on a treadmill and then given 60 basic math problems. Shortly after, the subjects underwent five minutes of high-intensity physical activity (running), then given 60 similar math problems. It was hypothesized that there would be more questions answered correctly after the high-intensity exercise when compared to the low-intensity one. The statistical analysis test used was the T-test. The mean for questions answered correctly after the low-intensity exercise was 29.05 with standard deviation 9.28. The mean for questions answered correctly after the high-intensity exercise was 32.55 with standard deviation 10.25. The Tcrit = 2.093 when $\alpha = 0.05$, which means the difference between both groups were not significant. It was concluded, high intensity exercise does not correlate with improved thinking skills.

The Growth of Mold on Bread with No Preservatives

Gabriele Di Iorio, Michele Cinquino, George Pamel, Maya Catterall
Teacher: Annie-Hélène Samson

This experiment was performed to determine the inhibition effects of preservatives on bread comparing the resistant level of mold growth of bread with preservatives compared to one without preservatives. Each slice of bread was sealed in a Ziploc bag with most of the air being removed from the bag before sealing it. All the bags were stored at room temperature for 3 weeks. After the 3 weeks ended, the mold growth in the sample with preservatives was compared to the mold growth in a sample without preservatives. The sample with the preservatives had the greatest resistant to the mold growth, with no mold seen on the bread. Compared to the sample without preservatives with displayed the least resistant to the mold growth, with mold growth visible all over the bread. This suggests that bread with preservatives has a higher inhibition to resisting mold growth then bread which doesn't contain preservatives.

The Mechanics of Hearing

Jenna Randazzo, Ema Begum, Patricia Morissette, Chantal Coulthrust
Teacher: Caroline Robert

As someone gets older, their hearing capabilities begin to diminish. This experiment was designed in order to demonstrate the effect age has on human capability to hear certain frequencies. The hypothesis of this experiment is that younger individuals, compared to older individuals, are capable of hearing higher frequencies. Twenty people aged from 16-20 years old, control group, and another twenty aged from 45-60 years old, experimental group, were subjected to different frequencies starting from 6000Hz and going up by 1000 to 20,000Hz. They were asked to record when they were unable to hear the ascending frequencies. This data was collected in order to calculate the average of the highest heard frequencies per group. With the use of the T-Test, the final outcome demonstrated that there was a significant difference between the means of the highest heard frequencies of each age group. The mean of the young age group was 18,600Hz and the mean for the older age group was 12,575 Hz. This large significant difference between the means demonstrate that the hearing capabilities of older individuals are significantly lower than younger individuals. This demonstrates that younger individuals, compared to older individuals are capable of hearing higher frequencies, suggesting that human hearing capabilities diminish over time.

The Neurological Effect of Sugar in Caffeinated Drinks

Denis Chmoulevitch, Tamim Rezai, Kun Yi Wang, Thomas Bugden
Teacher: Jeffrey Eng

As a drug that is omnipresent in many popular drinks (i.e coffee, tea and coca cola), caffeine is now considered as a low-harm stimulant that can effectively keep somnolence at bay. However, little is known about its effects on our concentration when combined with substances like sugar. Sugars are usually associated with short term energy usage, hence the link to the "almost immediate" effect of sugar on brainwaves and the increased ability to perform mental tasks. However, according to some studies, sugar might not play a role in our concentration or our energy levels, but rather affects our overall mood and expectation. Thus, combining sugar, which will be the independent variable with a chemical stimulant may or may not result in more wakefulness which will be interpreted through brain wave readings, which will be the dependent variable along with the performance on algebraic tasks. Knowing the effects of these 2 compounds, an experiment where caffeine is ingested with sugar might create a more active set of brain patterns and a better performance result on mental arithmetic tasks than when caffeine is ingested on its own. The conclusion drawn from the results can be very relevant for young students who reach for sweet caffeinated drinks during their late-night studies as well as younger children who consume sugar rich products such as candy and energy drinks. This experiment will determine the exact interplay between coffee and sugar as it pertains to brainwaves and ability of the subject to perform simple algebraic problems. The notion of biology comes to play here, since chemical stimulants (coffee and sugar) will be tested on complex living organisms (humans) and their organ systems (the nervous system).

The Physiological Effects of Cardiovascular Exercise in Colder Climates

Adriel Sayag, Steven Iacobellis, Jordan Elyahou, Joel Kogan
Teacher: Brid Nic Niocaill

The aim of the experiment was to discover whether certain physiological effects would change in colder climate conditions, when compared to normal, room temperature climate conditions. The methods employed were having the test subjects sprint 291 meters in both cold climate conditions and room temperature climate conditions, while recording certain physiological effects. We found that for all of the test subjects run time was lesser, the change in heart was lesser and the level ventilation greater when running in colder climate conditions. Therefore, our hypothesis was correct in that we hypothesized that these physiological effects would change when performing cardiovascular exercise in colder climate conditions.

The psychological effect of coffee

Emilio Dako, Jonas Mayo, Salma Bourouain, Hamza Lahmimsi
Teacher: Jeffrey Eng

The intent of this project was to study the psychological effects, particularly the placebo effect of coffee. A total of 10 subjects were used, and after the ingestion of unsweetened caffeinated and decaffeinated coffee, each took different tests to evaluate their overall alertness and focus. The difference in scores for the tests for both types of coffee were relatively small. This indicates that even if caffeine physically stimulates the neurons, hence increasing the alertness of an individual, the brain itself has a significant part to play in that overall sense of alertness.

The Relationship Between Chewing Flavourless Gum and Short Term Memory in Humans

Melissa Polizzi, Brandon Lazarus
Teacher: Francesca Thériault

Chewing flavourless gum is a habit that has been conveyed to aid one's short term memory due to an increase in blood flow and nervous system activation (Rickman, Johnson and Miles 1). We hypothesized that chewing flavourless gum enhances our recollection of words based on short term memory. We measured the amount of words recalled in intervals of three minutes with an experimental group of ten people. Then, they each received a piece of flavourless gum given a list of ten words. As well, a control group of the same ten people who received no flavourless gum with an identical list of ten words. Our observations indicated that chewing flavourless gum had an effect on the amounts of words recalled in three minutes; chi square statistics for the number of words recalled with gum & the number of words recalled without gum showed a non-significant Δ b/w the 2 test groups (7.7mean, 1.703std) without gum (8.9mean,1.101std) with gum and a p value of 0.3286. The number of words recalled was higher in the experimental group that received the flavourless gum than in the control group that did not receive any gum. This has important implications for short term memory, since the use of flavourless gum could potentially increase success while retaining information during exams.

Using Solely Reflected Artificial Light to Grow Oregano, Thyme and Parsley Plants in an Effort to Expand Urban Agriculture

Sebastian Caucci, Owen Miller and Jeff Smith
Teacher: Brian Mader

This experiment sought to maximize indoor growing space as a way of helping the expansion of urban agriculture to transform it from a hobby to a larger scale practice. Two groups of 30 seeds (n=60) were planted, including Thyme, Oregano and Parsley (10 of each), and their growth was studied. One group, the control group, was placed in direct artificial light and the experimental group other was placed in the same light reflected by mirrors. The results showed an average height of 2.4 cm, 1.3 cm and 9.4 cm respectively for Thyme, Oregano, Parsley in direct light; in indirect light there was an height of 0 for all plants. The gap lengths were 2.253, 1.208 and 8.99 for the 3 plants, meaning there was a significant statistical difference between the two groups. We concluded that there was not enough light reflected onto the experimental plants to sustain effective growth.

Visual Memory vs. Auditory Memory

Alessia Pepe, Xena Saraguro, Luba Dube
Teacher: Francesca Thériault

Statistics show that people are better visual learners than auditory learners in short-term memory. We hypothesized that people exposed to a visual stimuli would therefore remember a greater number of words than those exposed to an auditory stimuli. We presented ten words of the same category to fifteen participants using a visual means and ten other words of another category to the same participants using an auditory means and recorded their results. Our observations indicated that the type of means used had a considerable effect on the amount of words retained; T-test statistics for the number of words remembered showed a significant difference between visual (M = 9.47, STD = 0.64) and auditory (M = 6.67, STD = 1.18) with a p- value less than 0.0001 ($\alpha = 0.05$). The participants remembered a greater number of words when the words were shown as opposed to when they were narrated to them. This has important implications for educational purposes since students or teachers can integrate more visual tools to better themselves in their studies, teaching and learning habits.

Onward to ScienceFest 2017!

The December 2016 edition of ScienceFest is designed to not only promote current student work to the college at large, but also to get students further involved in their research by taking it outside the classroom and to a diverse audience. This fosters transparency in research science but also provides an opportunity for students to defend their reasearch and explain it to others in new ways.

There are currently many Independent Reasearch CE projects underway in various disciplines. Some projects are linked to courses, others linked to SPACE (Sciences Participating with Arts & Culture in Education) and still others are completely independent. Many of these projects will be presented during ScienceFest 2017, near the end of the Witer 2017 semester (in May).

The 2017 edition will consist of a series of student presentations, science fair style installations, as well as a poster presentation. Be sure to hold on to your posters from this semester because posters presented here may be presented again in 2017 and entered to with prizes!

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STUDENT SUCCESS ACTION PLAN


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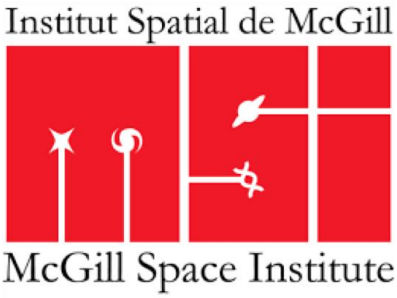
COMICS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Institute of Aerospace
Design & Innovation


the nest
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TEAVANA


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SPACE


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