**Chem206**

**Broccoli extract: “Better than Sunscreen”!**

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Sun rays and UV radiations that reach our earth, especially the UVA and UVB, are continuously affecting human health. Thus, we need to enhance our daily-life sunscreens to make them more efficient protectors against the malicious effects of the sun. Normally, sunscreens should absorb UV radiations and prevent them from entering the skin. However, current sunscreens are not 100% efficient and some are even harmful. Some UV radiations always manage to reach the skin, causing serious damages, like skin cancers, after long exposures to solar radiation. Sulforaphane, a compound identified by a team of researchers over 15 years ago, has shown to prevent the development of tumors in several animals that had been subjected to cancer-causing chemicals. This compound works by increasing the production of certain enzymes that shield cells from UV damage. Moreover, we have found that broccoli contains Sulforophane. Our objective is to manufacture a sunscreen substituent that does not harm human skin. We will attempt to make this substituent more durable than any other sunscreen. This is possible because Sulforaphane increases cellular immunity towards harmful radiation in comparison to current sunscreens, which ineffectively reflect or absorb UV rays with possible side effects.

**Green Detergent: B-2-Clean**

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Synthetic detergents are a source of phosphates which, when released into the environment, can cause harmful effects such as eutrophication of water. Our aim is to enhance the green detergent B-clean made from the plant **"Shilsh al takh"**, mainly through making it more efficient as well as more environmentally and consumer friendly in hopes that it will replace traditional synthetic detergents. The main aspects we focus on are the fragrance of the detergent, its composition, its shelf life, and the possible addition of enzymes that will increase its efficiency in removing blood and grass stains. All of the ingredients will come from natural sources; the fragrance is obtained through the addition of essential oils, the shelf life will be increased by the addition of preservatives such as **(**grapefruit seed extract or carrot oil**)**, and the enzymes will be a form protease. Hopefully, this improved formula will be a step closer to a new, eco-friendly *Lebanese* product.

**Tobacco Plant Extracts As Corrosion Inhibitors**

*Sarah Maria Bahouth , Maria Bou Sleiman, Maria Salloum, and Dr. Najat A. Saliba*

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The use of tobacco extracts for the corrosion inhibition of mild steel in 2M and 5M HCl has been tested by using weight loss techniques. Tobacco is a rich source of alkaloids. Alkaloids, such as nicotine, are compounds containing N, S and O and they serve as effective inhibitors of corrosion. Our study has revealed that the efficiency of tobacco corrosion inhibition increases with the increase of tobacco extract concentrations. Moreover, the effect of temperature on the efficiency of the inhibitor is studied between 300 and 400 C. It was also revealed that the increase in temperature increases efficiency. This project offers an eco-friendly, cheap, safe, renewable, and readily available alternative to prevent steel corrosion in contrast to the toxic organic compounds commonly used.

**Smart Smell Sensor**

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The sensor is the heart of any gas monitoring instrument. Although it seems to be a sophisticated system beyond normal people’s reach, it is sometimes possible to use a simple, inexpensive gas monitor for a given application in place of an expensive analyzer. We aim at creating an Oxygen and Carbon Dioxide Dual Sensor. A sensor that easily measures two of the most important gases for human race. Based on the changes of water characteristics after bubbling an air sample into water, we will detect if there is any O2 depletion or CO2 excess. The water characteristics we are detecting include acidity and turbidity for CO2 determination and fluorescence for O2. This Dual Sensor is based on colorimetric, titrimetric, and potentiometric techniques, thereby joining all their strong points into one efficient, fast, affordable, and practical interface that will enable us to reach intended results.

**Aloe Vera Spray**

[*Sehrish Asghar Abbasi*](http://moodle.aub.edu.lb/user/view.php?id=3745&course=2045)*,* [*Sarah Abdel Massih*](http://moodle.aub.edu.lb/user/view.php?id=2831&course=2045)*, and Dr. Najat A. Saliba*

*Faculty of Arts and Sciences, Chemistry Department*

Beirut is infested with mosquitoes and often one has to undergo painful stinging sensations due to mosquito bites. Aloe Vera, besides from having numerous beneficial characteristics, has been used for centuries for its anti-inflammatory, anti-bacterial and soothing properties. It contains Salicylic acid - which helps relieve inflammation and prevents infection - and also Saponins - which have cleansing and antiseptic properties. The project aims to develop a natural product from Aloe Vera in the form of a spray, which will serve to reduce swelling and itching caused by insect bites and other minor swellings resulting from sunburns and acne. The spray will be produced from vitamin C, vitamin E and the gel extracted from Aloe Vera leaves. The effectiveness of the spray will be analyzed by applying the spray on areas of the skin with insect bites and/or swellings. Then the action and effects of the spray will be observed, and finally we will compare the observed changes in sprayed skin sections to other sections where the Aloe Vera spray was not applied.

**Whey Recycling**

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The main objective of our experiment is to recycle whey or milk plasma - the liquid remaining after [milk](http://en.wikipedia.org/wiki/Milk) has been [curdled](http://en.wikipedia.org/wiki/Curd) and strained; it is also a [by-product](http://en.wikipedia.org/wiki/By-product) of the manufacture of [cheese](http://en.wikipedia.org/wiki/Cheese) or [casein](http://en.wikipedia.org/wiki/Casein). Whey is considered a major pollutant for soils and water because it is very acidic. In addition, whey contains about 70% lactose, which is another drawback, since lactose is a heavy disaccharide that constitutes a potential nutrient for microorganisms in the soil. As a result, these microorganisms feed on it and consequently damage the soil and harm existing plants. In this experiment, we tend to decrease the percentage of lactose in whey by hydrolyzing it in the presence of Hydrochloric acid (HCl) and heating up the solution up to 1470C. Through this method, we will reduce the amount of lactose in whey, thereby hindering its pollutant effects. Regarding acidity, it will be reduced by a neutralization reaction using Sodium hydroxide (NaOH). The resultant neutral and low-in-lactose product will be rich in vitamins and minerals, like Calcium (Ca). Thus we will be able to convert a product responsible for land pollution into a fertilizer by a simple hydrolysis reaction.

**Hot Box: The Chemical Heater**

*Christina Bergqvist, Charbel Aouad and Dr Najat A. Saliba*

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Nowadays, most heating apparatuses have a negative impact on nature. Microwaves and electric ovens have a high energy consumption and studies have shown that cooking with a gas oven releases particulate matter, carbon monoxide, nitric oxide and nitrogen dioxide, all of which are detrimental to the ecosystem. The purpose of our study is to create a prototype of a chemical heater whose heat is provided by the exothermic reaction of calcium oxide and water. Both calcium oxide and the product calcium hydroxide are ecologically friendly. In the laboratory, we have used different amounts and ratios of fresh calcium oxide and water to identify what mixture would result in the highest and most lasting temperatures, hence improving the performance of the heater. We have designed this chemical heater as a small and compact box that can easily be transported to work in picnics and especially in camping parks where lighting a fire is prohibited.

**Biodegradable Planting Pot**

*Kamel El Salek, Rawad Baroud and Dr. Najat A. Saliba*

*Faculty of Arts and Sciences, Chemistry Department*

The use of plastic is increasing a lot nowadays. In fact, we see it in almost everything surrounding us. But, despite of its importance, plastic poses a risk to the environment and its main problem is that we can not get rid of it easily. Consequently, the interest in biodegradable plastic is growing because of its advantages over regular plastic. We will focus at producing and enhancing a biodegradable planting pot in a multidisciplinary way. We will prepare a biodegradable plastic from carob powder. In addition to that, we will manufacture a horticultural gel that will be applied to the outer surface of the pot and this gel will suppress the growth of weed and undesired vegetation. Finally, the most important part will be the application of liquid shellac. Taking into consideration the commercial use of the biodegradable planting pot, we will apply to the inner surface of the pot liquid shellac which prevents early degradation of the pot (the pot will degrade from the outside). So if a florist wishes to display his flowers in the degradable pot, degradation will not start before it is submerged in the soil, thereby ensuring the durability of the biodegradable pot.

**Generation of Electricity by pH Potential Difference**

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A rise in the average temperature of the world, the melting of the ice caps, an increase in green house gases, and the horrible effects of global warming are the reasons behind trying to find a natural, reliable source of electricity. Even if only a small amount of energy is saved through a certain technique, it would still matter because it all has to start somewhere. One such method is the generation of electricity by a difference of pH potential between soil and a tree Xylem. As we know, whenever we have a difference of pH between two solutions we are able to generate electricity. Once such a difference of pH is generated between the tree and the soil surrounding the tree, we are able to create an electric potential that must be amplified by capacitors. This is not only a clean source of energy but it is also produced by a natural phenomena. If such an electric potential that can light up a simple LED lamp can be produced, then this can not only reduce the reliability of humans on fossil fuels but it can also promote the planting of trees and the increase of greenery around the world.

**Fresh White Coffee**

*Alexandra Mikhael, Maya Al-Haddad and Dr. Najat A. Saliba*

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White coffee is a traditional herbal tea made with orange blossom or rose water. It is common in Lebanon and Syria and is frequently served after meals. Moreover, white coffee acts as a sedative and nerve relaxant and also aids in digestion. Usually, it is prepared by the addition of a few drops of concentrated orange blossom or rose water to previously boiled water. The aim of this experiment is to come up with a method for the preparation of white coffee directly from the petals of either fresh or dried flowers, without the use of the bottled concentrate prepared by manufacturers. This serves as a fast, practical and natural method for making white coffee with ease at home. The experiment also entails highlighting the differences between the use of fresh and dried flower petals for the coffee; that is, determining which one gives a better taste. The instrument used to achieve this is a modification of a coffee/espresso machine which will help in filtering and extracting the desired liquid from the flowers to produce home-made white coffee from natural petals free of any additives and preservatives.

**Mulberry Hand Gel for Stains**

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There are several fruits that have natural staining properties, such as mulberry and pomegranate. These stains are not removed easily using normal detergents and soaps. In our experiment we chose the mulberry fruit and aimed at manufacturing a gel (detergent) that helps remove the stain caused by the black mulberry. The active ingredient of this gel is the juice of the unripe white (red) mulberry fruit, which can remove the stain caused by the black one. This way of cleaning these types of stains is used traditionally in Lebanese villages, whose inhabitants have no scientific background. Our hypothesis is based on an acid-base reaction between the acidic unripe mulberry and the relatively basic black ones. Normally, some components of black mulberry chelates with their natural oils are present in our hands. When unripe mulberry is applied on our hands, an acid-base reaction occurs between the stain of the black mulberry and some components of the unripe mulberry. Thus, with a minimal amount of water, the stain is removed easily.

**Cat-Free Areas in AUB**

*Nour Tohmaz, Serena Abou Samra, Nader Masri and Dr. Najat A. Saliba*

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AUB's campus provides its students with the privilege of enjoying nature in the city, but this campus is also the home of hundreds of cats. Although cats are an important part of the campus' ecology, they can sometimes be a nuisance to students, especially those who are eating. Our experiment proposes a solution to this problem by creating certain areas, like the cafeteria for example, free of cats by the act of a repellent which is not harmful to them. The repellant is mainly composed of natural oils; those of citrus, lavender, coffee and cinnamon. It is known that oils are made up of esters and thus they have strong scents. The mode of action of the repellent is based on these scents that have a strong repelling action on cats since cats possess a very sensitive olfactory system. To conduct the experiment, we are going to use food as an attractant to cats versus the repellent, and we will observe the difference in their reaction towards the control and the experimental group. Practically, we can apply this repellent through a spray around a specific area and observe the reaction of cats and their number.

**Lighten Your Cities from the Seas**

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Energy resources are becoming scarce while their demands are continuously increasing. Our project aims at producing electricity from everlasting natural forces without causing environmental pollution. We are planning to use sea waves to generate electricity for all purposes. Our design will be new, easy to construct, cheap, and hopefully efficient. The waves will hit a magnet and move it relative to a fixed coil, thus producing electricity. What is important about our project is that it can be used away or near the seashore since it is a floating system. It is not threatening to any marine creature because it will not affect their habitats or their food supply. On the contrary, we will be able to supply cities with electricity without causing pollution.

**Another Source of Energy**

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Fruit and vegetable (FV) wastes are generated in large quantities on a daily basis. This kind of residue is an important source of energy. Because of its high biodegradability, FV wastes can be treated by an anaerobic co-digestion process. We plan to generate methane from FV domestic wastes. This methane will later be pressurized and used as an alternative energy source. The aim of our project is to analyze the quantity of methane generated from this composting process. The drawback with the digestion of FV waste is the high moisture content of the feed which inflates the required size of the digester. We seek to design an anaerobic garbage-digesting-can that can fit in every home and can later be used to replace normal methane bottles. We will use our own waste to generate energy in an eco-friendly way. This anaerobic digester consists of 50-80% methane, depending on the feed material. The material drawn from the anaerobic digester - the sludge or effluent - is rich in nutrients that can serve as excellent fertilizers. It might take from 40 to 50 days to carry out the procedure. Also, solar energy might be needed to increase the rate of the reaction.

**A User Friendly Citrus-Extracted Ant Reppellent**

*Abir Bou Khalil, Odette Abou Ghanem and Dr. Najat A. Saliba*

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Our project consists of making an ant repellent with an effective insect-controlling amount of D-limonene, a non-toxic emulsifying agent, and a non-toxic hydrophilic solvent. The hydrophilic solvent we will use is not only safe to humans and household animals but also to landscapes, indoor plants, and the environment. The key ingredient is D–Limonene, which will be extracted from orange rinds since it is the major component of citrus oil. Its solubility properties are similar to that of CFC’s but it is environmentally friendly, which makes it an extremely safe and effective solvent, especially in cleaning solutions. A problem in the termination of ants using insecticides is that ants normally appear near food where a careless use of the insecticides may cause human or household animal poisoning. However, all constituents of our product are approved by the U.S. Food and Drug Administration as safe and non-toxic if accidentally ingested. Besides, efficient amounts of D-limonene can be extracted from almost two orange peels which we would have otherwise discarded as wastes after enjoying a glass of energetic orange juice.

**Smart Garbage Bin**

*Sahar Morkos El Hayek, Afif Harb and Dr. Najat A. Saliba*

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The problem of bad odor spread due to inappropriate garbage disposal is an alerting aspect of city life. Synthetic air-fresheners have been used in order to mask garbage smell on individual levels. However, food companies and restaurants that accumulate garbage for a long time before discharging it require a better way to pack their disposals in order to prevent the production of bad smells. This is made possible by using a “smart garbage bin”, which contains its own decomposition and perfume-producing factory. It consists of a layer of potato-dextrose agar on which a specific yeast strain, *Candida krusei var. transitoria,* is cultured at a pH of 4, and temperature around 40OC. This layer is connected by a dispenser to a garbage storage cavity, where yeast pseudo mycelia will be intermittently dropped in order to digest organic matter, thus converting sugars and amino acids into fragrant chemicals, such as isoamylalcohol and different acetates. The practicality of such a device easily solves the problem of bad odors, while making use of an old degradation process and introducing it into our civilized life.

**Light Pollution and Plant Development**

*Ziad El-Zaatari, Amina Jaafar Harb, Hawra Kanaan and Dr. Najat A. Saliba*

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Light pollution is an important source of pollution in and around cities. Especially during the night, light pollution causes high levels of artificial light in these areas and both urban and peri-urban plants may be exposed to these artificial lights. We seek to study the effects of nocturnal artificial lighting on the development of different plants. We are exposing plants to either yellow light, white light (to simulate different types of artificial lighting), or no light during the night. We are allowing the plants exposure to normal sunlight during the day. Our aim is to look for differences in several plant growth factors, including height of the plants, number of leaves, stem width and chlorophyll content of the plants. We will be doing a statistical analysis to the collected data and drawing conclusions from the obtained information. Moreover, we are also developing a novel method to approximate chlorophyll content using a digital camera and Photoshop software. Our results will be reported by the date of the project presentation.

**Pomegranate Extract: A Natural Anti-Obesity Drug**

*Alain Mina, Aline Toukhtarian and Dr. Najat A.Saliba*

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Countless are the environmental attributes that promote obesity, an ever-growing challenge in communities, particularly rural ones. Rural characteristics that encourage inactivity and unhealthy food choices include the lack of nearby recreation opportunities like exercise trails, neighborhood aesthetics, and anxious feelings resulting from traffic and crime. Previous obesity-related studies have found that an extract from pomegranate husk and leaves may help control weight gained from consuming a high fat diet. Pomegranate fruit is rich in several polyphenols and has been linked to several health promoting and disease preventing effects, including protection against prostate cancer, Alzheimer's disease and recently obesity. Actually, pomegranate leaves and husk, a by-product of the pomegranate juice industry, are an inexpensive and abundant source of ellagic acid. Ellagic acid, a polyphenol antioxidant, is widely used as functional food for its physiological functions. One of these functions is that ellagic acid can inhibit the development of obesity and Hyperlipidemia by suppressing energy intake and pancreatic lipase activity that catalyzes the hydrolysis of lipids to be absorbed by the intestine. We will attempt to extract ellagic acid from pomegranate leaves and husk, and then illustrate its inhibitory effect on pancreatic lipase, and so its role as a natural anti-obesity drug.

**Coffee and Plant Growth**

*Claudia Farhat, Julio Rizk* and *Dr. Najat A. Saliba*

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Throughout the centuries, people have been experimenting different chemical compositions and fertilizers on plants, using them to achieve best growth rate in minimal amount of time. One of the ongoing debates is the one concerning whether caffeine containing coffee affects the growth rate of plants. The argument against the usage of coffee is that it is highly acidic, thus making the soil environment acidic too, which in turn does not favor growth in most plants. In our project we will be growing seeds in a soil medium containing coffee and a basic solution whose job is to neutralize the acidic effect of coffee. The above procedure will be repeated with different amounts of coffee and basic solution, thus comparing the plants’ growth with a blank. As a result of completing the above procedure we will be able to prove that caffeine containing coffee powder increases growth rate in plants and since it is a widely available product in most homes and found in bulk in the market, it can be favorably used.

**Titanium dioxide in Green Roads**

*Elsa Marina Arbajian, Moubadda Assi and Dr. Najat A. Saliba*

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Titanium dioxide (TiO2) is a white pigment often used in paints and plastics to opacify them. It has also been shown that it has the property of absorbing certain pollutants like nitrous oxides and organic volatile compounds. Therefore it would be a good idea to incorporate TiO2 in paint used to draw lines on the roads because it would absorb some of the pollutants emitted by vehicles. In our laboratory experiment, we aim to show that TiO2 can absorb CO2, a major warming gas. To accomplish our objective, we will perform two pH titrations: one for a solution of CO2 rich water and the second for a mixture of CO2 rich water and titanium dioxide dissolved in it. By comparing the concentration of CO2 in the two, we can conclude how much of the gas titanium dioxide was able to absorb. The two titrations will be back titrations of CO2 as we will add an excess of NaOH first and titrate using a standard HCl solution.

**Scented Paint**

*Elie Fares, [Maguy Arnous](http://moodle.aub.edu.lb/user/view.php?id=4879&course=2045) and Dr. Najat A. Saliba*

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In this experiment, we seek to prepare a scented paint. Our research has led us to pursue two distinct approaches. First, we will prepare our own “organic” paint using milk, corn starch and citric acid, following a defined procedure. In the second experiment, we will get any commercial paint, remove its strong smell using vanilla extract and then add a specific “good” smell to it. For comparative purposes, the same smell will be added in both procedures. Both experiments promise to give very close results: a certain scented paint that will be used under the theme of “bringing nature to the city”. We are bringing the sight and the smell of nature to the city by using our resulting scented paint in painting murals, decorative things in the city, or inside mere households. Furthermore, we want to do a comparative study between the two paints we prepared. Our comparisons will be based on many factors, such as durability, efficiency and cost control.

**Natural Foot Deodorant**

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The purpose of this study is to create a spray-on deodorant for feet which will eliminate the bacteria and fungi responsible for foot odor (bromohydrosis), thus leaving feet smelling clean and fresh. This can be obtained using natural ingredients from everyday plants. Basil (Ocimum basilicum) contains linalool which is known for its potent antibacterial properties. The same applies for thymol, the essential oil of thyme (Thymus vulgaris). Citronellal from lemongrass (Cymbopogon citratus) will also be used for its antifungal properties and pleasant citrus smell. All of these ingredients will be extracted together in one steam distillation. A thickening agent, such as polyethylene glycol (optional), can be added to the distillate to make it gel-like. To test the antibacterial effectiveness of this product, human volunteers’ feet will be swabbed after a full day of wearing closed shoes. The feet will be swabbed before and after using the spray. The bacteria will be grown on agar plates and the number of colonies will be compared.

**Inula Ointment**

*Mohammad Darwish, Ihsan Ghazal and Dr. Najat A. Saliba*

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In our villages, there is a herbal medicine used for wound healing that is common in Lebanon, Palestine and Jordan: Inula Viscosa. This medicinal plant has been regarded as one of the most important ones in the Mediterranean region. The method of healing a wound is by covering it by a whole Inula leaf. This plant can be used in the form of an ointment as a complementary medicine even in places where Inula does not grow. This ointment is useful as an anti inflammatory and anti bacterial due to the flavenoids - Rhamnocitrin, 7-0-methylaromadendrin, 3-0-acetylpadmatin, and the sesquiterpene lactones - present in the Inula leaf. Our new procedure shows a better, more natural and cheaper way for treating wounds than the usage of medicinal synthetic products. Our product is further assessed by assigning a specific suitable temperature range in which it could be stored and preserved. Also, studies have been done on mice in order to test the ointment’s effectiveness over a period of time. So, Inula, which is taken from nature,can now be used to treat wounds even in the city where the plant does not grow.

**Antifungal and Antimicrobial Biodegradable Plastic Bag**

*Lamees Nassereddine, Joseph Cherabie, Hassan Arrabi and Dr. Najat A. Saliba*

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Biodegradable plastics are becoming an active area of research due to the environmental demands that are present in today’s society. These plastics are usually created from natural sources which also adds to their benefits and similar to their traditional counterparts are able to molded and used according to their purpose. Natural sources which are used to create such plastics are rich in polysaccharides and oligosaccharides, including garlic powder which is to be used in this experiment. Garlic contains a compound, Allicin, which is a potent anti-fungal formed from the crushing of garlic cloves as a result of the reaction between Alliin and Allilin. This liquid compound can be added to the slurry of the biodegradable plastic to provide anti-fungal properties to it. In addition, the essential oil of oregano is an antimicrobial agent which can be used to form edible films from whey protein, which can be added to the biodegradable bag, and have been shown to prevent the growth of bacterial colonies including *Escherichia coli*, *Staphylococcus aureus*, *Salmonella enteritidis*, *Listeria monocytogenes*, and *Lactobacillus plantarum.* This bag would ultimately have both antimicrobial and antifungal properties which could prolong the shelf life of some food item, particularly for the case of our study, bread.

**Fruit Coating Solution**

*Reina Alameddine, Marie Therese Homsi and Dr. Najat A. Saliba*

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Fruit coating solutions preserve the quality of the fruit by acting as an oxygen, microbial, and aroma barrier that can efficiently delay fruit ripening and maintain the structure and appearance of the fruit. A coating solution is essentially based on proteins, carbohydrates and lipids. The project presents the method to prepare two coating solutions that differ with respect to their protein component; one is based on egg albumin, the other on wheat gluten. Both solutions contain pectin as carbohydrate and beeswax as lipid, the latter has a plasticizing effect that can enhance the solution’s texture. Thyme oil is also added to the mixture since it can improve the antimicrobial properties of apple based coatings. The method of extraction of pectin from apple and gluten from wheat is also presented. The effectiveness of the solutions is evaluated by assessing three criteria demonstrated by strawberries dipped in the prepared solutions: visible decay, weight loss and titratable acidity. After comparison to a control group, the results are expected to show that both coating solutions reduced weight loss of the fruit, maintained the amount of citric acid at a higher level than the control group. Therefore, the solutions protect the fruits and delay their ripening. The project also compares the effectiveness of albumin to gluten as a protein component able to increase water vapor permeability and improve the antimicrobial properties of the solution.

**FunAroma: Be the 1st to Light up the Nose!**

*Paul Bovary, Nathalie Gharibeh, Carole Rouphael, Rita Tohmé and Dr. Najat A. Saliba*

*Faculty of Arts and Sciences, Chemistry Department*

Busy with technology? No time for a walk in nature?! Well, nature has taken the initiative and is visiting you instead. Discover your ability in identifying different smells and get dizzy experiencing Lebanese fragrances! Funaroma is a new game based on cooperation between sciences, education and nature. Be the first one to light up the nose! Roll the dice, smell the fragrance, guess the identity! When you match the essence to the identity of the plant, a light bulb covered with a nose will light up due to a complex electrical circuit built on the lower face of the game cardboard. Glowing nose? Smart guess!! Keep on playing and answer a question related to the area of cultivation of the plant in Lebanon, its economical uses, the Lebanese common name, season of harvesting and culinary uses of the plant in our patrimony…Wrong answer? Don’t give up! Soon enough you’ll be in command of your nose skills! All it takes is for you to identify essences from the Lebanese floral diversity and be up to the challenge for answering dozens and dozens of questions.

**Synthesis of zeolite from coal ashes**

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Zeolites are used as commercial adsorbents; they are microporous minerals formed of silica and aluminum. They are formed in nature when volcanic rocks and ash layers react with basic ground water. However, pure zeolites are rare and those that occur naturally are contaminated by various minerals. Therefore, purification measures are taken into account when commercial applications are needed. There are other simpler, cheaper, and faster alternatives to produce zeolite such as combustion of coal and fly ash. One of these methods is based on the “classical alkaline conversion of fly ash” where sodium or potassium hydroxide solutions are added to the ashes at around 80-200 °C for 3 to 48 hours. Zeolite can be added to various applications such as shampoos and lotions in order to eliminate bad smells and for hygiene purposes. New discoveries have shown that zeolite can also be used in the field of cancer treatment.

**Complex Air Pollutant Absorber**

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One of the important issues facing humanity today is the problem of air pollution in cities whereby creating a relatively safe air environment in offices, homes and other confined places becomes a major concern. It is known that some plants have the ability to absorb specific air pollutants, for instance **aloe vera** eliminates emissions from most toxic materials, fig tree eliminates formaldehyde, chrysanthemum eliminates toxins such as formaldehyde, benzene and ammonia, spider plants eliminate formaldehyde, and hyacinth (lily) eliminates many toxic materials. If we can extract the various air pollutant absorbers these plants offer we can create a “complex air pollutant absorber” which can be useful in optimizing the air quality in the places we spend time the most time in (offices, schools, homes, etc.). This might present a route for a minimization of allergies and cases of asthma as well as other respiratory problems related to the various pollutants we can manage to absorb. If successful this experiment will present a cheap and easy way to improve indoor air quality. In this experiment, we will retrieve crude extracts from the various plants presented above. Air quality will be assessed before and after the introduction of the extracts into the medium being tested. As a final step we will try to combine different crude extracts and check if we can manage to present an efficient complex absorber.

**How to Clean Your Bedroom**

*Ali Shami, Hala Saad, and Dr. Najat A. Saliba*

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For many years now, fighting pollution has been a topic of major discussion. Indoor pollution specifically, is of special consideration since it poses the most direct and serious threat to our health. Ever since then, plants have become widely used to decrease levels of indoor pollution with their innate nature to fix pollutants such as CO2, while others were discovered to serve a more specific purpose in fixing other more dangerous toxins. This project harnesses a special plant, the “spider plant”, at its core, which has a natural ability to fix many toxic gases such as carbon monoxide, radon, and formaldehyde. The plant is enclosed in a device which takes air in, circulates it around the plant sufficiently, and then releases the clean air out. It aims to maximize the plant’s efficiency to fix such pollutants much more than would be the case if left alone. The device’s efficiency is tested by measuring only carbon monoxide concentrations coming in and out of the plant since it is the simplest to test for. If successful, the apparatus should provide an aesthetically appealing, efficient, and cheap method for solving indoor pollution.

**Fig Treatment for Polyps**

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The aim of this project is to extract the active ingredients in the latex of a fig tree to create a natural medication to treat skin polyps. The final product will be an affordable user-friendly gel that can be applied at home, thus replacing the necessity of multiple visits to a dermatologist in order to artificially burn the polyp. Moreover, the project was initially inspired by an old cultural practice that is popular in rural areas; hence it embodies the enhancement of a Lebanese tradition with the aid of modern chemical procedures. The latex of the fig tree is a milk-like substance that contains, among other elements, two active ingredients: the furocoumarin Psoralen and the keratolytic enzyme Ficin. In this experiment, we will extract these compounds and concentrate them into a gel that can be easily applied onto a polyp. The enzyme will digest the keratin that composes the bulk of the polyp, while the psoralen will naturally “burn off” the remnants of the dead epidermal cells due to its photosensitivity. To test the effectiveness of the product, we will apply it onto a patch of natural fur to check whether or not the gel degrades the keratin in it.

**Studying an Electric Generator’s Exhaust**

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Lebanon suffers from electric shortages. Therefore, Lebanese citizens have accumulated a huge number of back-up electric generators in Lebanese cities. These generators use diesel as their main source of energy. In our project, we will study how much diesel emission from diesel generators contributes to the increase of polyaromatic hydrocarbons which are known to be carcinogens. We will be collecting samples of PAH’s found in the air on filter papers. Samples will be collected during power outages when the generators are on and during normal electric feeding hours. This allows us to compare the difference in concentrations and obtain quantified measurements of the increase in PAH’s due to the generators. The samples will be analyzed using mass spectrometry and gas chromatography; we will specifically be measuring the amounts of 1-NitroPyrene, Phenanthrene and Flouroanthene which are PAH’s known to be diesel markers.

**Biodegradability Inquired**

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With the sharp advancements in petrochemical industries, it looks as if the whole world is wrapped with plastic. Indeed, petroleum-based plastics seem like the universal choice with no notable effort, whatsoever, to pursue another course of action. However, the serious environmental complexities imposed by such a grave dependence press for the need for a less polluting means of packaging in terms of manufacture and disposal. Biodegradable plastics may very possibly be a good alternative considering their renewable, eco-friendly sources and their readiness to breakdown into harmless natural compounds (as opposed to petroleum-based plastics). This would take pressure off the ever-mounting landfills and reduce the leaching of noxious chemicals into our ground water. In our project we try to make biodegradable plastics from the starch of potato, rice, and corn and the lactic acid of milk. We then study the readiness of the (five types of plastics) to biodegrade under regular conditions by submerging them in soil under sunlight over a period of one month after which their mass decay is measured. This measurement will be used in order to decide which type of plastic produced is the best in terms of biodegradability.

**Solar Stove**

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Throughout this century, solar energy has long been a very promising source of energy capable of replacing electricity, a major pollution generator. Hence, transforming an electric stove into a solar one is our main aim in order to “bring nature to the city” and to reduce the pollution created by gas and electric stoves. The concept is simple: by connecting solar panels to the resistance of the stove, we will be able to generate an electric current capable of heating the resistance once the panels are exposed to sunlight. This heat created will allow us to cook normally without resorting to any polluting gas. A solar stove could be a very practical energy-saving green instrument that can be used in every house and improve our lifestyles.

**Plant Extract Attracts Wildlife: Birds and Butterflies**

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In urban ecosystems, birds and butterflies play a minimal role in nature’s way to pollination. Trees, shrubs, and plants are becoming more and more extinct in the city due to the lack of pollination. This is primarily because of urban pollution, which repels all the birds and butterflies necessary for pollination in the city and destruction of harmful insects. Our experiment aims to create a natural spray of extracted plant nectars to act as an attractant for wildlife creatures (like birds and butterflies) to direct and thus induce the process of pollination, especially by helping plants of low nectar volume. Our experiment will involve extracting the nectar components from a mixture of naturally-attracting plants. Since different plants have different nectar components, we will arrange the mixture into a bio-spray that can be used, as much as pesticides are used today, however to attract the wildlife and promote nature in the city. Our research will also realize the synthetic production possibility of the nectars in labs to minimize plant losses. Extraction procedures will take place in the lab, and real-life experimentation - that will either validate or reject the hypothesis - will take place outdoors, specifically in AUB green regions and in Beirut districts.

**Potato Covering Layer**

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Based on daily observations, it has been found that when a cross section of a potato tuber has been rubbed against a piece of glass, the glass acquires a water-repellent property; in other words, when the glass is washed with water, water does not stick to it. It could be suggested that there is a substance(s) in the potato tubers, which is non-soluble and gives the glass its ability to repel water. One such substance is starch polymer, which is present abundantly in the potato tuber, consists of a long and sometimes branched chain and is insoluble in water. In the experiment, starch will be extracted from potato tubers and tested for its water absorbance and water repellent properties. Finally, if such a property was determined, we will try to make a solution out of it that can be used. Advantages of this solution are transparency and cheapness. One of its important applications is preventing rain water from sticking on car windshields, thus ameliorating vision in rainy days especially when windshield wipers do not work.

**What If AUB Students Rode Bikes?!***Sawsan Allam, Rawan Gebran, Roy Souaid and Dr.Najat A. Saliba  
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Cities themselves present both the problems and solutions to sustainability challenges of an increasingly urbanized world (Grimm 1). Traffic is becoming a major problem that is increasing with urbanization and affecting nature greatly, especially in Lebanon. In this study, we are hypothesizing the use of bicycles instead of cars in the region engulfing AUB in order to see how, as students and citizens, we can enhance the urban ecology in our immediate vicinity. This study mainly comprises of analyses and statistical work taken from a chemistry-oriented perspective. The focus of this study will be threefold. First, we will compute the decrease in CO2 and traffic levels if bicycles were the vehicles used instead of cars. Second, we will compare the time needed by a car versus that needed by a bike to cover the same chosen path. Third, we will study the increase in the availability of parking spaces (mainly on the coastal region and the parking building on Bliss Street). From the analysis of our results, we will reflect on our hypothesis and draw conclusions on physiological, psychological, sociological levels, hence hopefully providing the groundwork for future lobbying based on concrete scientific research to improve our AUB vicinity.

References:Grimm, Nancy B., et al. "Global Change and the Ecology of Cities." Science 319.5864 (08 Feb. 2008): 756-760. Academic Search Premier. EBSCO. AUB, Beirut. 7 May 2009 <[http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=30001266&site=ehost-live](https://imail.aub.edu.lb/services/go.php?url=http%3A%2F%2Fsearch.ebscohost.com%2Flogin.aspx%3Fdirect%3Dtrue%26db%3Daph%26AN%3D30001266%26site%3Dehost-live)>.

**Cigarette Filter Treatment**

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How can we reduce the pollution caused by cigarettes? It is well known that cigarettes are a major cause for pollution. The pollution caused by the cigarettes can be divided into two stages. The first is caused by the smoke released while the cigarette is burning. The second is when the cigarette butts, disposed to the environment, contaminate water by releasing nicotine and other residual materials trapped in the filter. Every year more than 5 billion cigarette butts are collected, making it a major environmental problem. Our purpose in this experiment is to collect a sample of cigarette butts from the AUB campus and to treat them so they can be used in some beneficial productions such as cloth production, video film production. Cigarette filters will be treated by a water washing system so that all the contaminants are washed away. The sample is then dried. Contaminant levels in the filter before and after treating it are going to be measured by gas chromatography, and the results are going to be compared to see if the method was effective in purifying cellulose acetate.