

Session Reports: Environment



Oral Session 1

Discussant and Author: Judith Pajo

Social Formations: People Organizing around Climate Change

This session contributed by students from South Africa, United Arab Emirates, and Thailand raised the issue of social formations across regions impacted by environmental change. How do people organize themselves and their concerns in times of climate change?

To contextualize the question, allow me to explain that my own undergraduate research experiences in political philosophy and feminist theology in Europe and graduate research experiences in cultural anthropology and social science in America have taught me to listen intently to people who inhabit different environments, economies, polities. Anthropologists want to learn from the diverse cultures, traditions, environments, and environmentalisms, and I believe a cultural perspective will help us frame the discussion of this panel.

In three presentations, we learned about distinct groups of people: students, artists, and Buddhists all prompt us to think about the impact of individual and society on the environment. Though some researchers divide individuals by age, gender, race, and class, we may also form or join groups that cut across such divides and advocate broader change. How do various forms of collective action benefit the environment?

Students have a special status. The first presentation, "Using environmental awareness clubs to address solid waste pollution in and around township primary schools in Motherwell, Port Elizabeth", informed us of the efforts of a group of students to organize themselves in environmental clubs. Shared concerns motivate them to reduce litter, recycle, and transform the schools and the curriculum. We want to learn from the students: How do we become aware of shared environmental concerns and take action?

Artists have a special status. The second presentation, "Waste recycling through ecofriendly art techniques", informed us of the projects of artists working with salvaged materials. Their sculptures built with milk cartons or empty batteries address our emotions. We want to learn from the artists: How do we alter mass consumption so that natural resources will be protected?

Buddhists have a special status. The third presentation, "A Buddhist Perspective on Global Warming", informed us about religious engagement with the environmental movement. Though some claim that the environmental crisis is caused, in part, by the doctrines of certain religions, others are turning to their scriptures and finding references to ecological values. Moreover, members of different religions are working together on issues of environmental concern. We want to learn from all religions: How do we cultivate a spiritual connection with our earth?



Confronted with the problem of pollution, both the solid kind and the kind that melts into air (climate change is a prime example), these presentations urged us to investigate current social formations that address environmental issues, worldwide.



Oral Session 2

Discussant and Author: Haider M. Hamzah

The three presentations for the Oral Session 2: Environment discussed some sort of environmental contamination. The first presentation (Benita Davis / Guyana) researched the quality of river water near gold mining operations in Guyana and its suitability for consumption in an effort to establish a baseline for future research and monitoring. This was accomplished by a slew of tests, ranging from electrical conductivity to turbidity, that examine both the water and the water near to sediment from four sites.

The second presentation (Hind Alriyami / United Arab Emirates / ABSENT) in this session studied microfiber contamination of oysters in United Arab Emirates. This was done by selecting and inspecting, microscopically and spectroscopically (FTIR), 40 oysters from 4 different markets within varying locales, e.g., industrial and residential areas.

The third and final presentation (Kelvin Brian Nyaga / Kenya) of this session examined the possible causes of air pollution in Kenya. This was achieved by surveying 350 inhabitants of Kenya's capital, Nairobi.

Through discussion, it was revealed that unchecked large corporations are the heart of the problem. The government of each presenter's country has seemingly turned a blind eye to the repercussions of big business. The presenters were encouraged to raise awareness by publishing their results through their universities.



Oral Session 3

Discussant and Author: Judith Pajo

Natural Formations: Humans in a Multi-Species Context

This session contributed by students from United Arab Emirates, Maldives, and Qatar raised the issue of natural formations across regions impacted by environmental change. Species are adaptable but some are threatened by extinction, while others are thriving and being discovered. How do humans fit in the ecosystem?

Differing from a previous session on the environment, in which students shared their research on social formations, the students in the present session shared their research on plant species, animal species, and interactions with the human species. Shall we call them natural formations? I ask because a nature-culture dichotomy may hamper our efforts to develop solutions to the ecological crisis. We learn through research, year by year, region by region, that what we think of as natural environments may also be social formations (products of human activities).

Consider these historical cases: In pre-modern Europe, forests were cleared to fuel empires; in modern times, trees were replanted by nations now fueled by oil. In pre-historic America, forests were cleared because grasslands provided better hunting grounds; in recent times, grasslands continued to be protected in national parks. Humans around the world have transformed natural landscapes based on cultural principles.

Now, consider these current cases. What new ecologies are being generated, in this historical moment, in regions around the world? That is why these papers are important:

In the first presentation, "Characterizing the biodiversity of inland and coastal sabkhas in the United Arab Emirates", we learn of 37 plant species and 250 bird species that are sensitive not only to conditions in coastal and inland wetlands but also population pressures on the ecosystem. How can resources for spotting diverse species be shared?

In the second presentation, "Evaluating the effectiveness of Baa Atoll Biosphere Reserve: Assessment of beneficiaries and their perception towards management", we learn that human pressure on the ecosystem is leading to tensions between the fishing industry and tourism industry, and the biosphere reserve. How can multi-species ecosystem be managed?

In the third presentation, "Antibacterial activity of new Sponge species isolated from the Qatari marine zone", we learn of two new species of sponge just discovered. Do we harvest them for medicinal purposes? Do we also study how they evolved and adapt to the ecosystem?

Together, these papers remind us: we need comparative research, across space and across time. These students have a lifetime ahead to document how these environments are changing in the next several decades, so that we better understand the trends; the worrisome and the hopeful ones. Will we be able to stop the mass loss of biodiversity? Certainly, we will need to extend our concern to the environment because humans cannot exist if all other species that inhabit the earth, water, sky, are lost.



Oral Session 4

Discussant: J. Robert Hatherill

Author: Glenn Arthur Ricci

The first presentation of the fourth oral session in the environment theme was the project by Enkhuur Munkhsuld, C. J. van Leeuwen and Stef Koop (National University of Mongolia, Mongolia) that was a case study of Ulaanbaatar City, Mongolia and the application of the City Blueprint Approach that was developed in the Netherlands. The City Blueprint Framework is able to provide an overview of the Integrated Water Resources Management performance and identify bottlenecks in municipalities and other regions. The urban water management of Ulaanbaatar City was assessed. It was found that due to the landlocked nature of Mongolia and its capital, the minimum and maximum values used in the approach (which were related to sea level) as indicators were unsuitable. The research concluded that more flexible indicators would be needed for different regions, especially landlocked ones.

Looking at a different aspect of the environment, the next presentation research analyzed the peel waste of pineapples in Sri Lanka. The work of R.A.D.Rajapaksha, M.D.J.C.Sandarani, N.M.Adassooriya and C.V.L.Jayasinghe (Wayamba University of Sri Lanka, Sri Lanka) evaluated the feasibility of utilising extracted cellulose fibres from industrial pineapple peel waste for additional value and to evaluate the structural characteristics of extracted cellulose. The study found that there is great potential for successful extraction of cellulose fibers from pineapple peel waste and is a useful source for probiotic encapsulation, especially since the yields were high and the raw material cost was low.

The final presentation also looked at maximising the most of plant life. The work of Jomesha Stewart (University of Guyana, Guyana) examined the tolerance of two grafted tomato plants to diseases. Grafting was chosen as an alternative solution to preserving plants without the use of pesticides. Two different grafted tomato plants were developed, disease pathogens were introduced to them and they were observed over a period of four weeks. The study found that there was a perceptible difference in the performances of the grafted plants when compared to the non-grafted plants, highlighting the potential for this line of research.



Oral Session 5

Discussant and Author: Sally O'Connor

This session is centered around water issues. Water is a resource that has become a major global concern in recent years and will likely continue to be viewed with even greater intensity in the future as the resource is depleted and/or become more polluted. This issue was discussed in this session from the biological, chemical and social sciences points of view. It is also worth noting that the papers came from across the world, from South Africa to the Netherlands to Malawi. The presenter from the Netherlands talked about the water crisis in Iran. This set of talks gave the audience a wide view of the issues, and subsequent discussions were rich and engaging. Another big issue that emerged during discussion was microplastics, which has been a major concern for oceans, rivers and tributaries.

The effect of microzooplankton grazing on phytoplankton biomass in a lake in Port Elizabeth in South Africa was the focus of the presentation by Lethukuthila Mhlongo, a student in Planet Sciences at the Nelson Mandela University in South Africa. The goal of the study is to determine if increased grazing will reduce the phytoplankton biomass, thus contributing to our understanding of a potential role of microzooplankton in the treatment for harmful algal blooms (HABs). This study is of direct relevance to commercial fisheries and recreational activities. In the study, Mhlongo collected water samples from a very polluted lake where factories discharge their waste. Using appropriate protocols, he then subjected the water samples to two treatments of microzooplankton (one at lower concentration and the other at higher concentration) with a control. His study found out that increased microzooplankton reduced significantly the formation of biomass. During the 4-week period of the experiment, he found significant differences in the treatments, with the higher concentration resulting in no biomass, indicating that biomass formation can be prevented with increased concentration of microzooplankton. His study also found that temperature and dissolved oxygen had no significant effect on biomass formation. This study raised more questions that Mhlongo would like to pursue, such as the effect of seasonality on grazing.

Temwani Chisunkha, a student at the Malawi University of Science and Technology, discussed the quality of groundwater, more specifically its fluoride content and the impact on human health. He showed maps where 25 nations suffer from high fluoride content in its groundwater. This is a particularly salient issue in the African continent where the geology of the region (Great African rift valley for example) has caused increased groundwater fluoride from the rock-water interaction. The goal of Chisunkha's study is to determine parameters that cause increased dissolution of fluoride in groundwater. For this study, he collected soil, rock and water samples in the Songwe area in Malawi where there is known occurrence of high fluoride content in groundwater. Rock and soil samples were analyzed using X-Ray fluorescence to determine mineral content, while in situ measurements of water samples were done to record pH (alkalinity), electric conductivity and temperature. Metal ions in the water were measured using atomic absorption spectroscopy and the fluoride concentration using a fluoride meter. His study found increased concentration of fluoride in areas where rock mineral content is high and where there is increased alkalinity (or higher pH). A higher pH causes more fluorite-bearing rocks to dissolve which then could release more fluoride ions into the groundwater. This study is



particularly relevant to communities that depend on groundwater as a source of potable water. Selecting an area that potentially can cause greater fluoride in water could result in fluorosis, a disease manifested by pitting of tooth enamel and deposits in bones.

A third paper looked at the water issue from a completely different perspective – that of an anthropogenic one. Laura Muns, a social sciences student from the University of Amsterdam in the Netherlands, discussed the socio-economic and political dimensions of the water crisis in Iran. She argues that solutions to water crisis, which can be very technologically based, can be exploited politically, and can be devoid of consideration of the connection between the man-made solutions and the natural world. She used the water transfer projects (like dams) around the Zayandeh Rud river as an example to point out that technological solutions are not neutral. Dams can be used to supply water to a group of people but not to others, and the decision of which group can be politically based. Her presentation opened the minds of the audience that technology might have a solution, but other factors should be considered to ensure that the consequences of any potential solution are known to decision-makers.

Because of the breadth of coverage of the issues surrounding water, this session generated a lot of very informative discussions and realizations of problems that local perspectives don't necessarily allow to happen.



Oral Session 6

Discussant: Christopher Ashwell

Author: Glenn Arthur Ricci

Since the invention of the wheel, humankind has been inventing and thinking of new ways to travel faster and easier. Unfortunately, this has come at the cost of the environment, which is why Oral Session 6: Environment began with looking at the possibility of magnets for travel. The research of Jasper Halbey and Mirko Kemm (University of Applied Sciences Emden-Leer and University of Oldenburg, Germany) examined the concept of using a rotating chain of permanent magnets for contactless vehicle propulsion by utilising eddy current forces. The project developed a test in which a chain of permanent magnets were built and mounted on two rotating gears above a conducting plate. The chain of magnets was then driven by a motor while sensors recorded. Various thicknesses, widths and materials of the conductors were tested although most of the measurements were mostly consistent with theoretical predictions. Nonetheless, the results could be useful for future concepts and related applications.

The oral session theme continued looking at ways to improve propulsion systems in the second presentation. The research of Spencer Dansereau, David Marshall, Rishi Raj and Paolo Colombo (Montana State University Bozeman, Montana, USA) looked to develop novel polymer-derived ceramic matrix composite fabrications for high temperature aerospace applications, such as aerospace propulsion systems. To do so, the project examined two developing methods of producing ceramics in order to fabricate novel ceramic matrix composites. The base for these composites were done using a 3D printing process. The resulting composite still needs testing in order to verify the mechanical behaviour of the fabrication, but still, these composites have the potential for use in spacecrafts and certain jet engines.

The final presentation moved away from looking at methods to improve transportation and instead looked at a more practical way to integrate modern technology into the traditional charcoal coolers found in Kenya. Dennis Chang'ach, Edgar Kitui and Denis Mwai (Jomo Kenyatta University of Agriculture and Technology, Kenya) looked to develop a suitable and affordable method of lowering cooler temperatures so that produce that has been harvested could be stored longer. Currently, the post-harvest loss can be as high as 50%, which takes a toll on the farmers and their potential profits. The farmers use a charcoal cooler, but this is an ineffective system and a costly one. Therefore, this research developed an automated solar powered evaporator that can offer an easier and more efficient way to cool and make produce last longer in an eco-friendly manner.



Oral Session 7-A

Discussant and Author: Haider M. Hamzah

All three presentations talk about the problems of soil in terms of nutrient distribution and fertilization and ways of solving these problems. For the first presentation by Ayesha Albalooshi / United Arab Emirates, mentioned the agricultural production problem because this region is accompanied with high amounts of salinity and nutrient poor soil. The solution that has been attempted was the use of Bichor, a charcoal that improves chemical properties of the soil and makes it retain more nutrients.

The other presentation by Morine Wamboi / Uganda, talked about the termites which are insects that are detritivores. They are beneficial regarding improvement of soil fertilization because it's hypothesized that they break down organic materials which increases fertility in soil.

In the third presentation by Rainee DeRoin / USA, the Eastern Redcedar which is a kind of tree that's affecting the Oklahoma state region in The United States of America was discussed. These types of trees consume large amounts of water that does not leave a lot for the other areas which results in reducing economic value of land. The solution that was found is that when the Eastern Redcedar is replaced or converted to Switchgrass, there would be an increase in sediment yield due to soil disturbance.

Two common discussion points were brought up: economy and biodiversity. All presenters suggest ideas and solutions to problems that will boost their county's economy if implemented. However, the negative effects on biodiversity that implantation would entail are a cause for concern.



Oral Session 7-B

Discussant and Author: Harald Mieg

The session comprised three presentations.

Margarita Kharlamova, Russia, presented a study on the synthesis and properties of complex $\text{Mn}_{0.5(1+x)}\text{Al}_x\text{Ti}_{(2-x)}(\text{PO}_4)_3$ in ethanol conversion. Bioethanol is a product of biomass processing and also one of the main biofuels currently used as a petroleum-substitute in transport applications. Moreover, it's the source for industrially important compounds, such as hydrocarbons, ethers, aldehydes, ketones, hydrogen. For this reason, it is crucial to find suitable catalysts capable of effectively converting bioalcohols into these products. Nowadays, one of the best catalysts for those reactions are complex phosphates with NASICON structure. The goal of this project is to carry out an experiment, in which the stability of $\text{Mn}_{0.5(1+x)}\text{Al}_x\text{Ti}_{(2-x)}(\text{PO}_4)_3$ systems was studied during time.

Perry Wasdin, University of West Georgia, presented a paper on halide-oleate ligand equilibria of solution-phase PbS quantum dots monitored by NMR spectroscopy. The presentation described a series of experiments that investigated the surface binding that occurs between quantum dots (QDs) and ions or molecular ligands. PbS QDs have proven to be especially useful in solar cells due to their electronic properties. Recent reports have shown PbS QD-sensitized solar cells can achieve external quantum efficiency greater than 10%. A series of halide salts was used to replace the native oleate ligands to minimize any surface traps and enhance QD-electrode coupling.

Janella Gherasim, Utah Valley University, presented a study on the use of finite element modeling to increase the efficiency of low environmental impact hydropower. The central problem of low-impact hydropower is its low efficiency, meaning only a small fraction of fluvial energy is converted into rotational energy, the major source of inefficiency following from conservation of mass. The objective of this study was to use finite element modeling to determine the improvements in efficiency that would result from innovative features for preventing backflow.

All three projects show practical prospects aiming at eco-friendly technological innovation. Interestingly, the idea of a life-cycle analysis for any of the processes or products to invent was far from consideration.

