



# THE BOOLEAN

Snapshots of Doctoral Research at  
University College Cork

2011

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## Introduction

Every year, doctoral students in UCC publish books, theses and papers sharing the outputs of their research with peers in their academic disciplines, covering fields from medicine to climate change, and from law to food. While the outputs of the work may be of interest to others beyond this community, there are few opportunities for them to learn about the work. In addition, the language used for scholarly communication is often not that which would be happily understood by the interested non-expert.

The Boolean was introduced in 2010 to try and bridge this gap between the work doctoral students in UCC and the sharing of the outputs of this work more widely. The first volume, following its online publication in late 2010, has been accessed and read widely all over the world, and many articles have been downloaded hundreds of times.

The authors whose work is described in the pages of this volume were challenged to learn a new language of communication, to present their findings to an audience with no pre-knowledge of the field. They then took feedback both from staff and student reviewers, to give the final versions published here.

All authors are to be congratulated for rising to this challenge so well, and for bringing to life both the breadth of research ongoing in UCC and their passion for their work.

We hope all readers will find these articles stimulating, interesting and informative, and thank all those who have contributed to this volume.

‘The Boolean’ team

October 2011

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# I'll eat what she's eating — can the university student experience influence eating behaviours?

**Ciana Aspell**

Food Business and Development, UCC

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## The pathway to university

If I asked you to draw your food habits over your lifetime as a pathway what would it look like? Would it be a straight line, or perhaps have more of a meandering appearance? This research looks at food habits like a pathway through life, or the Food Life Course, concentrating on how food habits are formed and how subsequently these habits are re-fashioned due to a change in circumstances. We develop patterns of behaviour around food in childhood largely as a result of familial influences and these behaviours evolve as an individual moves through different life stages. However, the impact of life events on an individual's food choices can vary depending on social and personal influences and the eating environment itself.

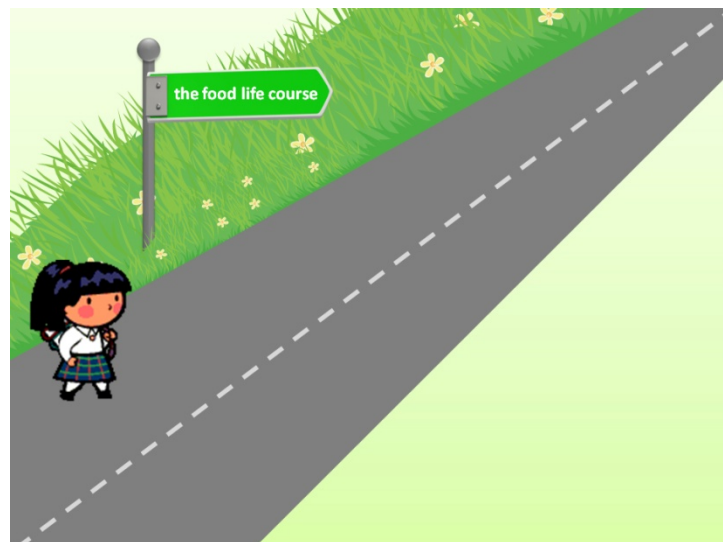


Figure 1: The Food Life Course. Female students' eating behaviours may meander during the transition to university

So, for example, what would happen if I took an individual out of the routine of their family environment and thrust them into a totally new environment with completely different influences? Influences like new social networks and that of a new social institution. That is exactly what happens when an adolescent starts University. I am specifically going to

concentrate on female students and how social and personal factors interact to influence individual behavioural patterns. I am focussing on what is called the 'transition to university' and the effect (if any) this has on the eating behaviours of young women. Eating behaviours of these young women can be quite complex, with femininity and beauty ideals coming to the fore. Norms and ideals in relation to food can become rooted in a value system that communicates thin as the ideal of beauty and perfection. The result can be a refashioning of food habits where peer influences become the dominant role in relation to these choices. To the point of entering University a food pathway may be relatively straight, but due to the transition, food choices may go into flux and may not stabilise until they finish university. However, the impact of this transition can be long-term; in this case previous eating patterns are never returned to.

## **Motivations for food choice**

Within this new context I am interested in the extent to which peer influences impact on a female's food choice or, to put it another way, the degree of personal choice a female student feels she has over her choices. If we can imagine a group of girls sitting in the university canteen each one in turn makes her lunch choice, until we come to one girl in particular, let's call her Maeve. Now let me give you some background on Maeve. She chooses to play music and sport because she finds them fulfilling and enjoyable so overall Maeve exerts free choice over her life domains. However, in certain contexts, like university, peers can have a substantial impact on Maeve's motivations or intentions, especially in the realm of food choice and consumption. Maeve may feel she has personal choice over many areas in her life or is intrinsically motivated, but the presence of peers in this particularly context, food choice, can cause her to become extrinsically motivated or controlled by others. What is interesting is that Maeve could personally be a source of her own external control as a result of perceptions she has about ideals and values in relation to food.

## **Extrinsic motivation or personal choice?**

The level of external control that Maeve feels over her behaviours can vary depending on whether she feels a sense of ownership over the behaviour or if she internalises the behaviour. Different types of motivation can be described based on the degree that Maeve attempts to incorporate the behaviour into her own personally held norms and values. This can be viewed as a continuum, where the motivation to engage in a behaviour can be because of a controlling orientation or a sense of choice. If Maeve pursues an activity out of interest and enjoyment she is internally motivated to engage in the behaviour thus it reflects intrinsic motivation. Extrinsic motivation is where engaging in the behaviour is



done for a reward or social recognition and does not emanate from the self. So, Maeve regulates her eating behaviours because of pressure from her friends. Extrinsic motivation can be broken down into four behavioural regulations which vary depending on the degree of internalisation. In order to explain this effectively, let us now go back to the group of friends sitting in the university canteen making their food choices. Everyone has made their choice except Maeve. As Maeve stands about to make her choice, the following options reflect why she could make this choice:

- Option 1: Maeve chooses a salad with no dressing because she gets pleasure from that type of food and enjoys how it tastes — *Maeve is intrinsically motivated toward the behaviour*
- Option 2: Maeve chooses a salad with no dressing because of the presence of others — *Maeve is externally regulated to perform the behaviour and feels she has no volition*
- Option 3: Maeve chooses a salad with no dressing because she would feel ashamed if she ate something else — *This is regulation through introjection, where Maeve feels she has to maintain self-worth*
- Option 4: Maeve chooses a salad with no dressing because she feels it is a good thing in order to feel good about herself — *This is regulation through identification, where eating this way is becoming personally important*
- Option 5: Maeve will choose a salad with no dressing because she feels energised after eating this food — *This is regulation through integration and is the most autonomous kind of extrinsic motivation, but the goal Maeve is trying to achieve is still external from the self*

Moving down through Maeve's lunch choices, we can see that the degree of internalisation or the degree that Maeve is accepting the behaviours as her own is increasing; however, all the options represent extrinsic motivation. Maeve may be beginning to accept these behaviours as her own but they did not originate within the self but as a result of peer influences around food. In order to increase intrinsic motivation an individual must feel: they have choice over their behaviours — autonomy; feel connected to other people and socially valued — relatedness; and feel they can master the behaviour — competence. Behaviours that are intrinsically motivated provide well-being and are more likely to be continued throughout the individual's life. They follow choices that emanate within the self and what they believe to be true. Extrinsically motivated behaviours can lead to lower self-esteem and can cause female students to be more susceptible to social pressures about thinness. However, if a female student is thrust into a controlling environment, this can in time cause her to change her eating habits to fit the external controls she is faced with. Dealing with such external forces can cause her to develop strategies in certain eating situations that can lead to unhealthy patterns of behaviour. Such strategies can include compensatory behaviours, where a female student may eat less after bingeing

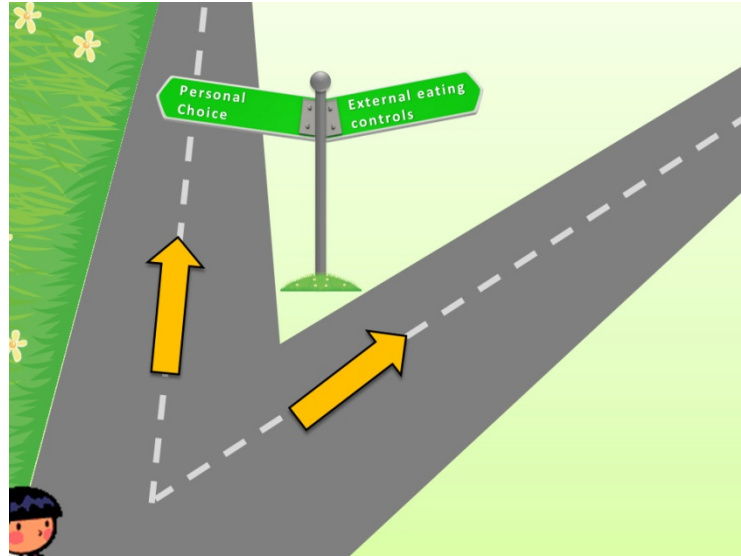


Figure 2: The motivations behind food choice — will a student be externally controlled?

during occasions (e.g., following alcohol consumption) by skipping meals in order to offset calorie intake.

So what determines Maeve's choices and what are the external forces acting upon her? She freely exerts choice in other domains of her life like music and sport but she is unable to spread this choice to her food behaviours. There is a knowledge gap concerning the eating behaviours of Irish female students and, in particular, the impact social influences can have on these behaviours. Female university students are particularly vulnerable to social pressures associated with physical appearance, with friends often playing a dominant role in the development of unhealthy eating behaviours. Those who perceive pressure from peers are often more likely to engage in unhealthy patterns in order to live up to unrealistic ideals. Social adjustment can be very important in university providing a powerful motivation to conform to these ideals or even internalise the belief that thin equates beauty, perfection and popularity. Behaviours established during this transition could potentially create a life-long concern with body image and associated health problems.

## Methodology

With this research, I hope to contribute to the knowledge concerning the eating patterns of young women but go further by specifying the impact social influences can have on eating behaviours during the transition to university. On entry to university such changes to food choice and consumption can be instantaneous so the research will start this September. First year students, 300 in total, from three universities, University College Cork, National University of Ireland Galway and Dublin City University will be administered with a questionnaire concerning their food choice consumption patterns and their motivations

behind food choice at Time 1 (September 2011). The same students will be administered the same questionnaire at Time 2 (April 2012). Comparisons between the two sets of results will show (if any) changes to both food consumption and the motivations behind food choice. At both times, height and weight measurements will also be taken to compare any differences. The same students will be administered a slightly augmented questionnaire in second year to again further assess any differences in food choice as a result of the transition to university.

## **Conclusion**

Students enter university with established eating behaviours and they should be able to continue to uphold their own beliefs in relation to food. Any information received by external forces such as friends that may differ from these beliefs should be disregarded in favour of personal choice. A strategy needs to be developed to help these young women deal with social pressures but how can we implement such a strategy if we do not understand the external forces facing these students in relation to their food choices? I hope to delve deeper into the social conditions in which these young women now make their food choices and dare to ask if eating and ever be as individual as other activities.

Ciana Aspell is a student of Food Business and Development under the supervision of Dr. Mary McCarthy and Dr. Sinead McCarthy

# **Investigating the accountability of Transnational Armed Groups under International Law for armed attacks**

**Anna Marie Brennan**

Department and Faculty of Law, UCC

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## **Introduction**

According to the National Counterterrorism Centre in the United States, there were approximately 11,000 attacks carried out by Transnational Armed Groups worldwide in 2009. A Transnational Armed Group can be described as a non-state armed actor which operates beyond the territorial borders of a single state and carries out serious and violent acts intended to cause fear, death, serious bodily injury and property damage to a person, group or general population in order to force a government or international organisation to perform or refrain from performing a particular act. An example of a Transnational Armed Group is Al-Qaeda. According to the Program on Humanitarian Policy and Conflict Research (HPCR) at Harvard University, other examples of Transnational Armed Groups include Jemaah Islamiyah and the Palestine Liberation Organisation. However, these particular Transnational Armed Groups are more limited in geographical scope and vary in organisation and objectives. According to HPCR, Al Qaeda is the only Transnational Armed Group operating on such a wide geographical basis with training grounds in Pakistan, Afghanistan and Uganda. In addition, it is noted that Al Qaeda has also proven itself to be global in outlook by carrying out armed attacks in locations such as Madrid, London, Bali, Karachi and New York.

In recent years, states have changed from law enforcement to an armed engagement in their methods of handling the threats posed by Transnational Armed Groups. Domestic law enforcement has proven to be an ineffective tool in deterring attacks by Transnational Armed Groups because it has not been able to keep up with the new methods such as Improvised Explosive Devices (IED) continuously developed by Transnational Armed Groups to carry out attacks against civilians. Many academics consider these violent acts by Transnational Armed Groups to be an armed conflict to which International Humanitarian Law applies. Therefore, it is necessary to consider how Transnational Armed Groups can be held accountable under International Law for attacking civilians if such acts constitute an armed conflict.

## **The rationale for holding Transnational Armed Groups accountable under international law as opposed to domestic law**

Although there are many rationales for holding Transnational Armed Groups accountable under International Law for violent attacks, the most convincing rationale is that domestic legal systems are not the most suitable forum for addressing the violent acts of Transnational Armed Groups. The criminal justice system is based on the principle that criminal activity can be prevented or controlled by deterrence. Craig Allen, who is the Judson Falknor Professor of Law at the University of Washington in the United States, notes that this deterrence takes two forms. According to him, the first form is specific deterrence, which refers to the practice, usually through imprisonment, of disabling a particular actor from committing future crimes.’ The second form is general deterrence which describes the ‘public effect’ of such punishment in deterring others from carrying out crimes. According to Professor Allen, general deterrence assumes that a rational actor will cease criminal behaviour if the potential cost as discounted by the likelihood of being apprehended and tried for the crime is too high. Professor Allen also notes that the general-deterrence approach to criminal justice depends on the ‘choice theory’ of criminal behaviour. Choice theory views a person’s decision to take part in criminal activity as a rational choice established on the apparent consequences of taking part or not taking part in criminal behaviour. However, the deterrence approach tends to break down with regard to Transnational Armed Groups operating in locations beyond the criminal jurisdiction of nations. In addition, it is important to emphasise that the domestic criminal justice system is by nature reactive in that the system in general endeavours to ‘identify persons who have already committed crimes and to then gather the evidence necessary for their indictment, prosecution and conviction.’

Nevertheless, it is important to point out that there are numerous insurmountable challenges to prosecuting members of Transnational Armed Groups within the domestic criminal justice system. Firstly, assembling the necessary evidence for achieving a conviction from locations outside the state’s jurisdiction can be obtained only with the cooperation of the host state. It can be readily observed that not all states will be willing to cooperate, and some states may not be able to offer any assistance. Secondly, it is argued that exercising jurisdiction over members of Transnational Armed Groups such as Al-Qaeda can be problematic in that it can be extremely difficult to secure the extradition of a suspect due to the non-existence of an extradition treaty. A state may also refuse to extradite any person to a state where the death penalty might be imposed if the person is convicted. In addition, the security precautions necessary for judges, prosecutors, witnesses and jurors in trials of member of Transnational Armed Groups offer a perspective on the financial costs of prosecuting members of Transnational Armed Groups suspected of planning and carrying out violent armed attacks. During trial, certain evidence against the accused

will be classified or will require summoning witnesses from abroad and members of state armed forces and law enforcement agencies to give evidence at trial. The prospect of disclosing classified information to members of Transnational Armed Groups for use in their defence at trial highlights the national security implications of prosecuting members of Transnational Armed Groups in the domestic legal system. Therefore, it needs to be considered whether international criminal justice would be a better legal mechanism for holding members of Transnational Armed Groups accountable for armed attacks.

## **The applicability of the Geneva conventions to Transnational Armed Groups**

In considering whether Transnational Armed Groups can be held accountable under International Criminal Law as opposed to domestic criminal law, it is first necessary to examine whether the violent sporadic attacks they perpetrate constitute an armed conflict within the meaning of the Geneva Conventions. The Geneva Conventions and their Additional Protocols are the principal legislative instruments of International Humanitarian Law (IHL), the branch of international law that governs the conduct of armed conflict and seeks to restrict its consequences. In particular, the Geneva Conventions seek to protect those persons who are not taking part in the hostilities, for example civilians and health care workers, and those who are no longer participating in the hostilities, such as prisoners of war and the sick and wounded. Common Article 2 of the Geneva Conventions states that the Geneva Conventions are applicable to armed conflicts of an international nature. Therefore, Common Article 2 only applies to armed conflict between states and not to violent attacks by Transnational Armed Groups. On the other hand, Common Article 3 of the Geneva Conventions, which applies to armed conflict occurring within the territory of a state between state armed forces and dissident armed forces, may also regulate attacks by Transnational Armed Groups. Two requirements in particular define the scope of application of Common Article 3:

- the existence of an armed conflict; and
- that it is a non-international armed conflict.

However, characterising attacks by Transnational Armed Groups as an armed conflict within the meaning of Common Article 3 raises major policy questions. First of all, ascribing 'belligerent' or 'combatant' status to members of Transnational Armed Groups might invest members of such groups with rights and privileges under International Humanitarian Law. Secondly, the classification of attacks by Transnational Armed Groups as an armed conflict may also symbolically aggrandise the Transnational Armed Group by suggesting that states consider them much more than a sinister criminal organisation. Lastly, categorising attacks by Transnational Armed Groups as an armed conflict could also im-

munise members of such armed groups from prosecution for proportional attacks directed against military targets. As a result of these issues, it is difficult to categorise attacks by Transnational Armed Groups under either traditional perceptions of war or contemporary ideas of armed conflict. Nevertheless, the attacks do exhibit several characteristics of armed conflict including their purpose, coordination and intensity.

The question of whether Common Article 3 of the Geneva Conventions regulates armed attacks by Transnational Armed Groups still remains. The text of Common Article 3 provides very little guidance on the issue. According to Professor Jinks, Common Article 3 is only helpful in determining the type of armed conflicts it does not regulate by identifying its field of application as armed conflict not of an international nature. Jurisprudence of the International Criminal Tribunal for the Former Yugoslavia (ICTY) has arguably clarified the definition of armed conflict in IHL. In particular, the ICTY Appeals Chamber in the case, *Prosecutor v. Tadic (Tadic)*, concluded that:

[A]rmed conflict exists whenever there is a resort to armed force between States and protracted armed violence between . . . such groups within a State. International humanitarian law applies from the initiation of such armed conflicts and extends beyond the cessation of hostilities until a general conclusion of peace is reached; or, in the case of internal armed conflicts, a peaceful settlement is achieved. Until that moment, international humanitarian law continues to apply in the whole of the territory of the warring States or, in the case of internal conflicts, the whole territory under the control of a party, whether or not actual combat takes place.

Two features of this definition clarify the meaning of ‘armed conflict’ under International Law. First of all, the term suggests that an armed conflict exists only if the armed group controls a segment of the state’s territory. Secondly, the term categorises internal hostilities as an armed conflict only if the violence is protracted. Professor Jinks contends that both requirements would limit the conditions under which Common Article 3 applies. Even though the definition laid down by the ICTY is persuasive, a careful reading of the Tribunal’s reasoning makes clear that it does not restrict the scope of application of Common Article 3 to Transnational Armed Groups.

The Tribunal’s definition does not require that armed groups have control over territory within the state. The Tribunal defines the circumstances in which International Humanitarian Law applies by carefully analysing its general scope of application, the temporal scope of application and the territorial scope of application. Professor Jinks notes that by defining the territorial field of application for non-international armed conflict the ICTY confirms that IHL is applicable in territory that is no longer under the control of the state and in the whole of that territory.

According to Professor Jinks, the ‘protracted’ armed violence requirement does not limit the application of IHL in any considerable way. The conclusion reached by the ICTY Appeals Chamber in *Tadic* indicates that most instances of internal violence would satisfy this requirement. Whether the internal violence is protracted, is determined by reference

to the entire time period of the armed hostilities from the initiation to the cessation of the hostilities. Moreover, IHL applies to all acts committed during an armed conflict even if the act was committed before the point at which the 'protracted' threshold was crossed. To be precise, the 'protracted' requirement does not exclude acts committed in the early stages of a non-international armed conflict. The 'protracted' armed violence requirement can be best appreciated as little more than a reiteration of the rule excluding isolated and sporadic acts of violence from the scope of IHL. Furthermore, the jurisprudence of the International Criminal Tribunal for Rwanda established that armed violence over a period of a few months meets the 'protracted' requirement and, because of the level and intensity of the armed violence, it constituted an armed conflict within the meaning of Common Article 3.

## Conclusion

In conclusion, the intensity, coordination, and pattern of attacks by Transnational Armed Groups against the United States and other states make clear that attacks by Transnational Armed Groups are not simply isolated and sporadic acts of violence but instead constitute an armed conflict within the meaning of Common Article 3. Attacks by Transnational Armed Groups have involved the coordinated use of force and have demonstrated their capability to operate globally even against military and diplomatic targets. It is clear that the organisational capacity of Transnational Armed Groups such as the Palestine Liberation Front and Al Qaeda distinguishes them from 'mere bandits' in that they possess the *de facto* capability to carry out sustained armed attacks against states.

Anna Marie Brennan is a PhD Candidate in the Department and Faculty of Law under the supervision of Dr. Siobhan Wills and Dr. Fiona Donson. The author wishes to acknowledge funding from the Department and Faculty of Law, University College Cork.



# Could waste fuel our cars?

**James Browne**

School of Engineering, UCC

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## Introduction to waste in Ireland

We are all familiar with the old saying of, “waste not, want not”; however, waste is an inevitable outcome of human activity. It is also clear that there is a direct link between economic development and increasing waste production. As people of the technology era, we as a society generate quite a staggering quantity of rubbish, more formally referred to as municipal solid waste (MSW).



Figure 1: Biodegradable municipal waste

Currently, waste management is a hot topic in Ireland, with recent controversy over the proposed 600,000 tonne *per annum* municipal waste incinerator at Poolbeg, Dublin and also the controversial High Court ruling over waste ownership and collection in Fingal, Co. Dublin. It is fair to suggest that there is a lack of certainty and clarity with regards to implementing Ireland’s waste management strategy. In the past, waste management was not considered a priority. However, over the past 20 years, this situation has changed dramatically, and waste management is now a top priority at National and European level.

### Biodegradable municipal waste

Biodegradable municipal waste (BMW) is municipal waste that is capable of undergoing decomposition either in the presence of oxygen (aerobic degradation) or in the absence of

oxygen (anaerobic degradation). BMW comprises of food and garden waste, paper, cardboard, certain textiles and wood. However, it is the food and garden waste, often referred to as the organic fraction of municipal solid waste (OFMSW), which presents the greatest environmental hazard, due to its fast rate of degradation and resulting by-products. In Ireland, about 65% of municipal waste is biodegradable, with OFMSW accounting for approximately 40% of this amount. Paper and cardboard account for about 54%, while textiles and wood made up the remainder.

## **Pollution from Waste**

As the environmental damage resulting from increased waste production and over reliance on landfill became more apparent, the EU moved to encourage the diversion of biodegradable waste from landfill. The EU Landfill Directive (1999) set out ambitious targets for member states to reduce the quantity of bio-waste going to landfill every year up to 2020. Ireland has a target of 60% reduction of bio-degradable waste by 2020 based on 1995 levels.

According to the environmental protection agency (EPA), approximately 2 million tonnes of MSW was landfilled in 2009. Although this figure has fallen somewhat, mirroring the fall in the economic growth, it is predicted that a return to growth will see an increase in waste generation once again. In order to reduce the harmful effects on the environment and to meet the ambitious waste diversion targets there is an urgent need to develop alternative waste management infrastructure to safely manage biodegradable waste.

## **Could waste be a renewable energy source?**

To date, Ireland has almost exclusively relied on landfill as a means of managing MSW. While management of landfill sites has improved over recent years, it remains an undesirable treatment of biodegradable waste. In fact, the major problems associated with landfills are a result of OFMSW. Foul odour, water pollution from landfill run-off (leachate) and air pollution are all associated with the breakdown of organic waste buried deep within the landfill. As the garbage decomposes in the absence of oxygen (anaerobic conditions), bacteria present in the landfill produce a biogas which is approximately 50-60% methane, 40-50% carbon dioxide and small quantities of other gases such as water vapour and traces of hydrogen sulphide (the rotten egg smell).

Methane is reported as having a Global Warming potential of twenty times that of carbon dioxide. On the positive side, methane is also the major gas component of Natural Gas, which has an almost identical energy value (38MJ/m<sup>3</sup>). This energy value is similar to that of a litre of diesel fuel. Some landfill operators have taken advantage of the stored energy potential in landfill gas and have installed gas generators to generate electricity.

However, it is difficult to control and monitor gas production within landfills and the practise of utilising landfill gas is seen as a good short term solution to combat green house gas emissions, but ultimately landfill is the least desirable waste treatment option from an environmental viewpoint. The diversion of OFMSW from landfill presents an opportunity for generating a renewable source of energy.

## **Anaerobic Digestion — Bio-gas Production**

The idea of using anaerobic digestion (AD) for treating potentially polluting wastes has been around for many years. In the late 1800s the street lamps around East London were powered by biogas from sewage sludge. However, the process was often prone to failure and was seen as an unreliable source of fuel. In recent years, great improvements have been made in understanding the biological activities in the AD process and have lead to the development of many biogas plants across Europe. By optimising the naturally occurring AD process in a purposely designed biogas plant, the potential energy from organic wastes can be recovered in the form of methane gas. Various organic wastes can be used, such as OFMSW, slaughter house waste, agricultural slurries and preserved/ensiled energy crops such as grass silage. Besides the production of energy in the form of biogas, AD also produces an organic fertiliser with lower pollution potential and significantly better availability of nutrients when compared to slurries. The biogas can be used to generate heat and electricity in a combined heat and power (CHP) unit, and electricity can be sold to the distribution grid or used on-site if needs be. An important consideration with using biogas for CHP is that up to 50% of the energy is transferred into heat, so having an adequate use for this energy is important for the efficiency of the system. Where a significant heat source is not required, upgrading biogas to biomethane may be a more effective method of energy transfer.

### **Utilising Biogas for Transport**

Biogas can be upgraded to biomethane by eliminating the non-methane components such as carbon dioxide, hydrogen sulphide and other contaminants. The resulting biomethane is practically identical to natural gas and can be blended to give a cost-effective alternative to conventional transport fuels such as petrol and diesel. In countries such as Sweden, Germany and Switzerland, biomethane is used in addition to natural gas as a gaseous transport fuel in compressed natural gas (CNG) vehicles. Biomethane can also be injected into the gas grid reducing reliance on imported fossil fuels. The existing natural gas infrastructure allows for an efficient distribution system with the possibility to sell the biomethane anywhere on the gas grid.

A market for a competitive transport fuel in the form of a blend of biomethane and natural

gas (BioCNG) has potential to bring environmental and economical benefits. There are now over 12 million CNG vehicles worldwide; this is set to rise due to cost efficiency and improved air quality. The use of compressed biomethane and blended BioCNG is also increasing, e.g., in Sweden there is approximately 17,000 CNG vehicles utilising a BioCNG fuel that contains more than 55% biomethane. The proportion of biomethane used in the gaseous fuel has increased over time and is set to further increase in the future.

## **Renewable Energy in Ireland**

Although Ireland has made significant progress in generating renewable electricity, mostly through wind, it has proven difficult to meet the renewable energy targets for Heat and Transport. In the case of transport energy, this is partly because of the uncertainty over the sustainability of certain Biofuel crops and the food versus fuel debate. In addition, the cool, temperate, “mild” Irish climate and the limited availability of arable land does not allow for the mass production of high-yielding energy crops such as palm oil, sugar cane or cereals. It has been argued that Ireland’s arable land (which accounts for only 9% of the total agricultural land mass) is already fully utilised for food and beverage production. However there is significant potential for renewable gas production from wastes and residues. The biodegradable fraction of municipal, commercial and industrial waste is now considered to be a renewable source of biomass. Biowastes such as animal slurries and waste products from abattoirs, breweries and agri-food industries could fulfil a significant portion of our energy needs. It is estimated that Ireland could easily supplement 3.5% of transport energy from renewable gas from wastes, while the additional potential from surplus grassland (2.5% of total grassland) could fulfil the 10% renewable energy target in transport for 2020. As Ireland currently imports approximately 98% of transport fuel, the potential contribution from indigenously produced biogas is significant. Transport energy accounts for approximately 40% of total energy use in Ireland, so finding sustainable, renewable sources of transport fuel would be hugely beneficial, both economically and environmentally.

## **The future role of AD in Ireland**

Although the benefits of using AD as a means of waste management and energy production have been highlighted by many, there are still obstacles in its development in Ireland and elsewhere. The introduction of a brown bin for organic waste in commercial premises and municipalities has provided a waste stream which is suitable for AD and biogas production. However the investment costs of an AD system are significant and in order to encourage investment, more certainty needs to be given to national and regional waste management strategy.

AD is better suited to certain waste streams which degrade quickly, e.g., food waste; however, it is not effective for woody material, which takes far longer to breakdown under anaerobic conditions. AD can provide part of the waste management solution but other technologies such as composting and thermal treatment will also have to be utilised to divert the large quantities of biodegradable waste which are currently being sent to landfill.

Concerns about pathogen kill and the use of digestate as a fertiliser need to be addressed by further studies. The importance of agriculture to the Irish economy is hugely significant and so precautions are necessary where there is a risk of contaminating the food chain and the spreading of infectious diseases such as foot and mouth. This is particularly relevant to the movement and storage of agri-food wastes, animal slurry and former food stuffs.

Ireland has the potential to develop a significant biogas industry which would have multiple benefits to society and the environment. Further knowledge and expertise needs to be developed in all aspects of AD. To this end the ongoing research into AD and biogas production is important for future development in Ireland. Current and future research will focus on biogas production from organic wastes and residues, AD biogas technology and modelling of biogas systems.

*James Browne is a student at the Bio-energy group under the supervision of Dr. Jerry Murphy, Civil and Environmental Engineering Department UCC. The author would like to acknowledge Bord Gais Eireann and IRCSET for funding his research.*

# **An ethnographic study of Irish Neo-Pagan culture**

**Jenny Butler**

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## **Introduction**

The idea that Witches and Druids are real people who follow spiritual traditions with serious intent is a hard one to fathom for many people in contemporary society. The neo-pagan movement is strange and unfamiliar to the general public. Similarly, the research topic of neo-paganism is a relatively new one in academia. The primary aim of my research is to document neo-pagan culture from an ethnographic perspective. There have been very few academic works written on modern or “neo” (new) paganism and, as far as the author is aware at the time of writing, there has been no large-scale ethnographic work at all carried out exclusively on neo-paganism in Ireland, and in this respect the area of research is virgin territory for ethnographic analysis. Ethnography is the documentation and analysis of the culture of a specific group of people in regard to their beliefs, oral traditions (stories, songs and ways of speaking) and ritual practices (symbolic behaviour) and oftentimes their material culture (tangible objects). My research looks at all of these aspects of neo-pagan culture.

## **What is Neo-Paganism?**

Neo-paganism is an umbrella term used to refer to a variety of spiritual practices. The prefix ‘-neo’ is used to indicate the modern spiritual movement, as distinct from pre-Christian contexts of so-called “pagan” religions. Neo-pagans may choose other labels to describe themselves, such as “earth-based spiritualist” and I include those who self-identify as such, or as “neo-pagan” generically, in my research. Neo-paganism is an umbrella term used to refer to a variety of spiritual practices. The prefix ‘-neo’ is used to indicate the modern spiritual movement, as distinct from pre-Christian contexts of so-called “pagan” religions. Neo-pagans may choose other labels to describe themselves, such as “earth-based spiritualist”, and I include those who self-identify as such, or as “neo-pagan” generically, in my research.

One form of neo-pagan spirituality is Druidry. There is also Witchcraft, which itself encompasses an array of paths, including Wicca (a mystical religion), Hereditary Witchcraft

(passed on through generations of a family) and Traditional Witchcraft or Hedgewitchery (a modern form of witchcraft based on practices associated with the Wise Women figures of pre-modern Ireland, who were generally healers who used herbalism and other traditional means to cure people).

The term *Pagan* stems from the Latin word *paganus*, meaning ‘country-dweller’. Another neo-pagan path is heathenism, which stems from the Old English word meaning ‘inhabiting open country’ and is probably the root word for *heath* or areas of moorland. Both terms are associated with rural areas and the natural landscape and, consequently, neo-paganism, a movement that reclaimed the word *pagan*, has come to be defined as “nature religion”. Strictly defining neo-paganism as a religion is problematic. Some neo-pagans, particularly Wiccans, view themselves as priests or priestesses of a mystery religion, since they become a member of clergy on initiation into a Coven (ritual group of witches) while other neo-pagans may feel that it is not a religion at all but a philosophy, or simply their chosen way of life. While many feel that neo-paganism is indeed a religion with its own set of ethical and moral principles, others dislike the label “religion” itself and prefer the term “spiritual”; perhaps this stems from a backlash against organised, dogmatic religions that people were raised with and abandoned in favour of a spirituality that allows people to express themselves freely through ritual and to describe their beliefs in a way that makes sense to them.

## Misconceptions

There are many misunderstandings of what neo-paganism is since the movement has been greatly misconstrued, largely due to its low public profile. The general perception of the average Irish person on hearing the word “pagan” is of a person with no formal religious beliefs, an atheist, or even an individual who holds anti-Christian beliefs. This misapprehension of neo-paganism as anti-Christian most likely stems from the use of the word “pagan” and “heathen” by Christian clerics to mean either something anti-Christian or as evil and Satanic. It is important to clarify that neo-pagans view Satan as part of Christian mythology and, as such, do not acknowledge this figure as a “pagan” deity. The majority of neo-pagans view themselves as followers of the “old religion”, i.e., one that pre-dates Christianity and has its own pantheon, distinct from the Christian one.

With Druidry in particular, there seems to be the ‘tree-hugging-hippy’ stereotype that environmentalists and nature-lovers are often pigeonholed into. The notion of a Druid is often muddled up with the popular image of Merlin of Arthurian legend and wizards of fantasy literature (this is especially the case in the present day with the release of the film trilogy *Lord of the Rings*, an adaptation of J. R. R. Tolkien’s work, which contains the characters of the Wizards Gandalf and Saruman, and also J. K. Rowling’s *Harry Potter* series of books, and the films based on them, which have characters who are wizards).

There are the more damaging misconceptions of neo-paganism, as when ritual practice is confused with Devil-worship and negative Occult activity; this is largely due to melodramatic films and sensational literature portraying lurid details of “rituals”, the Black Mass, brainwashing cults and other tactics intended to shock. Neo-paganism has no connection with such activities, but the fact that some neo-pagans carry out rituals wearing robes and using paraphernalia, which appears strange to those unaccustomed to it, may cause fear if people do not understand what neo-paganism is.

## **Methodology**

The methodology, or way in which my research was carried out, included two main field-work methods: ethnographic interviewing and participant observation. Ethnographic interviewing is an in-depth, conversational style of interviewing, which aims to get insight into “what it is like” to be part of a particular cultural group. Thirty-six interviews were conducted with neo-pagans to find out what it is like to be part of this spiritual community. In my ethnographic description, interview extracts are included so that the interviewee is quoted directly. This is especially important in cases where a person is talking about a strongly held belief or meaningful personal experience, as viewpoints and subjective experiences are better expressed in the words of the interviewee themselves.

Participant observation is a method whereby the researcher takes part in events with the people being researched, so that the academic can gain a better understanding of how life is for the “insider” or member of the cultural group. The researcher is both an insider taking part in the event and also an outsider, in that their role is to analyse what is going on. I took part in different kinds of rituals, seasonal festivals and other kinds of gatherings with various neo-pagan groups.

There are many ethical considerations while conducting this kind of fieldwork. One is to be clear that their role is that of a researcher who is collecting data for academic analysis. It is important to protect the identity of the interviewees and other research participants, which is achieved by the use of pseudonyms. Exceptions are made in cases where the work of pagan artists is discussed or reproduced, as there is an issue with appropriate copyright and credit for this work.

## **Research question**

My research question is twofold:

(a) What characterises neo-pagan worldview? (b) How is this worldview expressed through ritual behaviour?



In folkloristics (the academic study of folklore), we use the term “worldview” to mean the belief-system or set of beliefs of a particular cultural group. The study of this is an examination of how certain people view the world. The neo-pagan belief-system can be described as a “magical worldview” because, typically, they believe in magic, spirits and deities. The spiritual practice includes many kinds of rituals, such as life cycle rituals, i.e., baby blessings, Handfastings (neo-pagan term for weddings) and funerals. There are also healing rituals, including the healing of people, animals, and the planet itself or “earth healing”. There are also the seasonal festival rituals. Neo-pagans celebrate eight annual festivals: Samhain (October 31st), Winter Solstice (December 21st), Imbolc (February 1st), Spring Equinox (March 21st), Beltaine (May 1st), Summer Solstice (June 21st), Lughnasadh (August 1st) and the Autumn Equinox (September 21st). Some neo-pagans use the Irish-language names for the festivals, but the names are most often found in anglicised form in neo-pagan literature.

## **Landscape, history and mythology**

My research also looks at identity construction, the process whereby individuals and groups create their own individual worldview or outlook on life, within Irish neo-paganism and what is uniquely Irish about neo-paganism in this country. Some of the cultural resources, or aspects of identity that are held to be important, have to do with the relationship that neo-pagans have with the Irish landscape, mythology and how they perceive history. Neo-pagans have a deep spiritual connection to the natural landscape, which is viewed as a sacred landscape. There is an abiding belief that deities and spirits are place-specific, i.e., geographical areas have their own associated deities and spirits. Many Irish neo-pagans venerate the “old gods” of the land of Ireland and there are those who believe that these gods and goddesses have endured through time and that one can communicate with them today. The “old gods” of Ireland are considered to be those of the Celtic pantheon. Despite the fact that most surviving Celtic legends were recorded after Christianisation, they still contain information about the gods and goddesses of the Celts. For modern Pagans, the legendary characters of Celtic myth are not metaphorical or figurative heroes but real, living, beings that may even have the power to influence the everyday lives of human beings. Neo-pagans honour the deities and sometimes attempt to communicate with them through ritual. For example, one Druidic Grove (a Grove is a ritual group of Druids) named the Owl Grove invokes Lugh during their *Lughnasa* (Harvest) ritual; Lugh is one of the principal gods of the Celtic pantheon and he is a sun god. Neo-pagans have many sacred sites on the landscape, including Newgrange and the Hill of Tara, which are both in Co. Meath, as well as stone circles and other megalithic monuments and groves of trees. Among neo-pagans, there is a strong affiliation with earliest religions of Ireland and of Europe more generally, and it is often the case that sacred sites are chosen because of their association with earlier and indigenous religious practices. For example, there is

a connection between religious worship within groves of trees and pre-Christian druids; similarly, megalithic monuments have associations with early religious practices. For the majority of the Irish populace, these are heritage sites with an historical legacy. However, for neo-pagans they are more than just heritage sites and are indeed “living” sites, in that they are used frequently for spiritual purposes, for ritual and as gathering places.

## Conclusion

My analysis of the data I have collected reveals a vibrant and dynamic Irish neo-pagan culture that relates to the Irish landscape, mythology and history in unique ways. I plan to publish my research results in book form, which primarily aims to document aspects of this cultural movement, as it exists in Ireland. A secondary, but important, outcome of publishing this data is that it will lead to a better understanding of this culture both within academia and among the general public. I hope to achieve this by publishing academic articles as well as a book-length study, to educate people about neo-paganism and also to reach a broader audience through other media.

The research on which this paper is based was conducted with the support of a Government of Ireland Scholarship in the Humanities and Social Sciences, awarded by the *Irish Research Council for the Humanities and Social Sciences*. Thanks are also due to my supervisors Dr. Stiofán Ó Cadhla and Prof. Emeritus Gearóid Ó Cualaoich for their help and support.

# Characterizing Ireland's wave energy resource

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## Introduction

In theory, the energy that could be extracted from the oceans is well in excess of any current, or future, human requirements. While wave energy currently lags behind conventional, carbon based sources of power and other renewable sources of energy such as wind and solar, advances continue to be made. The developers of Wave Energy Converters (WECs), the devices that are designed to harness the power of ocean waves, require methods to compare and evaluate the wave energy resource at different locations in order to allow them to select the most suitable sites to achieve optimal power capture and economic performance from their installations. The focus of my Ph.D. research is towards developing new methods for characterizing the wave energy resource off the west coast of Ireland with reference to the potential power available and the performance of typical devices, and also to allow for the comparison of possible sites for the development of WEC projects. In particular, efforts are being made to differentiate between which sets of wave conditions, known as sea states, occur most frequently at a location of interest and which sea states contribute most to the energy that can be expected to be produced by a WEC.

## Wave measurement and data processing

In order to quantify and characterize the ocean energy resource at a location of interest, it is first necessary to collect data which describes the nature of the incident waves. Many different wave measurement techniques are in use worldwide, each with their own inherent advantages and weakness. In the past, wave heights were estimated visually by a network of trained observers aboard ships, a method which produces surprisingly accurate results, notwithstanding the human capacity for exaggeration! Nowadays a plethora of tools are available to ocean researchers, ranging from pressure sensors fixed to the seabed to satellite mounted radar systems.

This research relies on data collected by wave buoys (Fig. 1); one of the most commonly used measurement systems in the field of ocean energy. These buoys are moored to the seabed and employ complex instrumentation to measure the motion of the passing waves.

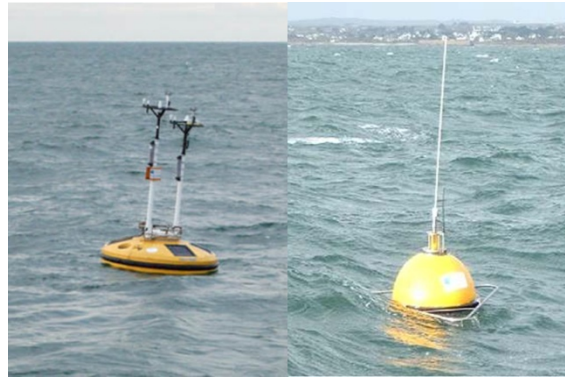


Figure 1: Wave measurement buoys: (a) Fugro Wavescan buoy, (b) Datawell Waverider buoy

This data is then transmitted to an onshore receiving station. A typical 30 minute recording of wave elevation, measured at the Galway Bay Wave Energy test site, is shown in Fig. 2b.

An important aspect of my project to date has been the implementation of an efficient computer program to collate the collected wave buoy measurements, apply quality control checks to remove erroneous recordings and finally analyse the data in order extract useful information. This final step can be difficult. Visual investigation of the wave record illustrated in Fig. 2b is almost impossible; it appears to be a very confused and irregular signal, made up of many waves with different heights. Advanced analysis techniques must be applied to simplify the data by decomposing this surface elevation profile into its corresponding wave spectrum, illustrated in Fig. 2a. The size and shape of this spectrum

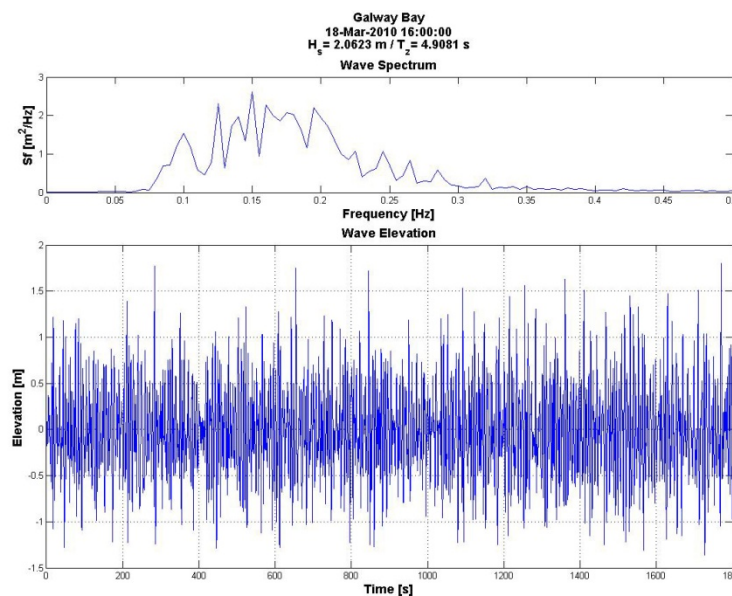


Figure 2: (a) Wave spectrum corresponding to (b) 30min recording of wave elevation from Galway Bay

provides us with details of the character of the observed wave conditions and allows for the calculation of important parameters used in the description of wave climate. These parameters include the significant wave height ( $H_{m0}$ ), average height of the largest third of all the observed waves in a record, and the wave period ( $T_{02}$ ), the time it takes for two successive wave crests to pass a fixed point in space.

## Resource characterization

### The need for resource characterization

The accurate characterization of the wave energy resource will be vital for all stages of the lifecycle of a commercial wave farm. At the initial design phase it will be necessary in order to quantify the amount of power that an individual device can be expected to produce and predict the wave induced forces it will need to withstand. Resource characterization will also be required to ensure that WEC developments are sited at the most energy rich and economically viable locations. Finally, once these devices are deployed at sea and connected to the electrical grid, knowledge of the incident wave conditions will allow for the monitoring of the performance of the farm. My research aims at aiding this process by identifying suitable methods for the analysis of measured wave data in order to describe and characterize the wave climate that can be expected at a site.

### Analysis and results

One of the most useful and commonly employed techniques for visualising the wave energy resource at a location of interest is to create graphics known as scatter plots, which illustrate the occurrence of particular combinations of wave parameters such as  $H_{m0}$  and  $T_{02}$ , referred to as sea states. These scatter plots provide a useful method of ascertaining an overall understanding of the wave resource. Fig. 3 illustrates range the sea states experienced through the year 2010 at the Atlantic Marine Energy Test Site (AMETS), a grid connected site for the deployment of pre-commercial WECS that is being developed by the Sustainable Energy Authority of Ireland (SEAI) near Belmullet, Co. Mayo, based on wave data processed using the methods outlined in the previous section. The percentage occurrence of different combination of  $H_{m0}$  and  $T_{02}$  is noted in the relevant box and along with the colour shading indicates how frequently each sea state occurs. Fig. 3 shows that WECs deployed at AMETS could expect to experience a wide spread of conditions, with significant wave heights greater than 10m evident during storms. The presence of a red/orange hotspot is also noticeable, highlighting that for most of the year wave conditions fell within a significant wave height range of 1-3 metres and a wave period range of 5-8 seconds. In the past, these sea states have been deemed to be the most significant for the capture of wave energy.

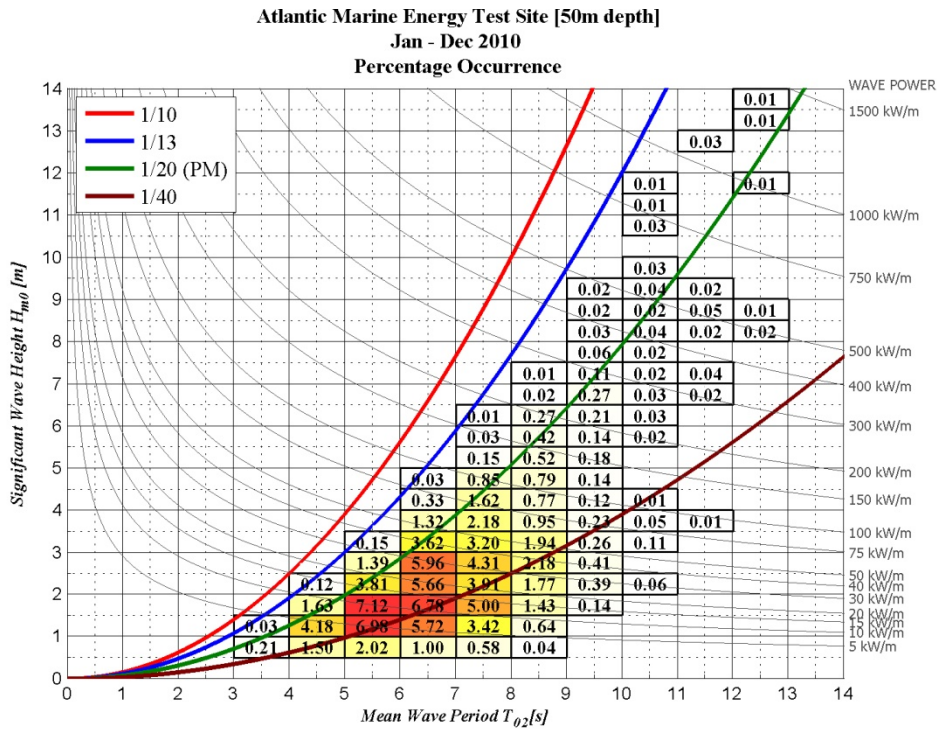


Figure 3: Sea State occurrence (%) scatter plot for Atlantic Marine Energy Test Site for 2010

An important finding from my research has been to identify a major limitation associated with scatter plots like Fig. 3 in that they fail to fully describe which sea states contribute most to the wave energy experienced at a particular location. The AMETS scatter diagram is redrawn in Fig. 4, using analysis techniques developed for this project, with percentage occurrence replaced by the percentage contribution that each sea state makes to total incident wave energy over the course of the year. When this diagram is compared with Fig. 3 it is evident that there is an obvious upward shift in the position of the hotspot. This indicates that the most frequently occurring conditions over the course of a year are not necessarily the most energetic, and that the sea states highlighted in Fig.4 are in fact more favourable for the capture of power.

Generally WECS are not able to operate efficiently in all the wave conditions they will experience and must be tuned to achieve optimal performance across a limited range of sea states. As my research has shown, two significant clusters of sea states exist at a site: the most frequently occurring conditions and the most energy rich, with the latter group proving to be the most significant if maximum power capture is desirable. These findings should assist the designers of WECS in deciding on the sea states in which their device should achieve optimum performance in and in selecting the most favourable locations for deploying their wave farms.

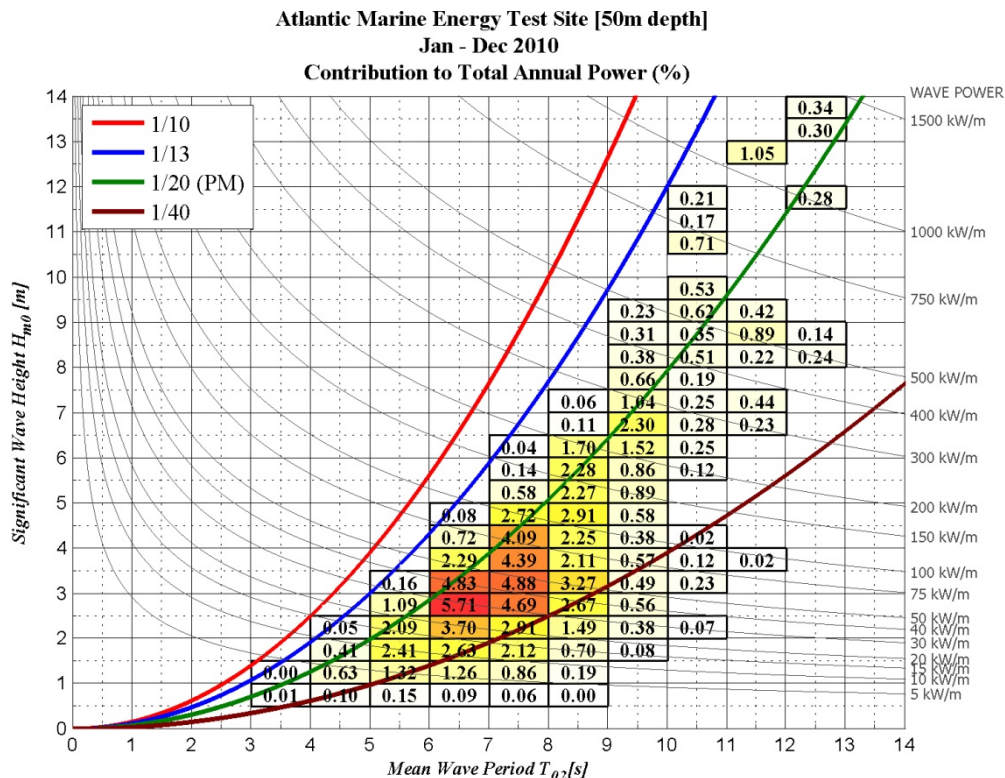


Figure 4: Sea State contribution to total annual energy (%) scatter plot for Atlantic Marine Energy Test Site for 2010

### Conclusion

This paper has described the wave data processing and analysis techniques that are being developed as part of this Ph.D. project in order to characterise the wave energy resource off the Irish coast. It has been demonstrated that the most prevalent wave conditions experienced at a typical exposed ocean location are not the most energy rich when observed over the course of a year. Future research will focus on quantifying the level of variability that exists in the wave energy resource at various sites and will build on these results to propose a methodology which will allow WEC developers to select the most appropriate deployment locations and wave conditions for their particular devices.

The author wishes to thank Dr. Tony Lewis for his supervision and assistance and the Irish Research Council for Science, Engineering and Technology (IRCSET) for funding this research.

# What CLASS are you in? A study of social class, school choice and identity

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We do not go to bed in single pairs; even if we choose not to refer to them, we still drag there with us the cultural impedimenta of our social class, our parents lives, our bank balances, our sexual and emotional expectations, our whole biographies / all the bits and pieces of our unique existences.” (Angela Carter, *The Magic Toyshop*)

## Welcome to my world

My PhD investigates schools and communities as places constructed by ideas of social class, school choice, identity and comparisons between people as worthy and unworthy, deserving and undeserving. This thesis contributes to the social justice genre of social science research where equal educational opportunities are seen as an essential ingredient in a just society. I explore the tension between what may be termed here, for the purposes of clarity, the middle-class and the working-class in the context of an Irish urban second level school with DEIS status. DEIS stands for Delivering Equality of Opportunity in Schools and it is the designation given to schools where a significant proportion of students are from working-class backgrounds. One adult participant in this study informed me that “social class didn’t exist in Ireland, that it was an English thing”. You may make your own mind up but not before you ask some important questions:

Does everybody get the same opportunities to be educated?

Does school choice contribute to the creation of middle-class and working-class schools?

Do we make assumptions about people because of the school they attend(ed)?

How are our identities formed in terms of social class, positioning and schooling?

My PhD questions the social, cultural and political world of school choice and student identity. Issues of social class, inequality, stratification and identity frame the life-world of the study. I examine how the schools that we go to and the choices that are (un)available to us are intrinsically linked to issues of social class and contribute to our performance of identity.

At the core of this research is a zeal for transformative action in terms of the provision of equality of opportunity in educational settings. The intention is to open up critical



spaces where we can ask questions regarding equality and social class in an Irish education context.

## **Researching people and culture**

Ethnography is a research field concerned with researching people and culture. My research is essentially a study of the social, cultural and political spaces of our school experiences and the complex (and classed) identities that are formed out of our constant interactions with people, place and space.

This ethnography undertook an in-depth analysis of one school community as a case study of school choice and identity formation. The school community is understood to be the inside world of the school and the outside world of the community and society. The people within and about this community create the interactions and moments of identity construction in a lived and living way.

This research provided a forum for the voices of those marginalised (knowingly and unknowingly) through classed positioning. I also hope that the opening up of discussion around the area of school choice, identity, privilege and difference will prove transformative for participants from marginalised places. It may open up realisations of inequality and inspire those on the margins to take control of their futures.

## **The methods of cultural exploration**

This study strives for an inside view of life-worlds through participation, observation and interview. This ethnography involved semi-structured interviews with thirty second level students, ten parents and ten teachers from the chosen research setting of Portown Community School. These interviews generated the data along with hundreds of hours of researcher participation and observation in the school and the community.

As this research develops, it also becomes clear that the macro-world of policy, legislation and societal structures has a significant influence on the world of the school and the micro-world of the person. Therefore, this study focuses on telling the stories of students from a marginalised community, with unequal opportunities, who are often wrongly dismissed as incapable or undeserving. I also focus on how the world of the individual is inextricably wound and bound by the political and social landscapes of our world.

## Findings

The data in this study has been generated over a two-year period and the following key themes are emerging as significant.

**Authentic and mystified worlds:** The study reveals that there is a significant chasm between people's lived experience of working-class spaces and the mystified views of them as dangerous, violent and undeserving places. Many of the participants recalled stories of where mention of their place and school immediately created a distance between themselves and others. For instance, one student recalled how "when they ask you where you're from and you say Portown they think you're a scumbag and then they go 'what school do you go to?' And you say Portown then they think you're slow." Such instances are moments of what Beverley Skeggs describes as *inscription*, where another assumes a position of superiority, morally and intellectually, because of place and social class. These mystified worlds were often displaced by authentic world experiences where students presented powerful moments of resistance and success in the face of adverse positioning.

**Unwriting social class:** There is a body of research heralding the "death of class" as a mode of social interrogation. This study contends that social class is definitely not dead but it may well have been bound in invisible cloth in an attempt to erase its uncomfortable appearance in contemporary political discussion. This study includes a critical analysis of legislation and educational policy documents that relate to equality as an issue in education and finds that social class has indeed been erased or omitted from many of them. It may have found suitably sanitised terms in "disadvantage", "social exclusion", "social inclusion" and "socio-economic status" that often serve to de-script social class from politics and society. This is important; in order to negotiate equality of opportunity and equality of condition for people, it is important that foundational issues such as social class inequality are recognised. For some people, that which is not written ceases to exist. Social class may be an uncomfortable topic for some people to address, but it is also a very necessary one.

**Class differences and the myth of equal opportunities:** This theme embodies the public delusion that we are all individuals who are given the same opportunities in life and that it is almost entirely our own fault when we fail to succeed. The data reveals powerful misconceptions regarding the nature of our lived world and that the same opportunities are not available to everyone. The data suggests that we are not all treated equally, that schools, families, people and places do afford and constrain educational opportunity. My interactions with participants around the topic of school choice were particularly constructive in this regard. As analysis progresses, it is emerging that students from working-class spaces do not have the same choices and opportunities as their middle-class counterparts, and that any discussion of equality needs to be tempered by the reality of the life-world of students from working-class backgrounds.

**Persisting and resisting inscriptions:** Many participants in this study showed critical self-awareness of how they were and are being positioned by social class and the inscriptions of others, and others did not. However, all people are constantly undertaking a process of self-authoring where issues such as social class and the positions imposed by self and others are significant. Therefore, on a psychosocial level, this study delves into the nuanced world of how others see us and how we see ourselves. Social class and relational positioning emerge as central spaces of self-authoring. Social class features on every level of the identity work being performed by participants. It is enmeshed throughout all of us in conscious and subconscious ways. Many of the participants resist negative inscriptions and consciously produce themselves as successful and ambitious role models for their communities; others disengage from their life-worlds and re-figure themselves.

**Denials of place:** Some participants in this study were locked in a denial of place and space. One such participant, who has lived fifteen of his seventeen years in Portown felt that none of the names or associations of the place applied to him as he had been born in another town about thirty miles away. This is a denial, an act of re-figuring the self. This identity work points to actions where participants decouple themselves from the social class baggage of family, peers, school and community. Therefore, some participants tended to speak of themselves as different, “not from here”, and as outsiders. Such actions function to position self and others in a relational field that often does nothing more than reproduce stereotypical inscriptions and create further difficulties for those being positioned as the working-class other. The idea of escape figures prominently in the data. It contributes to notions of a deficit culture; where the working-class are not considered equal in educational terms because of what they lack. This idea of deficit often ignores the effect of society, positioning and wealth on people’s educational opportunities. Such instances narrate the working-class school and place as badges of shame that need to be hidden and eradicated from one’s social identity. Such actions may inscribe the individual as socially mobile and yet they also create this disruptive notion of deficit where the culture being left behind is unfairly labelled as flawed and devalued.

## Conclusion

The themes that are outlined above are only partly representative of the breadth and depth of the data in this study. Let it suffice to say that the worlds of identity and social class enmeshed within education, society and the community unearth powerful messages about our place in the world and the interlocking and situated nature of experience and action. From a national policy point of view we may consider examining the make-up of our schools and communities in order to develop more equitable structures for our young people. Our curricula may need to be revisited in terms of their cultural relevance to various groupings in our society. Our national policies should carry the weight of their discursive

convictions and actively work towards, not against, equality of educational opportunity.

We are all complicit actors in our world and the responsibility for fostering equality lies with each of us as an individual and in our socially and politically negotiated actions. Privilege is real. Inequality is real. Act. Speak. Write. Level the playing field. Opportunity is for everyone.

Kevin Cahill is a third year PhD student under the supervision of Professor Kathy Hall. Thank you to my supportive supervisor and also to her colleagues on the Cohort PhD in Education team.

# Help-seeking behaviour for chronic pain

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'Pain is inevitable, suffering is optional' Author unknown

## Introduction

Many people with Chronic Pain do not seek help from healthcare professionals; in some cases, they are suffering severe daily pain. Others have sought help initially but failed to return if their pain prescription ran out or treatment was ineffective. There is also a cohort of people who delay seeking help until their pain becomes intolerable. Untreated Chronic Pain can lead to increased disability, increased risk of fall, depression, sleep deprivation, reduced quality of life, social isolation and impact significantly on co-existing diseases. It is therefore pertinent to ask the following questions; why do some people suffer in silence? Why do people fall off the help-seeking path? Why is help-seeking delayed? Although these may be key questions to consider, it would be as prudent to ask what factors influence prompt help-seeking behaviour. The answers to the latter question may provide valuable information on model behaviour which could be adopted by others. Against this background this research aims to develop and deepen understanding of the factors (barrier and facilitators) influencing help-seeking behaviour for the treatment of Chronic Pain.

## What is Chronic Pain?

Everyone has experienced physical pain. Humans and animals alike rely on pain signals to tell them that something is wrong or warn of impending danger. As a result, pain can be described as extremely useful. However, when pain no longer serves a useful purpose and extends beyond 3 months it is defined as Chronic Pain, with some experts calling for it to be classified as a disease in its own right and not merely a symptom of a disease.

The prevalence of Chronic Pain is staggering, and it is estimated that 1 in 4 people in Europe are living in and with Chronic Pain. The cause of Chronic Pain can vary from malignancy and degenerative disease to trauma or surgery. However, in a significant proportion of people the reason for its existence remains unknown. Certain types of Chronic Pain emanate from acute pain, and during the transition from acute to chronic, known as

the sub-acute phase, opportunities exist to prevent the occurrence of Chronic Pain. However, this involves prompt help-seeking from the patients' perspective and appropriate pain management from the healthcare professional. Failing this combination of events, the person moves into a phase where pain is chronic. Living with Chronic Pain causes changes to the central nervous system and treatment of such pain is complex and magnified if pain has been endured for a significant period of time. Therefore, the message is clear, early intervention equals better long-term outcomes.

## **Why do people seek help from a healthcare professional for chronic pain?**

There is substantial evidence demonstrating that clinical factors such as pain severity and disability influence help-seeking behaviour. However, during the initial stages of this research, which involved exploring the literature and conducting interviews with 25 people with Chronic Pain, preliminary results identified additional factors. These factors are as follows.

Individuals who believe that pain in later life is normal or something that should be expected are more likely to either delay seeking help or not seek help at all, choosing instead to suffer in silence. The expectation of pain in older age is evident throughout the literature. Most of the qualitative studies on this topic conclude that attributing the cause of pain to aging can account for patient delay in seeking treatment.

Expectations are developed by people prior to engaging in a behaviour, often influencing the person to behave in a particular way. People who believe that a certain behaviour will result in a positive outcome are likely to engage in that behaviour; conversely people with low expectations are less likely to engage. Expectations are shaped from past experience and other social-cognitive factors. Within the context of seeking help for Chronic Pain, poor expectations have been described as a barrier to help-seeking. In other words, individuals may not attend their doctor because they expect no positive outcome and are resigned to the fact that nothing can be done to treat their pain.

It is realistic to assume that if a person thinks they will be stigmatized or negatively labeled as a 'liar', a 'complainer' or 'hypochondriac' when they ask for help; they will avoid asking for help. This is particularly true for people with Chronic Pain if no cause or source of the pain is identified through X-rays or MRI's. People in this situation begin to doubt the existence of the sensations that they are experiencing and as a result conceal their pain from others, thereby hampering future help-seeking from healthcare professionals. As one person commented during interview;

'you feel like a fraud, doubt starts to set in, God am I only imaging this... you actually feel like you're going bonkers... that it really is all in your head'

The word 'help' can reflect a state of vulnerability; something which is traditionally not associated with masculinity. Researchers have explored the relationship between men and help-seeking, concluding that masculinity may have a negative impact on seeking help. In other words men do not want to be labeled as 'weak' by asking for help particularly for pain conditions. Other work has demonstrated that females are more likely to be vocal about their pain and displayed more help-seeking behaviours than males.

Stoic attitudes such as, 'I should hide my pain from others', or 'I must be courageous in the face of pain', can seriously impact on the communication of pain to healthcare professionals. Research conducted in nursing homes found that stoic attitudes were the most frequently cited reason for not seeking treatment.

Research conducted to date has found that, if an individual has a negative encounter with a healthcare professional regarding their pain, they are less likely to seek help in the future. Further research has demonstrated that if a negative help-seeking experience occurs initially when the condition is mild, the person is deterred from future help-seeking even if pain worsens. In fact, there is evidence to suggest that people disengage with medical care due to previous negative encounters, resorting to over-the-counter remedies and the use of alternative therapies. One person interviewed for this research stated;

'I had a bad experience, your past experience will stop you from seeking help in the future'

Being motivated towards finding a cure or a treatment that will reduce the pain is described as having a positive effect on help-seeking behaviour. Some people are afraid of not being believed but those who believe in what they are experiencing are more likely to seek help. An interviewee pointed out that it was her instinct and self-belief that got her the help she needed.

While having self-motivation and belief is one thing, the encouragement and support of others has been described as something that often prompts action, particularly if the person is going through a phase of contemplation. Some people in the interviews described the support from others as a factor which enabled them to seek help.

Understanding Chronic Pain and the importance of seeking help during the early stages of the disease can lead to prompt help-seeking. Very often, those who delay are unaware that their pain can be treated successfully. Knowledge of treatment options and the awareness of specialist pain clinics can also influence those who have disengaged to re-enter the treatment cycle.

## **Progressing this research**

The factors presented above together with additional variables have informed the development of a questionnaire which is underpinned by a theory of human behaviour. No

instrument of this nature exists; thus, to date, definitive conclusions regarding the relationship between actual help-seeking behaviour and influencing factors have yet to be established. The newly developed questionnaire is currently undergoing pilot testing and review by experts to ensure that the content of the questionnaire is valid. In the coming weeks, the questionnaire will be distributed to a large national sample of people with Chronic Pain. This will allow for the significance and influence of each factor to be measured. Data generated will also demonstrate that the questionnaire is reliable and robust, thus strengthening its potential for subsequent use by other researchers.

## **Conclusion**

The help-seeking process is complex and involves a great amount of self-awareness, support from others, positive attitudes and determination. Treatments for Chronic Pain are improving and healthcare professionals are becoming more knowledgeable about the disease. However, it is essential that we understand the factors influencing a person's decision to seek help, to prevent people from suffering in silence or falling off the path to recovery; thus, the importance of this research. It is envisaged that the results will provide information on the most salient modifiable variables leading to help-seeking for Chronic Pain. In the future, this research will provide data for the development of a nurse-led intervention to reduce the barriers to help-seeking and enhance the facilitators leading to appropriate treatment.

Thanks to my supervisor Professor Geraldine McCarthy and Co-supervisor Josephine Hegarty, School of Nursing and Midwifery, UCC and colleagues for their continued support. I also wish to acknowledge the people who participated in the interviews and future participants of this research for their contribution.



# Can legal frameworks for disaster response be improved?

**Dug Cubie**

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... when the occasion arises, every Nation should give its aid to further the advancement of other Nations and save them from disaster and ruin, so far as it can do so without running too great a risk ... If a Nation is suffering from famine, all those who have provisions to spare should assist in its need ... To give assistance in such dire straits is so instinctive an act of humanity that hardly any civilised Nation is to be found which would refuse absolutely to do so.

Emer de Vattel, *The Law of Nations* (1758)

## Introduction



Figure 1: A woman injured in the 2004 Indian Ocean Tsunami being brought to an ICRC field hospital (ICRD: Thierry Gassmann)

We are all familiar with images of search and rescue teams, medics, and engineers arriving to help after a disaster, such as following the March 2011 Japanese earthquake and tsunami or the massive floods in Pakistan in July 2010.

In recognition of the devastating impact natural or human-made disasters can have on individuals and communities, an estimated US \$7 billion was spent globally in 2008 on emergency assistance including food, shelter and medical care. The mere words “Pompeii”, “Krakatoa” or “Chernobyl” conjure up scenes of death and destruction. So how can lawyers assist in disaster responses?

Cynics may say that things always get more complicated when lawyers become involved. Rules, regulations and red tape — surely all of these legal tools only delay vital life saving assistance? Yet legal practitioners at a national and international level are increasingly aware that we have a lot to contribute to ensure that humanitarian assistance is delivered efficiently and effectively to people severely affected by natural or human-made disasters. My research examines the evolving international legal mechanisms to facilitate the delivery of humanitarian assistance following disasters. Drawing on international humanitarian, refugee and human rights law, there is increasing discussion of a “right to humanitarian assistance”. Yet rights that are not enforceable are at best aspirational, so my research will determine whether such a right actually exists and what it might mean in practice.

## **Legal frameworks to facilitate responses to disasters**

National legal rules surrounding the relaxation of import duties for relief goods or work visas for international humanitarian staff are just two examples that can have an immediate and positive impact on the actual delivery of aid to victims of disasters. Furthermore, risk reduction and prevention measures such as building codes and urban planning can ensure that the negative impacts of a disaster are diminished from the outset. For a country’s national emergency response services, such preventative measures are crucial, including ensuring that legal frameworks for disaster mitigation and response are in place prior to a disaster occurring. Despite the severe nuclear emergency and extensive loss of life and damage caused by the 2011 Japanese earthquake and tsunami, the level of destruction would have been much worse if Japan had not learnt the lessons of the 1996 Kobe earthquake and developed a comprehensive disaster prevention and management regime.

On the other hand, Hurricane Katrina in the US highlighted that even advanced systems of disaster response can be overwhelmed – either by the scale of a disaster or by poor planning and implementation of the response. Therefore, there is a need for international systems to ensure that the global community of States and humanitarian agencies can respond effectively and appropriately when a Government is unable or unwilling to provide the necessary humanitarian assistance to its own citizens.

## **International responses to disasters**

International human rights law already obliges States to protect a range of rights which are equally applicable in the event of disasters, such as the rights to life, health, and an adequate standard of living. Furthermore, the International Red Cross Movement and many other humanitarian agencies consider there is an additional right to both offer and receive



Figure 2: A fleet of Norwegian M6 trucks delivering relief supplies after the 2004 Indian Ocean Tsunami (IFRC: Raqai Yani)

humanitarian assistance. It follows that humanitarian agencies have a corresponding duty to provide support to disaster victims and those vulnerable to future disasters.

Two contrasting approaches can be taken to improve the delivery of humanitarian assistance. A technical and operational approach addresses potential barriers for delivery of aid such as import duties and visas. Alternatively, a rights-based approach focuses on the entitlement of individual victims to an acceptable level of services post-disaster and the enforceability of these rights.

The approach taken goes to the heart of the potential tension that can exist following a major natural or human-made disaster; do individual rights take precedence over State sovereignty, or does a Government have a right to assert the non-interference in the domestic affairs of a sovereign State? While this may appear to be an academic discussion, in May 2008 Cyclone Nargis killed at least 138,000 people and affected over 2.4 million in Myanmar. The ruling junta in Myanmar was extremely reluctant to allow Western aid agencies to access the victims of the cyclone, despite reports that the national response was simply unable to cope with the scale of the disaster. For the first time, some Governments raised the prospect of military intervention to provide humanitarian assistance to the victims of a natural disaster and UK, US and French warships loaded with humanitarian supplies moved into position off the coast of Myanmar. Ultimately, diplomatic and humanitarian pressure ensured that limited aid was provided to the victims without the need for military action, but this aid arrived weeks after the event and in much lower quantities than could have been provided.

In the mid-1990s, the Sudanese academic and diplomat Francis Deng advanced the concept of “sovereignty as responsibility” to highlight the duties that Governments have towards people displaced from their homes as a result of war, human rights abuses or nat-

ural disasters. This formative development subsequently led the UN and world leaders to endorse the Responsibility to Protect doctrine in 2005, thereby establishing a global legal responsibility to ensure that war crimes, genocide, ethnic cleansing and crimes against humanity are tackled decisively. While the original concept of sovereignty as responsibility encompassed Governments' duties in a broad range of settings where human rights may be abused, legal obligations under the Responsibility to Protect doctrine only apply to specific international crimes such as war crimes and genocide. However, the delayed response to Cyclone Nargis raised an as-yet unanswered question. Should States have a similar Responsibility to Protect their citizens, and the international community a corresponding responsibility to intervene, to prevent suffering caused by natural or human-made disasters?

Moreover, it is not just in situations where a Government is unwilling to facilitate an international response that the rights and responsibilities of humanitarian actors are at issue. The 2004 Indian Ocean Tsunami affected 14 countries, as diverse as Indonesia, The Maldives and Somalia. The extent of the disaster, and the remoteness of many locations affected, severely stretched both national and international capacities to provide effective assistance to all those in need. Similarly, the Haitian earthquake of January 2010 effectively destroyed the national response capacity as up to a quarter of all State workers were killed or injured and large parts of the national infrastructure were destroyed. It was therefore unrealistic to expect the Haitian authorities to provide the extent of humanitarian assistance required without international support. Yet the deployment of the US military to support the emergency operation was controversial. As a former US colony, the arrival of US troops was criticised internally in Haiti, and countries such as Cuba and Venezuela claimed the US response was an imperialist occupation under the guise of humanitarian assistance.

## Future threats and debates

With the potential for increased frequency and severity of meteorological disasters resulting from global climate change, and the expanding number and range of organisations responding to disasters, the regulation of international humanitarian assistance is increasingly receiving attention from international institutions. For example, the EU *Consensus on Humanitarian Aid* was adopted in December 2007, and Irish Aid's *Humanitarian Relief Policy* was published in May 2009. Most notably, the UN International Law Commission proposed an examination of the rights and responsibilities surrounding disasters in 2006. As a result, over the past few years, Governments have been debating the *Protection of Persons in the Event of Disasters*. While this process is still in the early stages, it may lead to a legally binding international convention which Governments around the world would be expected to adhere to.

However, it is not yet clear whether binding international law is the most effective mechanism to ensure that individuals affected by disasters receive the assistance and protection they require. There already exist a range of non-legal normative standards such as the International Red Cross Movement's *Code of Conduct in Disaster Relief* and the Sphere Project's *Humanitarian Charter and Minimum Standards in Humanitarian Response*. Would non-binding minimum standards or guidelines be more flexible and appropriate in the complex aftermath of a major disaster, and would Governments be more willing to support such non-legal measures rather than being constrained by new international legal obligations?

## Conclusion

My research addresses broad conceptual notions of State sovereignty and individual rights, as well as the creation and elaboration of new norms in international law, by examining the contentious fault lines that currently exist in the development of international legal frameworks for disaster response. The interplay between sovereignty and rights, technical and rights-based approaches, and binding and non-binding rules all impact on the effective delivery of humanitarian assistance. Having worked in refugee protection and humanitarian assistance for the UN, Red Cross and NGOs for more than 10 years, my research is firmly grounded in the practical application of international rules. By examining the balance required between the competing interests of affected and donor States, Governmental and non-Governmental agencies, and humanitarian workers and individuals affected, my research will put forward clear rules and principles to improve the delivery of humanitarian actions.

As the international community debates new disaster response mechanisms, there is great potential for lawyers to contribute to the protection of victims of natural and human-made disasters. However, lawyers need to make sure that our involvement in humanitarian assistance and disaster response is appropriate, and actually benefits those most affected. The spectre of increased bureaucracy and delays due to legal uncertainty or complications is not going to assist people in the aftermath of a disaster. The practical application of legal rules have shown their value in Japan, but as a rich developed nation Japan had limited need for direct international assistance. Responding to a disaster where there is limited capacity at a national level, as seen following the Haiti earthquake, requires a different level of engagement by the international community. By extension, international lawyers need to ensure that legal frameworks in place minimise any practical barriers to the delivery of humanitarian assistance; while at the same time ensuring that individual rights are upheld and providing legal clarity for the actions of State and non-State actors.

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# Seeing the wood for the trees: land-use legacies in native woodland

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## Introduction

Native deciduous woodland in Ireland covers less than 2 % of the entire country. The scarcity of this national resource means that all remaining native woodland is of great conservation importance. However, any attempt to restore and preserve existing native woodland must consider all factors that contribute to its current status and condition. These include features such as climate, elevation, soil, threats from invasive species (non-native plant and animal species that adversely affect the habitats they occupy), as well as current and future management practices. However, one key factor that is often overlooked is the former history of the woodland, not only in recent decades, but also over the past few centuries. Unlike many other habitats (such as lakes, rocky shores, or rivers), historical management can have major impacts on current woodland structure and functioning; for instance, it can promote the survival of certain plant and animal species over others, and it can also alter environmental conditions (such as nutrient availability, hydrology, and soil structure). This work aims to gain a greater understanding of the effects of past land-use on various aspects of present-day native deciduous woodland in Ireland.

## Woodland history

Almost all woodlands, even those of natural origin, have experienced some form of management or disturbance event in the past. Indeed, human activities have had an enormous effect on much of the current wooded area in western Europe and eastern North America for many hundreds and even thousands of years. Woodlands have been traditionally used for a wide variety of purposes; they were frequently used to coppice wood for timber, to graze cattle and pigs, and as a supply of food, fuel and herbs. However, undoubtedly the most severe human impact on woodlands was the removal of trees and conversion to agricultural land.

In Ireland, the first significant woodland clearances occurred during the Neolithic period, nearly 6000 years ago, and have continued throughout history to the present-day. Although trees and woodland-associated plants and animals will readily re-colonise cleared

areas, these past disturbances have greatly affected the existing species composition and age structure of many existing woodlands. In addition, the complex history of Irish woodlands means that current woods are now often a result of several phases of deforestation and reforestation; consequently, even sections within an individual wood can have contrasting land-use histories. An assessment of the past history and management of Irish woodlands is therefore crucial to inform future management decisions. However, the importance of land-use history is only now beginning to be recognised. Consequently, the objective of this research is to explicitly investigate the impacts of land-use legacies on present-day plant and animal ecology, as well as woodland structure and functioning.

The continuous and widespread influence of humans on woodlands means that all “primary woodland”, i.e., natural woodland which arose after the end of the last Ice Age and has never been significantly influenced by people, has long been lost. However, despite the extensive effects of human activities, two main types of woodland can still be discerned, based on their land-use history. “Ancient woodlands” are those that have been continuously wooded since at least the time of the oldest available historical data, while “secondary woodlands” are those that have established on former agricultural land after that date. In Ireland, this threshold date is acknowledged to be 1660, which corresponds to the time during which the Down Survey maps were produced. While these maps were created to facilitate the confiscation of land following the Cromwellian invasion, they also represent the first accurate depiction of woodlands in Ireland.

## Study site

A recent inventory of woodland in Ireland found that only 123 individual stands (groups of trees) of ancient woodland still remain throughout the entire country. Most of these woodlands are poorly studied; often the only information available is a cursory description of their plant communities. Because of the rarity of these sites, our study centred on just a single ancient woodland, the Gearagh in County Cork (N 51°52'09“, W 9°01'00”). While the core of this woodland can be classified as “ancient”, parts of the outer sections are of secondary origin. A multi-disciplinary approach was used to compare the origin, development, and ecological functioning of these ancient and secondary areas; detailed investigations were carried out into the history, geography, soil properties (including types of seed present), vegetation composition, and soil and ground-dwelling invertebrate communities of the sites. As the areas of woodland of different age lie adjacent to each other, and are subject to the same climatic and environmental conditions, any differences between the sites can be attributed to their contrasting land-use histories.

The continued existence of the Gearagh as woodland, rather than pastureland, is due partly to its geographical setting, and also due to land-ownership boundaries. The core of the Gearagh is composed of a series of wooded islands along a 7 km anastomosing stretch

(rivers with multiple, interconnected, coexisting channels with stable, vegetated islands) of the river Lee, near Macroom. In the past, these wooded islands were protected from exploitation by the surrounding network of river channels. Such anastomosing river systems are a notable feature of rivers in this part of south-west Ireland. For instance, similar woodlands once existed on the river Bandon near Dunmanway, and on the river Bride to the west of Cork city. A historical account describes how the latter was cleared and drained during the early 1700s as part of a land improvement scheme. While attempts were also made to drain and straighten the river Lee along the Gearagh, these improvements proved much more difficult to maintain and were ultimately abandoned.

It is with the first Ordnance Survey map from 1842 that detailed features of the Gearagh can be seen for the first time. This map clearly shows the areas that had been cleared for agriculture, which have now re-established as secondary woodland and other areas which have remained as woodland to the present day. The cleared and wooded areas corresponded to land-ownership boundaries. Extensive relict flood protection walls are still to be seen in the previously cleared land, indicative of the cost and effort needed to maintain grazing land along the river. Evidently, the owner of the land that was not cleared had little interest in investing in such work. The ancient woodland area therefore remained relatively undisturbed and survived throughout this period of intensive modification of the Irish landscape.

## **Main findings**

The results of this research show that removal of the tree canopy and conversion of the land to pasture during the 1800s had many direct and indirect impacts on the ecology of the secondary woodland area (see Fig. 1). Soil surveys were carried out in the ancient and secondary woodland, with a view to determining the effect of past agriculture on nutrient availability and cycling within the woodland. The study shows that the ancient woodland contains a remarkably undisturbed soil, confirming the lack of human impact in this site. The soil is of a uniformly deep dark brown colour and is extremely well-drained, corresponding to a so-called “typical brown earth” soil, which developed naturally in woodland since the end of the last Ice Age. On the other hand, the soil of the secondary woodland site is denser and of a lighter colour. The historical removal of the tree canopy increased the amount of water percolating through the soil; this downward movement of water also carried various nutrients with it, depositing them at greater depths in the soil, beyond the reach of most plant roots. Farmers therefore had to apply organic fertilisers and lime in order to maintain the fertility of the soil. Indeed, liming was common in the late 1800s, and high amounts of calcium were recorded in parts of the secondary woodland in the Gearagh.

While the same tree species were found in both the ancient and secondary sites, the com-



Feature	Ancient woodland	Secondary woodland
Tree species	Hazel Oak Holly Birch Hawthorn	Hazel Hawthorn Birch Oak Ash
Ground vegetation	Ivy Wild garlic Honeysuckle Meadowsweet Bramble	Ivy Wood anemone Meadowsweet Wild garlic Lesser celandine
Soil properties	Acid brown earth 0.47 g/cm bulk density 5.01 pH	Brown podzolic 0.61 g/cm bulk density 4.62 pH
Soil invertebrates	<180 earthworms per m <sup>2</sup> >450 enchytraeids per m <sup>2</sup> 40 % decomposition	>300 earthworms per m <sup>2</sup> <230 enchytraeids per m <sup>2</sup> 60 % decomposition
Seeds in the soil	Soft rush Foxglove Trailing St. John's-wort Wood sedge Birch	Soft rush Wood sedge Remote sedge Jointed rush Gorse

Figure 1: Summary of the main differences between the ancient and secondary woodland areas of the Gearagh.

community distribution and species composition of the ground vegetation layer differed considerably between the two areas. The changes in the soil structure as a result of past land-use created a more poorly drained soil in the secondary sites. This is reflected by an increase in moisture-tolerant species in the secondary site compared with the ancient woodland. Seeds associated with typical grassland species were also found in the secondary site, but were less abundant in the ancient woodland.

The alteration of soil and environmental conditions as a result of historical agricultural use also appears to have had a major influence on soil and ground-dwelling invertebrates in the Gearagh. For instance, conversion to agriculture encouraged the proliferation of

large lumbricid earthworms at the expense of smaller enchytraeid potworms, which are far more abundant in the ancient woodland. The soil microbial community also differs considerably between the sites. In addition, these changes appear to have greatly affected processes such as leaf litter decomposition and nutrient cycling, which have important consequences for ecosystem functioning. Very little is known about the biodiversity and functioning of these ancient woodland soils, as they are extremely rare in western Europe.

## **Conclusion**

It is clear that the structure and function of Irish woodlands can be substantially altered by past human activities, and that these land-use legacies can persist for hundreds of years after woodland re-establishes. Although the above-ground vegetation of ancient and secondary woodland sites appears superficially similar, the sites actually differ significantly in a number of ways. This research highlights the importance of changes in soil conditions as a result of past land-use, and the effect that this can have on both the below-ground and above-ground communities. Detailed historical information is therefore vital for the successful conservation and restoration of our remaining woodlands.

Aileen Cudmore is a student in the School of Biological, Earth and Environmental Sciences, under the supervision of Dr. Simon Harrison and Professor Peter Jones. The author would like to acknowledge the Irish Research Council for Science, Engineering and Technology (IRCSET) for funding this research.

# Immersion: the key to a good gaming experience

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## Immersion and games

The first ever reference to games in history, a description of the origin of games by a figure from the 5th Century BC, Herodotus, appears alongside the first mention of immersion. Herodotus told a story about the King of the Ancient Lydians who was said to have invented games. The King was faced with a dilemma when he found that a famine had hit his land and he did not have enough food to feed his people; however, he came up with a very interesting solution. The King decided that his citizens would be allowed to eat during the first day, and for the second day they would become so deeply involved, *immersed*, in dice games, that they would forget about being hungry and would not need to eat, and this pattern would continue, with the people playing games instead of eating every second day. By this method, the King's people survived the famine, or so the story goes.

“Immersion” can be described as a state of being deeply engaged or involved in an activity, although when mentioned in the context of gaming, the immersive response is a much richer concept. While the concept of immersion is significant for games, applications of immersion can also be seen in many different areas. Certain types of educational settings use immersion as part of their teaching methods, particularly in teaching languages. When students are sent to the Irish-speaking Gaeltacht or to French speaking areas for a period of time and instructed to speak only the language of the area, this is an example of immersion learning. Immersion takes place in more ordinary classroom based settings also, where teachers refuse to speak the student's native language, and will instead only communicate through the language that the students are attempting to learn.

Immersion has also had applications in acting, as certain actors use the technique of Method Acting to “get into character” and try to think or feel as the character would, in order to give a very lifelike and realistic performance. Alternatively, on the other side of the screen, viewers of a film or television show can get very immersed in the action on the screen, as can be seen, for example, in an instance where you feel as if you're on the edge of your seat, anxious and full of suspense while you watch a particularly tense scene in a psychological thriller.

Although immersion has many applications in areas such as education, acting, reading books or watching television and films, immersion and gaming have been intertwined since their first mention in history. Currently, I am carrying out research in the area of immersion and games, with the end goal of creating a questionnaire which will measure the strength of immersion as encountered by the player in a given gaming experience.

## **Immersion and the gaming community**

Today, it is nigh impossible to imagine our lives without the existence of the internet. Over 1.7 billion people worldwide now have access to the World Wide Web. Internet access has become widespread, and the ways in which an individual can go online are increasing, especially with the introduction of Smart Phones and Tablets for internet use. Online gaming is currently one of the most popular forms of internet-based entertainment, involving millions of people each day. To give a sense of scale: 12 million individuals play one of the most popular of these online games, *World of Warcraft*, and that is merely one particular game within one genre of games, just a single example of the huge variety of games available today. Gaming is a multi-billion dollar industry.

Recently, immersion has become very popular within the gaming community and, therefore, the gaming industry. It has been found that immersion is one of the major motivations for players to choose a game, often being portrayed as “key to a good gaming experience”. As a result, immersion has become a very important word for games developers. In the gaming industry, developers often characterise their games as being “immersive” as the act of advertising a new game in this manner results in great games sales and huge profits. The strange thing about this is that many games developers do not actually understand what immersion is, and they have no way of measuring how immersive their new game is, yet they continue to tell the public how immersive their games are, and often end up selling millions of copies of their products as a result.

## **Measuring immersion**

Many have attempted to define immersion, yet none of these definitions have yet been widely accepted. Similarly, a few individuals have put forward measures of immersion, or theories about the different strengths of immersion that can be experienced by those who play games, yet none of these have been accepted as the definitive word on immersion. The development of a scale of levels of involvement is still at an early stage, but the area is attracting more interest in recent times, given the importance now placed on immersion by games developers.

Despite huge interest in the area, that concept of immersion has proved very difficult to

pin down and measure. My research has a two main aims. Firstly, the research aims to analyse the experience of immersion from the point of view of the player of a game. Secondly, the research aims to develop a questionnaire which will measure the quality and degree of immersion as experienced by the player in a given occasion of gaming. The first aim of this research has been completed.

Initially, I asked open ended questions on an online discussion forum (RPG.Net) in order to investigate the experience of immersion. The users of this forum are generally involved with a variety of types of games, from traditional table-top games to modern online computer games and everything in between. When I first posted the questions, I included the description of immersion by Coomans and Timmermans as the “feeling of being deeply engaged where people enter a make-believe world as if it is real.” Thirty eight individuals responded, and they talked at length about their experiences of immersion, the importance of these experiences for them, the reasons that they had become immersed and the reasons that they were involved in playing games. As well as this, there was an interesting outcome which was quite unexpected: some of those who responded began a heated debate about the description of immersion that had been posted, and discuss their beliefs about how immersion *should* be defined and what it means to them!

Two interesting items emerged from the analysis of these discussions. As anticipated, a definition of immersion as it pertains specifically to gamers emerged, which will be useful in discussing immersion with specific reference to games. This definition describes immersion as a subjective state of intense involvement in an imaginary setting, where an individual may either identify with or adopt a character or a setting (or both). If the individual identifies with a character they may adopt some, or all, of the character’s attributes. If an individual identifies with a setting some or all of the demands of the setting become the attentional focus. An immersive response can vary in strength and duration, at its most extreme, causing loss of a sense of self or reality and feeling as if one is the character or is “in” the setting.

Alongside this definition, a new classification of immersion as containing two separate *types* of immersion also emerged.

The first type of immersion, termed Cognitive Immersion, is frequently seen in the context of fantasy games, but also often occurs in watching a film or reading a book. This is the type of immersion that is most often associated with Role-Playing Games, and this can be seen in the media’s depiction. In the portrayal of Role-Playing Games in popular media, game players are regularly depicted as being entirely immersed within a Role-Playing Game. That is, the individuals become involved in a Role-Playing Game and for the remainder of the action, the onscreen scene cuts ‘into’ the game, where the players are depicted dressed as their game characters and existing purely in the imaginary world of the game. This type of immersion occurs when an individual becomes deeply involved in a fantasy world in which they may adopt the feelings, thoughts and mannerisms of a

character, communicate in-character with the other characters in this world, and forget themselves and the real world. Occasionally, the character can even appear to take on a life of its own, and the player of a game can forget their real world surroundings for a short period of time.

The second type of immersion, Visceral Immersion, relates to the sensation of being immersed in the adrenaline of a situation, where the individual feels a rush of adrenaline and gets caught-up-in-the-action. In this type of immersion, the individual is not necessarily absorbed in a character or role-playing to any extent, but they become immersed in the action of the game, the strategising or tactics, and are swept away by this rather than being swept away by the world or the characters. Again, they have the possibility of becoming immersed such that they can forget what is going on around them. An example of this may be in the first scene of a horror film where an unknown victim splits off from her friends and walks into a dark room alone: often this type of scene causes people to shout warnings at the screen even though they realise that the serial killer's first victim cannot possibly hear them and heed the warning. This type of immersion can also be seen in shooting games where the player's health points are dropping rapidly and they feel a rush of adrenaline as they attempt to survive and find their enemy, or in an action film where a generic hero abseils down the face of a building as his nemesis tries to cut the rope before he safely reaches the ground. This immersion can also happen in slightly calmer settings, such as when an expert chess player may become completely absorbed in the game and planning their next moves, such that they forget the world around them.

As part of this ongoing research, a review of studies has been conducted in the area of individual differences in game players, including information related to demographics, personality and identity. In the media, and in the general population, there is a stereotype of a gamer as being young, male, intelligent yet anti-social "nerds". In fact, very little evidence has been found to show that there is any difference between the general population and gamers in any of these respects. Interestingly, minimal evidence has been found to exist for the link between video games and violent behaviour, despite the vast media interest in this area. This paper suggests that the general stereotype of gamers does not hold credit.

Noirin Curran is a PhD candidate in the School of Applied Psychology and is a member of the People and Technology Research Group. The author wishes to thank her supervisor Dr. Jurek Kirakowski, School of Applied Psychology, University College Cork.

## Suggested Reading

Curran, Noirin. *Stereotypes and Individual Differences in Role-Playing Games*. International Journal of Role-Playing, 2. 2011. <URL: <http://www.marinkacopier.nl/ijrp/wp-content/issue2/IJRPissue2-Article4.pdf>>

# 'Moral shielding: A grounded theory of moral integrity maintenance within multidisciplinary teams'

**Rick Deady**

School of Nursing and Midwifery, UCC

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## **Introduction**

On a daily basis, many health care practitioners find themselves in situations where their original aspirations to be a caring and good professional are challenged. Imagine a nurse working within a war zone where she is required, due to limited resources, to make a decision as to which of two injured soldier should have lifesaving surgery first. This is known as triage. Having made her decision, she discovers that the second soldier has died in the meantime. She knew that the right decision was for both soldiers to receive the surgery; however, the circumstances prevented this. The emotional aftermath of such a situation has been reported to lead to a debilitating condition known as 'moral distress,' where the victim feels immense guilt, shame and even anger for not acting in a manner that maintains their sense of moral integrity. Fortunately, few professionals have to make such definitive life-saving decisions. Nevertheless, many clinical decisions require some degree of commitment to adhere to the 'right' moral course of action, and in so doing many professionals draw on their own personal and professional beliefs and values in order to arrive at a decision with which their conscience is agreeable. However, current policies and directives within the health care arena dictate that such decisions should be multidisciplinary, drawing on many diverse perspectives that are influenced by personal and discipline specific values and beliefs. Nevertheless, professionals do not always agree on what constitutes a good clinical decision. In essence, the decision-making process becomes a democratic/consensus approach. So, what happens to the practitioner who does not agree with the consensus decision of the multidisciplinary team?

## **Background**

The concept of moral distress (knowing the right thing to do but not acting) is a relatively new phenomenon under investigation within the health services, and has attracted much attention from a variety of disciplines, e.g., nursing, medicine, pharmacy, psychology and social work. Earlier studies have concentrated on situations of high intensity, such as the

triage event above. Others have included perinatal and critical care. The majority of these studies have taken a discipline-specific approach, e.g., nurses, doctors, pharmacists etc., in their attempt to describe the properties of moral distress. Recent studies, however, have demonstrated that moral distress can also occur in less high intensity and critical environs, as well as suggesting a multidisciplinary element within the process involved in its development.

In particular, disciplines practicing within acute psychiatric environments have shown the presence of moral distress and highlighted the complex processes involved in its development. However, not all practitioners develop moral distress as a result of being involved in the same clinical decision-making process. Whilst the process of moral distress has received some considerable attention, there has been little focus on why some practitioners do not develop it. This study has identified the process of 'moral shielding' as a potential mechanism for protecting the individual's sense of moral integrity when working within a multidisciplinary environment, in the absence of moral distress.

## Method

In order to avoid replication of previous studies on moral distress, I adopted a grounded theory methodology. This approach requires me to enter the field of study anew, and immerse myself in the environment under investigation, in this way, I interviewed and observed practitioners in their natural environment and gained an understanding of the problems that they encounter and how they resolve them. Each interview and observation was processed as if it is a micro study. After each session I postulated a theory as to what was happening and this theory was then tested at the next interview or observation. This process continued until the evolving theory was proven at each subsequent interview, thus grounding the theory in the real world. For example, if the practice of ducking a blow is observed in all candidates being struck, then 'ducking' becomes the process of avoiding being hit. However, if some candidates swerve to avoid the blow, then 'ducking and swerving' becomes the process and the question then becomes why some duck and some swerve, hence the need to interview. In this way, the substantive theory (initial theory based on the current data collected) of moral shielding was developed. To see if this theory exists elsewhere in the world, I will be undertaking a review of the current literature associated with this area; this is the current position of the investigation.

The current findings were arrived at by interviewing thirty two practitioners involved in multidisciplinary teams within the mental health services, together with, numerous observations at clinical group meetings and projects. Moral shielding is the process of thinking and feeling in a manner that shields the self from critical commentary in order to preserve one's sense of being a person of integrity. This internal construct is externally projected in behaviours that portray the individual as a moral practitioner; this mechanism



includes the practises of moral abdication, moral hinting, moral gauging and pseudo-compliance. These practices are contingent upon the individual's ability to recognise a condition as morally wrong and the significance of that event.

It was found that, due to individual standards and discipline specific perspectives, practitioners within the same environment may not necessarily view or recognise the same situation as problematic. For example, practitioners often disagreed on the degree of risk involved in discharging a client. In addition, whilst practitioners may recognise a risk exists, unless it had potential to cause serious harm, they may not act.

Choosing not to act was premised on a number of other factors, one of which was 'moral ownership'. If it was possible to relinquish all ownership of a problem then this action was taken (primary abdication). Here, the practitioner makes the decision that the problem belongs to another and, as such, they are excused any moral implications for not acting. If, however, they are unable to relinquish all moral ownership, they may choose to share it (secondary abdication). In this instance, the practitioner demonstrates that they are not wholly responsible and that others are also implicated and have a responsibility, thus sharing burden. Practitioners who suffered moral distress were found to have taken full responsibility for the event. To cause extreme anguish for the practitioner, however the event needed to be significant, e.g., a client committing suicide due to the practitioner's inaction (tertiary abdication). Therefore, relinquishing or sharing a moral burden shields practitioners from personal responsibility and potential criticism.

Practitioners working in an environment where it was felt that open and genuine dialogue was not encouraged or in which they felt vulnerable to having their views attacked were inclined to practice moral hinting. There were wide variations in moral hinting, from subtle enquiries to conference presentations, but the more common approaches involved making an enquiry in order to gain an insight upon another's opinion, e.g., 'how do you feel about', 'would it be ok to', 'so you are happy if we'. Moral hinting allowed the practitioner to 'test the water' of opinion, rather than making a definitive stance that signalled their own moral position. Making an overt stance on a perceived wrong (speaking your mind) was viewed as professionally risky and potentially dangerous for future relationships within the multidisciplinary team. Moral hinting shields the individual from such attacks and allows them to gauge the moral climate.

Gauging the moral climate of the multidisciplinary team was seen as a necessary strategy in order to make decisions on how to act in situations of disagreement. If a practitioner morally hinted as to their position but perceived that they were being ignored (morally shunned) they would retreat from the decision-making process. During this retreat, they would continue to gauge the moral climate of the multidisciplinary team for open and genuine dialogue that would allow them to share and discuss their concerns. Moral gauging also allows the practitioner to monitor any deterioration in the situation that may signal their need to act due to the event becoming potentially significant.

Not engaging in multidisciplinary team decision-making processes could be considered unprofessional, and so in order to avoid this accusation practitioners acted in a way that suggested that they were in agreement with decisions whilst at the same time, disagreeing internally (pseudo-compliance), and when the opportunity allowed (out of the sight of other practitioners) they practiced in their preferred manner. Long-term pseudo-compliance has the potential to develop a clinical environment for moral stagnation where significant clinical problems remain unresolved and stagnant.

## Conclusion

It is hoped that the outcome of this study will be a valuable resource to professional groups wishing to achieve genuine multidisciplinary practice that aids in good clinical decision-making. By understanding the processes involved in moral shielding, practitioners will gain an insight into their own practice and the practice of other disciplines, as well as, recognising the need to be sensitive to the values and beliefs of fellow colleagues.

In this regard, it is clear that practitioners have demonstrated within the study their need to be heard in clinically challenging situations, as otherwise they will engage in practices to maintain their own personal integrity that are not necessarily beneficial to good multidisciplinary decision-making or client care. Due to factors outside of the practitioner's control, such as power inequality and multiple disciplinary perspectives, the health care arena may not necessarily be the optimal environment for the discussion of clinically challenging situations. It is, perhaps, an opportune time to consider the need for an ethics ombudsman where staff can seek advice and support for their views in a supportive and non-threatening environment that removes their personal responsibility for resolving the situation. In this way, attacks on personal belief systems are removed and practitioners can avoid developing moral distress through abdication of part of their moral ownership to another in a more constructive mechanism that has the potential to resolve the clinical problem.

Rick Deady is a College Lecturer within the Catherine McAuley School of Nursing and Midwifery and a part-time Doctoral Student. His main areas of interest are Psychiatric Nursing, Multidisciplinary Practice and Forensic Psychiatry. I would like to acknowledge the support and guidance of my supervisors Dr. Tom Andrews and Dr. Joan McCarthy in the production of this work.

# The role of copper in the Electronics Industry as an interconnecting agent

**Gangotri Dey**

Tyndall National Institute

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**Mendeleev to Periodic table:** “Dear PT, according to you, which is the most boring element of them all?”

**PT:** “My Lord, Maybe copper?”

**Mendeleev:** “Why do you say this?”

**PT:** “It gets very boring for me. Unlike the other transition elements, for example iron, nickel, cobalt, which show magnetism, copper has no choice but to settle with one spin. Such monotony in spin makes it quite boring, I think.”

**Mendeleev:-** “Do you understand the beauty of copper? Do you know that it could change the modern electronics industry?”

**PT:** “No, never thought of that.”

**Mendeleev:** “Then listen to me carefully.

During the 1960’s, Gordon Moore predicted that, in the electronics industry, the number of components that could be assembled within one integrated circuit (IC) would increase exponentially over time, and thus also the size of a fully operational IC would be reduced. Indeed, this turned out to be true in the last few decades and is expected to remain valid in the near future.

For the wiring/interconnection among the components of the ICs, a good conducting material is needed. Aluminium has been playing its role for decades. However, it is well known that copper is of better quality in terms of conductivity and resistance. If copper could replace aluminium, then it would require less space for wiring in the IC’s as well as increase its efficiency.”

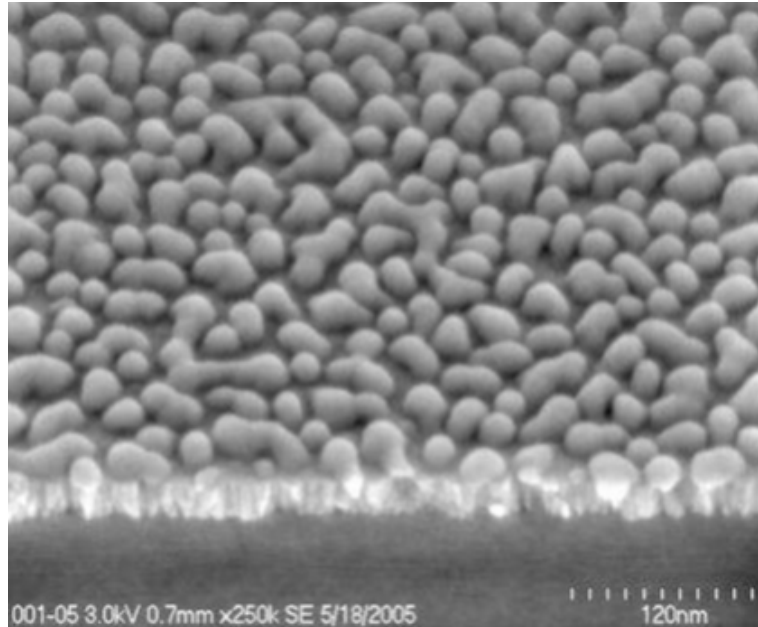


Figure 1: Experimentally observed Nucleation of Copper

**PT:** “Then what is the problem? I am eager to see a computer about the size of your thumb.”

**Mendeleev:** “Nothing comes easy in this world. Copper follows its own chemistry regardless of whether it is located within an IC. Fellow copper atoms tend to clump together with each other and prevent the formation of a single smooth layer of copper on the surface of the semiconductor used inside the IC’s. Instead they form islands (Fig 1) consisting of few copper atoms and the height of the islands exceeds the desired thickness of an operational conducting layer. Thus, it cannot be used as a base layer for the deposition of copper. In addition, copper is poisonous to silicon as it prevents silicon from displaying its own physical and chemical properties. Moreover, there is also very poor adhesion of copper to the silicon surface.”

**PT:** “Is there no solution to this?”

**Mendeleev :-** “Scientists have tried to find a suitable glue layer like tantalum, tantalum nitride, or ruthenium to which copper can bind strongly. But, so far, the surfaces have been found to be costly and not efficient enough to be used in a large scale production and are yet to be used by multinational semiconductor companies like Intel or IBM.”

**PT:** “But where do you need this copper layer?”

**Mendeleev:** “ Let me explain it to you through the schematic illustration of an interconnect as depicted in Figure 2, the whole orange portion is that of copper. It is the cross section of an interconnect. We need the copper layer over there. In order to deposit the copper very finely, we need to pass electricity. But before doing that we need a thin layer of copper which should already be present before passing the electricity to facilitate the

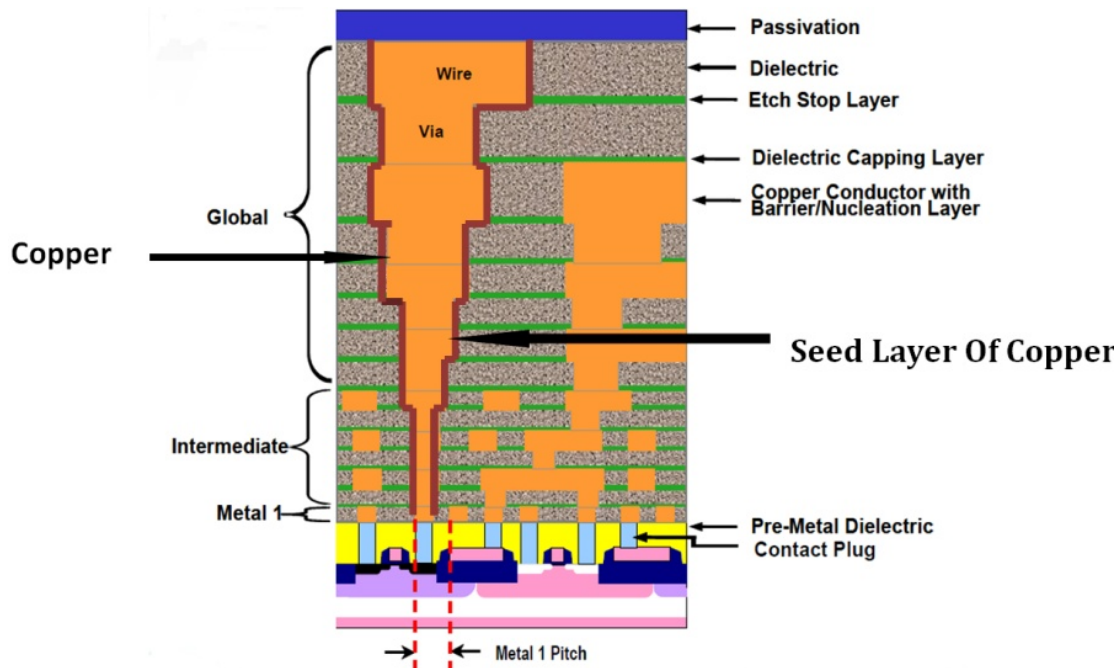


Figure 2: Schematic illustration of intersection of an Interconnect. (The orange colour the picture depicts copper)

deposition of the metal. That thin layer is known as the Seed Layer.”

Semiconductor Industry Association. The International Technology Roadmap for Semiconductors, 2009 Edition. International SEMATECH:Austin, TX, 2009

**PT:** “How thick should the copper layer be and can it be controlled?”

**Mendeleev:** “The copper layer should be around 2 nm thick, or one hundredth the thickness of my hair. Such extremely thin layers can be precisely deposited for other materials by a method known as “Atomic Layer Deposition” (ALD). This method was discovered in Russia and was independently discovered again in Finland in 1970s. The ALD method works like a chemical switch, which can go on and off to build up the layers. In this way, we can get layers as thin as possible. ALD has already been extensively used in the semiconductor industry for the deposition of high-permittivity materials. There is also a big demand of this technique in many other fields.”

**PT:** “Can ALD be used for the deposition of copper?”

**Mendeleev:** “Yes, it can be, if a proper precursor molecule is found which has good attachment to the surface and also produces inactive by-products. The precursor molecule should also be cheap and usable for large scale production in the industry. If a good precursor is found which has those good qualities, it has the capability to change the face of the semiconductor world.”

**PT:** “Where is the solution to this problem?”

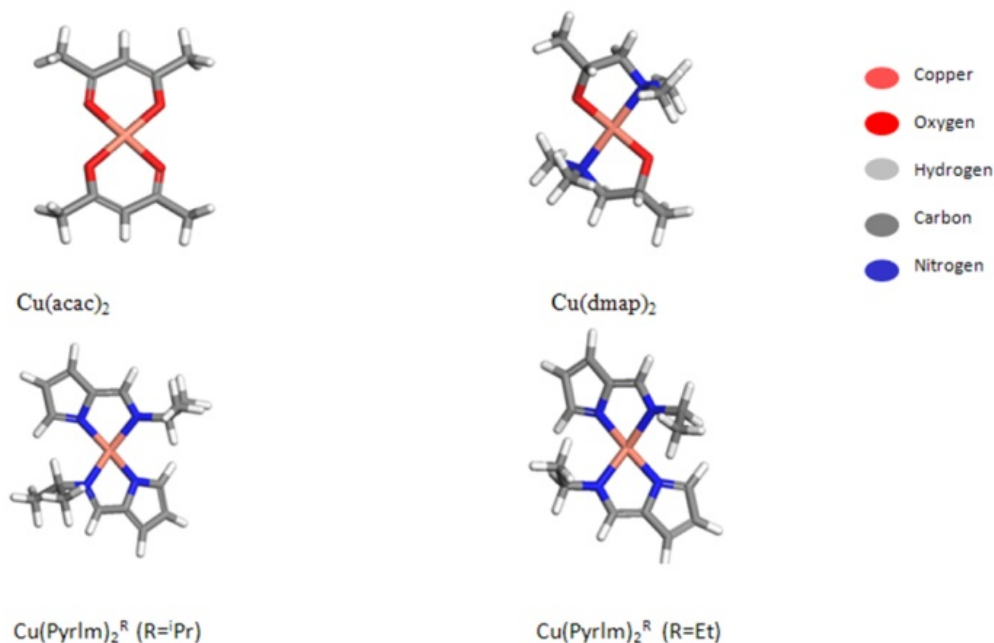


Figure 3: Some Common copper precursors

**Mendeleev:** “Many research groups are seeking for a way to deposit copper in thin films. One in particular is the “ALDesign” project running in Tyndall National Institute which is basically addressing this problem through computer calculations using various improved softwares. The scientists are looking at the chemical properties from the atomic level. A systematic study of the chemical properties of copper precursors and their reaction mechanism with the various reducing agents like hydrogen, alcohols, etc gives an idea of what could be a better pathway for the formation of thin films of copper to be used as a seed layer. In addition, they are also looking at some unconventional reducing agents in this field, like some organometallic reagents. We can hope that the problem will be solved soon to let the electronic industry boom.”

**PT:** “I have to say that copper seems to be very interesting and is not as mundane and boring as appeared to me before.”

**Mendeleev:** “Tapan Gupta has written a good book stating these problems. Have a look at this book if you like. Copper Interconnect Technology (Publisher- Springer ISBN 978-1-4419-0075-3)”.

I would like to thank my supervisor Dr. Simon Elliott from Tyndall National Institute for the necessary corrections., Dr. Biswajit Santra of Fritz-Haber-Institut der MPG (Berlin) for important suggestions, Science Foundation Ireland for the funding of my PhD grant number 09.IN1.I2628, ITRS and Intel USA for the permission of the pictures.

# Inflammatory bowel disease: a beast of burden

**Dawn Farrell**

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## Introduction

Imagine having to empty your bowel eight or ten times a day and experiencing constant panic and fear about the location of toilet facilities. Imagine experiencing constant tiredness that impacts on all aspects of your life including work, family and social life. These are just two examples of experiences commonly suffered by individuals with a condition called inflammatory bowel disease. These people are burdened with symptoms which impact on their daily lives. This research aims to provide healthcare professionals with an understanding of the extent to which individuals with inflammatory bowel disease experience symptom burden and to identify what symptoms are most problematic.

## Background

Crohn's disease and ulcerative colitis collectively termed as inflammatory bowel disease are complex disorders. In the United Kingdom, collectively Crohn's disease and ulcerative colitis affects approximately one person in every 250 of the population. Ulcerative colitis affects up to 120,000 people in the UK, or every 1 in 500 people. On the other hand, Crohn's disease affects up to 60,000 people, or 1 in 1,000 people. The prevalence and incidence of inflammatory bowel disease in Ireland remains unknown, although it is estimated to affect approximately 25,000 people. The cause of inflammatory bowel disease is unclear. Science suggest that it is as a result of an immune reaction of the body against its own intestinal tissue. Presentation of the illness can occur at any age; however, typical onset occurs in the third to fourth decade of life. Men and women tend to suffer equally.

Inflammatory bowel disease is characterised by unpredictable periods of active and inactive disease states. The cardinal symptoms experienced by individuals with inflammatory bowel disease include diarrhoea, abdominal pain, weight loss and rectal bleed, particularly during periods of active disease. It is also now known that individuals with Crohn's disease and ulcerative colitis continue to experience a number of other symptoms during periods of apparent disease inactivity. For example, individuals report experiencing fatigue, abdominal cramping, loss of appetite and bloating. Research has shown that many

individuals also experience psychological symptoms such as fear, anxiety and worry associated with their condition. The occurrence and duration of relapsing and remitting episodes and the frequency and severity of symptoms experienced over the course of the illnesses can vary from individual to individual. Moreover, individuals with inflammatory bowel disease are often treated with potent drug therapies, including steroids, which can additionally result in many undesired side-effects. These side-effects, coupled with the debilitating nature of the disease, can potentially impose significant symptom burden, thus limiting quality of life and functional status.

## **What is symptom burden?**

Symptom burden is a distinct concept in symptom experience that takes into account the physiological and psychological functioning of the individual. It is a subjective, dynamic concept that is, it is the patient's own perception of a constantly changing experience. Symptom burden is quantifiable, in that it is a composite or combined measure of symptom severity, frequency and distress felt by individuals as a result of symptoms.

In summary, symptoms experienced by individuals with inflammatory bowel disease have the potential to impose significant symptom burden. However, a review of the literature highlights a paucity of research surrounding this concept in individuals with inflammatory bowel disease. Therefore, the aim of this research is to explore the symptom burden experiences of individuals with inflammatory bowel disease. Two open-ended questions on a measure administered as part of the first phase of a larger two-phased study were used.

## **Symptom burden experiences of individuals with inflammatory bowel disease**

Individuals with inflammatory bowel disease experience a substantial number of symptoms over the course of their illness which may contribute to symptom burden. Preliminary results from this research identified specific symptoms of greatest burden and the consequential reasons for this from a sample of 185 participants.

### **Symptoms of greatest burden**

Each participant was asked to identify the three most burdensome symptoms experienced on a daily basis. A range of one to three symptoms were reported by each of the 185 participants. A total of 50 different symptoms were identified by participants as the most burdensome symptoms experienced, including both physical and psychological symptoms. Of



the participants who reported their three most burdensome symptoms (185 respondents), the most commonly reported were lack of energy or fatigue (73 respondents), pain (72 respondents), of which 13 participants specifically reported joint pain (13 respondents) and diarrhoea (65 respondents). A number of individuals communicated bowel urgency (43 respondents) and the constant need to go to the toilet or bowel frequency (26 respondents) as most burdensome. Abdominal/stomach cramps (34 respondents), bloating (n = 18 respondents), passing wind/flatulence (15 respondents), lack of appetite (10 respondents), sleep disturbances (9 respondents) and rectal bleeding (9 respondents) were also demonstrated as contributing to significant symptom burden. Although less prevalent, psychological symptoms such as worrying, fear, feeling irritable, nervousness, depression, anxiety, and 'emotional problems' were detailed among the most burdensome experienced.

### **Reasons why symptoms are burdensome**

The reasons why symptoms caused the greatest burden was explored and a number of explanations were provided by participants.

#### **Limits social activity**

Diarrhoea, bowel urgency and bowel frequency were commonly described as limiting social activity and thus augmenting the burden associated with the symptom. Individuals presented their social life as "non existent", "terrible", and "restrictive". Their reluctance to socialize was often attributed to the constant need to be near a toilet due to bowel frequency and urgency. Participants have to continually plan their day ahead so that they would be aware of the nearest toilet facility at all times. As a result, feelings of nervousness, worry, fear and panic were associated with leaving home and being in strange places. Additionally, participation in physical activity and sports was restricted or impossible due to the debilitating effect of fatigue.

#### **Negatively impacts on working life**

Pain and lack of energy was described as affecting the working life of individuals, particularly self-employed individuals or those who worked long hours or had physical jobs. In particular, lack of energy caused difficulties at work such as motivational issues and often resulted in absenteeism from work. Tiredness was depicted as a constant struggle with regard to work.

### **Negatively impacts on family life**

Impact on family life was also evident from the participants' responses, in particular from the burden related to lack of energy. Parents who experience burdensome symptoms expressed difficulties in caring for their children and an inability to enjoy family life. One mother reported lack of energy leaving her

“feeling as if I’m only a burden on my family and they’d be better off without me”

### **Diet restriction**

Diet was another struggle for individuals with inflammatory bowel disease as often pain and diarrhoea is experienced following eating, thus contributing to the burden associated with these symptoms. Lack of appetite and mouth ulcers often meant individuals were unable to enjoy their food. Restrictions on diet were imposed as a result.

### **Attributed to other symptoms**

Individuals felt that symptoms were often interrelated and experiencing a number of debilitating symptoms concurrently resulted in greater symptom burden. One participant stated:

“Abdominal pain, diarrhoea and emotional problems are interconnected. Pain and diarrhoea go hand in hand leading to you feeling down”

This comment depicted the effects of physical symptoms on the psychological state of individuals. For example, individuals experiencing passing blood in their stool reported feeling frightened. Bowel urgency and incontinence were associated with worry and anxiety. Pain, due to its difficulty to manage, was reported to substantially impact on one's mood. Lack of sleep was reported to lead to feeling irritable and cranky. Bloating impacted on self-esteem and body image. Embarrassment was one of the most commonly reported psychological reason why symptoms contribute to burden. Stomach gurgling, flatulence, bowel urgency, diarrhoea, foul smelling bowel motion, rash and sweating were all described as embarrassing, thus contributing to greater burden.

Likewise, psychological symptoms appeared to be linked with physical symptoms. Stress and worry were reported to cause diarrhoea and lack of appetite. One participant stated that:

“anxiety causes the flare ups of Crohn's”

Overall, reports by individuals participating in this research expressed that symptoms wear away at them and slowed them down in their day to day life, thus amplifying the symptom burden experience. Individuals expressed that they lacked control over their lives and felt

that symptoms “had a hold on their life” resulting in them not being able to live their lives as they wish.

## **Conclusion**

In conclusion, the findings thus far have illustrated a substantial number of symptoms that individuals consider burdensome. The complex impact of these burdensome symptoms offers insight into the reasons contributing to symptom burden. This knowledge will help healthcare professionals to be more sensitive to individual’s needs and assist supporting them in managing their symptoms. A goal of care for all healthcare professionals is to prevent suffering and improve quality of life, thus highlighting the importance of this research.

Moreover, these findings will support the findings from the first phase of my PhD study, which quantitatively measures the level of symptom burden experienced by individuals with inflammatory bowel disease. Additionally, these findings will inform the second phase of the study which will qualitatively explore the self-management strategies used to control such burdensome symptoms. It is anticipated that this research will provide data for the future development of nurse-led interventions aimed at reducing the symptom burden experienced and improve self-management strategies.

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# Justifying Jihad: US politics, propaganda and the Afghan Mujahedeen, 1979-1989

Jacqueline Fitzgibbon

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‘I believe that our public diplomacy represents a powerful force, perhaps the most powerful force at our disposal, for shaping the history of the world.’ (Ronald Reagan)

## Introduction

The Afghan resistance to the Soviet occupation began in 1979 and culminated in the withdrawal of Soviet forces a decade later and was, many believe, instrumental in the disintegration of the Soviet Union shortly after. The administration of President Ronald Reagan (1981-1989), many influential members of Congress and vocal right-wing groups, wholeheartedly supported the anti-government and anti-Soviet resistance efforts of the Afghan *mujahedeen*. These insurgents were recast as ‘freedom fighters’ and supplied with military hardware, training and economic aid by the US, Pakistan, China, Iran and Saudi Arabia. Furthermore, the Reagan administration undertook a major public diplomacy programme to promote this view of the *mujahedeen* to justify American support and ensure that the rest of the world, including Afghans, saw the rebels in the same light. In the 1990s, some of these former ‘freedom fighters’ used the skills they learned during this period in Afghanistan to create a deadly terrorist organisation, al Qaeda, which carried out the ultimate ‘propaganda of the deed’ the destruction of New York’s famed Twin Towers on 11th September 2001.

## Public diplomacy and propaganda in US Foreign Policy

As the aftermath of World War Two segued into the beginning of the Cold War, former allies and now emergent superpowers, the US and USSR, were soon locked in a competition for dominance in the international system. Direct military confrontation would lead to nuclear annihilation and so winning ‘hearts and minds’, the psychological battle for the ideological allegiance of the world’s peoples, became a major focus of US foreign policy. Public diplomacy and propaganda, as well as psychological operations and rhetoric, were now considered vital instruments in the pursuit of US foreign policy aims. US administrations framed the public presentation of foreign policy decisions with references to the political and cultural ideals of the United States of America, such as self-determination,

liberty and democracy. As America's past and present were perceived to be rooted in these values, it was axiomatic that its foreign policy would seek to propagate them.

The Truman Administration's (1945-1953) foreign policy doctrine called on Americans to support 'free peoples who are resisting subjugation' in Greece with substantial military and economic aid. Although these 'free people' were defending the repressive Greek monarchy they were also opposing communism and, therefore in the administration's view, containing Soviet influence. 'Freedom' was reduced to a concept — the antithesis of communism — rather than a reflection of the internal political conditions in Greece.

President Eisenhower (in office from 1953 to 1961) considered the 'P-factor' (psychological factor) of vital importance to US foreign policy, and established, in 1953, the United States Information Agency (USIA), the Public Diplomacy agency of the US government. However, he warned that 'audiences would be more receptive to the American message if they were kept from identifying it as propaganda'. The US was reluctant to associate its official information and communication activities with the term propaganda. This was partly due to the term's perceived negative connotations and partly because of America's inherent sense of exceptionalism: the US belief that it is unique amongst nations, an exemplar for others, and that its values were, and are, universal. As a result, the term propaganda was avoided by the US in describing its dialogue with foreign publics or its use of information as a military tactic. Instead, words such as public diplomacy, psychological operations and information warfare, which some consider to be merely euphemisms for propaganda, were popularised. In any event, during the Cold War, successive US administrations sought to manage public perceptions and information in the pursuit of foreign policy goals.

President Reagan, a former actor and an engaging orator, was a keen advocate of public diplomacy. Soon after taking office, President Reagan wrote that his administration was 'determined to stop losing the propaganda war'. One of the administration's main foreign policy strategies, the Reagan Doctrine, sought to 'rollback' communism by backing right-wing anti-communist insurgents whose political agendas were often extremist and reactionary. The strategy focussed on Third World, peripheral states such as Afghanistan, Nicaragua, Angola and Cambodia. To help achieve these aims, the USIA was strengthened and re-invigorated under the Reagan Administration to initiate a 'new war of ideas and values against communism'. The people of Afghanistan would become entangled in this ideological battle.

## **Public diplomacy and Afghanistan**

The administration engaged in public diplomacy in a large scale, coherent manner both within South Central Asia and back in the 'West' to create 'freedom fighters' from rebels regardless of their extremist views, questionable human rights records or involvement in

drug smuggling. To this end various members of the administration used public diplomacy to build support for the doctrine. The USIA instructed the Voice of America, the agency's broadcasting arm, not to use the terms 'rebels' or 'anti-government guerrillas' to describe the Afghan *mujahedeen* but rather 'patriots', 'nationalists' or 'freedom fighters' which have more positive associations. The necessity of creating support for the doctrine (and those it supported) within the domestic sphere was one of the 'lessons' drawn from the effects of negative US media coverage of the Vietnam War which the administration took to heart.

The USIA was involved on a number of levels in creating and managing public diplomacy/propaganda in relation to Afghanistan, and a special task force on Afghanistan was formed to keep the war in the public consciousness. The agency set up the Afghan Media Project to train *mujahedeen* as journalists, photographers and video-cameramen in Peshawar, on the Pakistan/Afghanistan border, to report from inside Afghanistan and distribute this 'news' worldwide. The agency also organised conferences, presentations by academics, Voice of America broadcasts on the war, situation reports, briefings to journalists and documentaries on Afghanistan.

The stance of the American media was generally supportive reflecting the administration's (and Congress') position. In a 1984, editorial the *Washington Post* stated 'The fight for freedom in Afghanistan is an awesome spectacle and deserves generous tribute', while in 1986 the *Los Angeles Times* offered this judgement 'The Afghan guerrillas have earned the admiration of the American people for their courageous struggle...The rebels deserve unstinting American political support, and within the limits of prudence, military hardware'. Whether the media based their reporting on independent investigation or were influenced by information filtered through official channels will be investigated during the course of my research.

## The archives

My dissertation focuses on investigating the public diplomacy/propaganda campaign of the Reagan Administration, the efforts of some members of Congress to aid the *mujahedeen* and the strategies of conservative groups and think-tanks to influence policy towards Afghanistan. This will require research at the Reagan Presidential Library in California. The archives there contain fifty million pages of documents relating to the Reagan presidency, 1.6 million photographs and tens of thousands of audio and video tapes so careful planning to pinpoint what I need will be required before I visit or I may never re-emerge!

I also intend to investigate the Afghan programmes of the USIA, to assess their impact on public perception and discourse surrounding the conflict in Afghanistan. This will necessitate a visit to Washington, where the agency's archives are located. Whilst there, I will also pay a visit to the Library of Congress on Capitol Hill, which is the largest library in

the world. An examination of the congressional record, congressional hearings and public statements of members of Congress will establish how successful the legislature was in shaping the public debate on aid to the *mujahedeen* and in affecting administration policies. In addition, my dissertation will assess the influence of the 'New Right' conservative groups and think-tanks, many of which were avidly pro-*mujahedeen*, on the Administration, Congress and on public discourse through analysis of reports and papers issued by these organisations seeking to influence policy. Unearthing this information may be less straightforward, as some of these are private rather than public institutions and so their archives may not be readily available to researchers.

## Conclusion

This research should illuminate why the Reagan Administration, various members of Congress and other private advocacy groups and think-tanks sought to characterise their support of the *mujahedeen* as synonymous with support for abiding US political and cultural ideals, and the extent to which public diplomacy and propaganda were utilised to this end. It will also seek to explain why the US media and public so readily accepted this narrative. It will also endeavour to establish how successful this public diplomacy exercise was in influencing the media and shaping public opinion and what impact it ultimately had on the course of the war in Afghanistan. While this research focuses on the Reagan Administration and Afghanistan in the 1980s, it is of continuing relevance, as the US is still a major world power seeking to actively influence international events by using both hard (military or economic) and soft (public diplomacy) power. While US public diplomacy offers 'universal' ideals as a guide for conduct in international affairs, US foreign policy often only seeks to ensure their application when in the American national interest. President Obama vocally supported rebels in Libya seeking to overthrow US nemesis Muammar Gaddafi but remained silent when revolutionaries with similar democratic aspirations were crushed, with Saudi military aid (a US ally), in Bahrain (a US ally). Such selectivity serves to highlight the relevance of exploring and detailing public diplomacy as a tool of foreign policy in today's world.

Jacqueline Fitzgibbon is a first-year PhD student in the School of History under the supervision of Professor David Ryan.

# **Student voice in Irish post-primary schools: is the challenge too challenging?**

**Domnall Fleming**

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## **Introduction**

All of us, as students, attended school and sat in classrooms for long periods. We listened (most of the time!), we absorbed, we learned, we sat and passed examinations (hopefully!), but we were largely silent participants in the whole classroom process. Yes, we answered and asked questions about what we were learning and responded to our teachers and classmates but, did anyone in our schools ever ask us what we thought about how we were being taught or whether and how we were learning? Did anyone ever ask us for our opinions on our schools or the classrooms in which we sat for all of that time? The answer is often a resounding no.

There is no tradition in Irish schools to ask, consult or discuss with students their views on their school, their classroom, their teachers, their learning or their experience in this very important and formative period of their lives. The challenge for schools therefore is why not engage with student voice?

## **What is student voice?**

Student voice, as a term, can be explained at a number of levels. It is, at its most basic level, engaging the student in dialogue, discussion and communication in the classroom about the topics that they are learning. This can be seen in normal classroom interactions between the teacher and students as questioning, discussion, brainstorming, debating and presenting. This voice provides the teacher with an insight into how students are progressing and also provides for an active and engaging classroom.

At a deeper level, student voice also means 'having a say'. In this case, student voice refers to consultation and dialogue about experiences in the classroom and in the school as a whole. Students are asked and given the opportunity to express an opinion relating to their school and classroom experience. This student voice provides the teacher and the school with the students' perspectives and these could be used to understand and improve the school. In both of these situations, however, the student voice is largely directed and controlled by teachers. Students are asked or invited to 'have a say'.



At an even deeper level, student voice is a process where students and teachers work together continually to research, examine and analyse what happens in schools and classrooms. This deeper process involves working together to co-construct learning and teaching in the classroom and students' experience of the school as a whole. This has the potential to transform the school and the classroom as it combines all the voices involved.

As we all know from our school days, our relationship with our teachers is vitally important to our learning and progress through school. Student voice can only exist when there are positive and open relationships between students and teachers. Some could argue though, that if students have a voice or a say that this will challenge the traditional power and authority of the teacher and therefore upset this relationship. Research shows that student voice enhances relationships at classroom and school level. Students respect their teachers because of the dialogue, communication and consultation that reflect student voice.

Student councils can be viewed as one element of student voice. They exist in most Irish post-primary schools and, as set out in the Education Act (1998) are structured to *'promote the interests of the school and the involvement of students in the affairs of the school'*. Research suggests that representative student councils do involve students in the affairs of the school but, at a level that concerns issues like school uniform, the quality of food and facilities in the school, and the quality of the school environment. Student councils, as they currently exist, do not provide a forum for a deeper student voice to develop in schools.

## **My research design**

This study uses qualitative and quantitative methods to research whether student voice in our post-primary schools can improve engagement, participation and learning. Three case-study schools from the voluntary secondary and vocational sectors were used in the research. Within these schools, the student councils were researched using observation, interviews and questionnaires. In parallel, nine teachers used student voice strategies in their classrooms with eighteen class groups across a range of subjects over a school year. All the students in these class groups completed questionnaires at both the beginning and end of the study period. Seventy students were interviewed in focus groups. The nine teachers completed reflective diaries and were interviewed on two occasions during the school year to examine their experience of student voice in the classroom.

Student voice strategies involved both teachers and their students engaging in a discussion and in the completion of a questionnaire relating to teaching and learning within the confines of their particular classroom relationship. The dialogue that this generated focused on pedagogy. While teachers initiated this dialogue, they listened carefully to their students and analysed the students' responses to the questionnaire. The teachers

then modified their teaching and classroom practice based on what they considered reasonable, possible and constructive.

My doctoral research also applies the findings of student voice research from other countries to the Irish post-primary context. It reflects both the challenges and opportunities of student voice for schools. The outcomes of the research should inform the design of internal school self-evaluation processes, school and classroom planning and the wider school improvement agenda.

## The students' voice

My study researched the student voice in both the classroom and, through the student council, at whole-school level. The initial analysis of the data gathered focused particularly on student voice in the classroom and the data clearly showed that students could think about and discuss their classroom experience and their learning in a meaningful way. They described what they liked and disliked, what they felt was effective and ineffective in class, and what helped them to learn.

Students were universally positive about their teachers and what happened in their class, but the clear message was that they wanted to be active and engaged in the classroom by a variety of methodologies and active-learning strategies. Questioning, both written and oral, work sheets, visual materials, practical work, and group and pair work were all cited by students as engaging, active and effective ways for them to understand and to learn. Co-operative learning involving groups or pairs of students was seen as very effective by students. Answering questions as a group rather than being *'put on the spot'* by a direct question from their teacher was a regular response. The students also voiced the pace of learning, the positive classroom atmosphere and their relationship with their teacher as very significant in their engagement and participation in the classroom and in their learning.

Almost all students cited the delivery of lesson content through note-taking as a very negative learning experience. In one interview a student stated that

*"It can get very boring and people lose concentration when loads of notes are just put up for us to write down. People would understand more if these notes were condensed into smaller bullet points and if they were explained by the teacher as people would understand better"*

Pressure of time and what was perceived as *'rushing'* to complete a topic were also seen as having negative influence in class. Good discipline and management in the classroom was expected and students stated that *"if people are talking all the time"* they find it very difficult to learn in class.

## The teachers' voice

Following the initial analysis of teachers' interviews and their reflective diaries, all expressed the view that engaging with student voice made them think and reflect on their teaching, on their students' learning and on their relationship with their classes. Student voice in the classroom was a new experience. While all were affirmed by what they heard and read, some were surprised and taken aback by what the students had said and the insights that they had.

Having engaged in dialogue with their students and having read the questionnaires, the teachers involved in the study made changes in their classrooms. Some teachers increased their use of visuals and introduced group and pair work, presentations by students, projects and a range of other student-centered methods. Others became more conscious of their use of notes and moved to shorter bulleted-type key points and linked this to shorter and more focused homework.

Some teachers did express reservations about what the students might actually say and if they would personalise any perceived criticisms. The initial analysis of the interviews and diaries clearly showed that this was not the case. The teachers were willing to change what they did in class in response to what the students had voiced to them. When asked if these changes improved the students' learning, one teacher commented in a diary response:

*“From correction of write-ups it is becoming increasingly evident that by active participation in class, group and class discussion and peer questioning, their own written work has improved greatly”.*

Another said, *“They really became more interested and involved. The group work was very good but now they have become very familiar with it and in asking each other questions rather than me doing it all the time”.*

Another teacher, interestingly, is very positive about the changes in the students, but is concerned about the examination looming in the background,

*“Yes learning improved. What we did in the class was very good but we drifted away from my emphasis on assessment and exam papers. My feeling is that they drove me on by their engagement and their voices — they were no longer these passive children sitting there”.*

## Student voice and transformation?

This initial analysis of data from these case-study schools focused on student voice in the classroom from the perspective of dialogue, interaction and communication and then from the perspective of students 'having a say' in what happened in that class. A further deeper analysis will look at the student council, and at the potential for student voice in

the classroom to co-construct and transform classroom practice, atmosphere, relationships and students' learning.

From mapping and navigating the surface of this student voice landscape, it was clear that there was no variation in the results arising from the initial data analysis in relation to school type. Students in all three schools demonstrated an ability to think about and analyse their experience in classrooms. The teachers were reflecting on their practice, on the context of their school and classroom, and on the pressures of curriculum and assessment. The students raised issues of pedagogy, of relationship, of engagement and participation, and on how they learned in classroom settings. The teachers discussed how particular subject areas, the age of their students and particular programmes and cycles in schools could affect their engagement with student voice. Classroom management, streaming or mixed-ability classroom organisation and leadership at class and whole-school level were also present on this student voice landscape.

In the bedrock of this landscape however, lie issues of curriculum ideology, of power, of trust, of relationship, and of the traditional and authoritative positioning of the teacher in the classroom. Student voice presents the challenge of bringing these to the surface to allow for the possibility of the transformation and co-construction of classroom practice and students' learning.

Domnall Fleming is a PhD student in the School of Education, under the supervision of Dr. Mary Horgan, Director, Early Years and Childhood Studies, School of Education, UCC.

# Development of a robust degassing process for carbonated beverage using gas stripping

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## Introduction

The modern beverage industry works in a dynamic and very competitive market, with increasing sales but decreasing profit margins. Projected global sales for carbonated soft beverages are expected to reach \$195 billion by 2014. Carbonated drinks are differentiated from other drinks by their “fizziness” (that comes from the dissolved carbon dioxide), which creates a “tingling” sensation in the mouth, and provides a unique taste sensation. They can be divided in non-alcoholic and alcoholic beverages. The non-alcoholic drinks are known as soft drinks and can be fruit based (orange, lemon and lime), cola type drinks (Pepsi, Coca cola), or others such as new energy drinks (like Red Bull), while alcoholic carbonated drinks include beer, cider, sparkling wines, etc. In order to maintain the flavour and the other quality attributes at the appropriate consumer level of appreciation, it is necessary to perform several quality control (QC) analyses. The most usual quality control tests performed are the sugar content (Brix), Acidity (pH) and the total amount of acid in the drink (Titratable acidity). The presence of gas bubbles in the carbonated drink interferes with most of these tests and therefore the degassing (removal of carbon dioxide) of the beverage is essential to prevent the interference of gas bubbles with the quality control analysis, which could even damage the analytical equipment.

Current methods of degassing samples can be slow and fairly imprecise, which means that they may induce error and variability in the subsequent measurements, and can represent a burden on precious time availability.

An innovative Irish company (Somex Ltd) explored the opportunity to develop a robust and reliable degassing technique based on the principle of gas stripping; replacing a soluble gas ( $\text{CO}_2$ ) with another gas (air) with a much lower solubility ( by bubbling air into the beverage ). A collaborative research project , partly funded by Enterprise Ireland, was undertaken at University College Cork to analyse the new degassing process in a scientific manner, to critically assess it against current alternatives, and to improve its robustness and efficiency.

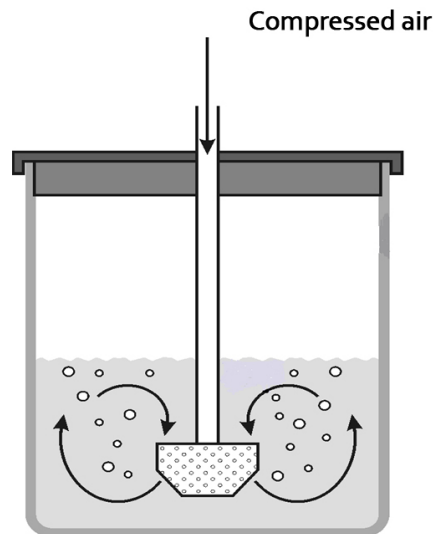


Figure 1: Schematic representation of the Somex gas stripping method of degassing with compressed air.

## Methods of research

1. **General analysis:** Firstly, mathematical models were developed for degassing, the role of carbon dioxide presence in pH and titratable acidity measurements, and the stripping process of carbon dioxide by gas stripping with air, which were tested with “model” soft drinks (a water solution composed by the usual ingredients of cola-type beverages in their normal proportions) The interaction between the various acids and carbon dioxide was thus studied without the interference of sugars or other ingredients. This provided a fundamental understanding of the degassing process.
2. **Degassing methods:** Different degassing methods were compared, including the most usual standards in industry (vacuum, stirring, airstone, ultrasonication, filtration). Quality control parameters such as Brix, pH and titratable acidity were measured to assess the effect of the degassing technique on the values obtained in the QC readings and their variability. Tests were performed in model solutions and also in a variety of commercially available soft drinks and beers.
3. **Stripping efficiency and nozzle design:** The effectiveness of the removal of dissolved  $\text{CO}_2$  in a liquid by bubbling through an alternative gas (air) with a much lower solubility is dependant on the gas distributor or nozzles (gas sparger) design. This effect was also studied by using different alternative nozzle designs.

## Summary of the main results

The model developed predicted that degassing would take 8 minutes, while experimental results showed that this was actually too conservative, and degassing with an appropri-

ately developed efficient system can be undertaken in 4 minutes, or even less (depending on the nozzle design). This shows a substantial advantage over current methods which can take 10 to 30 minutes (in some individual cases, such as beers, even more than that).

The comparison tests performed with the different degassing methods also demonstrated that the new gas stripping process was much more robust; that is, the values measured afterwards of the QC parameters have a significantly lower variability than those that result from using other methods of degassing. It was therefore established that the new system is both more efficient (faster to use) and more effective (more precise and so less prone to introduce variability)

During the investigation, a variety of novel designs were developed for the gas sparging nozzle. The influence of the sparger design on the efficiency of the stripping process was quite evident, with different degassing times and inherent variability. It was also confirmed that this process degasses very fast and efficiently, with the optimum nozzles degassing in less than 4 minutes.

Using the optimum gas nozzle design, the validation of the results was performed with a variety of commercial products, which proved that controlled gas stripping provided a more reliable and robust method of degassing and minimized variability in quality control for soft drinks. A second type of product considered was beer. For this more challenging case, (where alcohol may also evaporate during degassing) samples were degassed using the standard degassing of breweries (double filtration) and compared to the new gas stripping degassing. Subsequent quality control tests were performed measure (pH, Titratable acidity, colour and alcohol content) for both degassing methods. The results showed that controlled gas stripping led to more accurate and repeatable results, even though it degassed in just 3 minutes.

The validation studies showed that very different types of carbonated beverages can be degassed very efficiently and effectively by the gas stripping technique.

## **Conclusion**

This collaborative research between university and industry provided a strong case for the advantage of a new process developed by an Irish SME over existing alternatives and opened new avenues of development, both in terms of specific equipment design (nozzles) and of product applications (expanding from soft drinks to beer).

Carina Gomes is a PhD student at Department of Process and Chemical Engineering under the supervision of Dr. Jorge Oliveira. The author would like to acknowledge the contribution, support to this research from Brian O’Keeffe and funding from Somex Ltd and Enterprise Ireland.

# A new cure for hypertension — Renal Denervation

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The kidney presents in the highest degree the phenomenon of sensibility, the power of reacting to various stimuli in a direction which is appropriate for the survival of the organism; a power adaptation which almost gives one the idea that its component parts must be endowed with intelligence. (Ernest Starling 1909)

## Introduction

Hypertension, or high blood pressure, is estimated to effect one billion people worldwide. It contributes to an estimated 7.1 million deaths annually. Patients with hypertension are at a greater risk to stroke, coronary artery disease, heart failure, vascular disease, and chronic renal failure. Approximately 65% of hypertensive patients are either untreated and/or uncontrolled. Out of these, 10% have a particular type of hypertension called resistant hypertension. This is a form of hypertension that is drug-resistant. This means it is not controlled by antihypertensive agents/drugs. This particular type of hypertension is commonly seen in patients with renal failure (RF). It has been shown recently that this association of hypertension with renal failure may be a result of inappropriate sensory nerve activity arising from the failing kidneys.

Vito Campese was among the first to suggest that the hypertension associated with renal failure (RF) could be attributed to the inappropriate stimulation of the sensory nerves in the kidney itself. This hypothesis was built on by studies by Hausberg et al. They showed that in patients with end stage renal failure there was elevated nerve activity in the patients who, during kidney transplantation, did not have the diseased kidney removed (see figure 1).

This indicated a key role for renal sensory nerves within the diseased kidney in determining nerve output which can be significantly over stimulated in RF. This nerve activity has a knock-on effect of increasing blood pressure and thereby leading to a hypertensive state. A new potential therapeutic approach for controlling such hypertension is to disrupt or denervate the nerve pathways between the brain and the kidney.



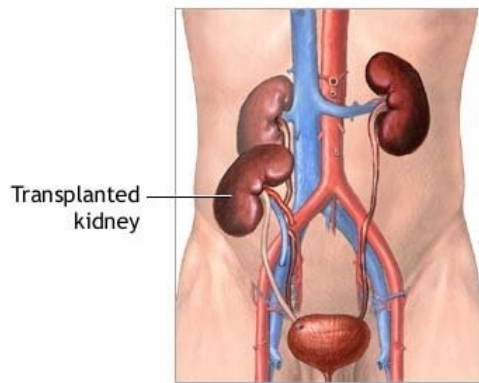


Figure 1: Kidney Transplantation

### My doctoral research

My research was undertaken to further demonstrate that during renal failure there is an inappropriate increase in nerve activity arising from the diseased kidney and that this leads to a disregulation of normal cardiovascular function and reflexes.

The kidney is essential in controlling blood pressure. It does this by controlling fluid balance or blood volume. By controlling body fluid, the kidneys can control our blood pressure (BP). When BP is increased, our kidneys excrete fluid to lower BP. Conversely, when BP decreases, our kidneys retain fluid driving BP up. Figure 2 shows how as body fluid increases, this results in more fluid in the blood thus increasing blood volume or the amount of blood in our bodies. This directly increases BP as a result. Therefore by controlling fluid loss and fluid retention our kidneys regulate BP.

The sympathetic nervous system, a division of the body’s involuntary nervous system is an important contributor to the control of arterial pressure under everyday perturbations in blood pressure. It does this under varying conditions by altering cardiac output (the amount of blood the heart pumps), peripheral resistance (diameter of blood vessels) and also renal function. Renal control of arterial pressure is regarded as being the major determinant of long-term arterial pressure because of its crucial role in maintaining extra-cellular fluid volume.

The kidneys are vitally important in altering arterial pressure by either increasing or decreasing fluid reabsorption and secretion in response to varying blood pressures. Activa-



Figure 2: How the body fluid directly affects blood pressure

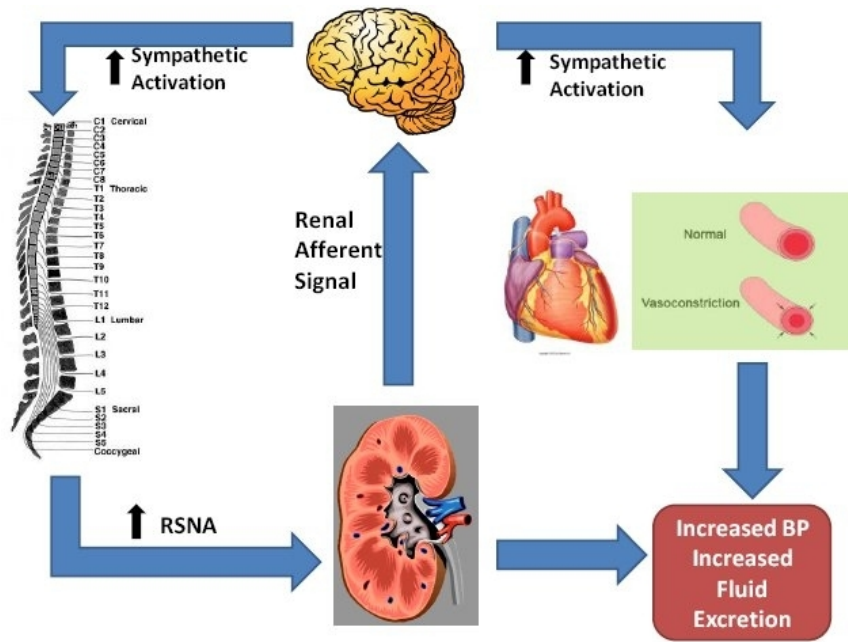


Figure 3: Schematic of the interaction between the kidney, brain and cardiovascular system

tion or inhibition of what is called renal sympathetic nerve activity (RSNA) is critical in this role (see figure 3). In a healthy kidney RSNA when activated will cause a decrease in filtration rate within the kidneys, thereby decreasing water loss and as a result increasing BP. In situations where BP has decreased, the brain stimulates RSNA. Conversely, the brain inhibits RSNA when BP has increased; this causes fluid loss and results in a reduction in BP. It is this reflex, known as the baroreflex, that I examined during my research.

Baroreceptors are the pressure sensors in our bodies. There are two types; high and low pressure baroreceptors. High pressure baroreceptors are activated by sudden changes in BP, whereas low pressure baroreceptors are active during slower, more gradual perturbations in BP.

My study investigated how the reflex regulation of renal sympathetic nerve activity was altered in a rodent model of renal failure.

### Methodology and results

The high pressure baroreceptors were examined by causing sudden increases and decreases in BP. From recorded data, a baroreflex gain curve was generated. This curve (shown in figure 4) shows how as BP increases RSNA decreases and as BP decreases RSNA increases in a normal healthy control rodent model. So a normal baroreflex gain curve should be sigmoidal in shape.

However, as can be seen in Figure 4, this reflex is completely blunted in the RF model. This indicated that the RF model has a loss of its reflex control of BP through RSNA. In other words, the RF model could neither increase nor decrease the RSNA, suggesting that

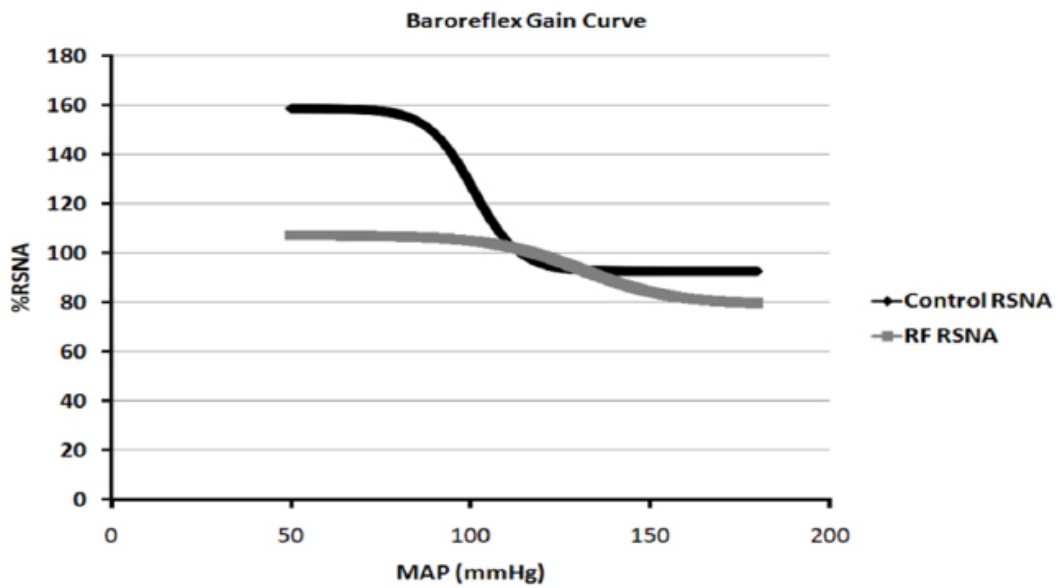


Figure 4: Baroreflex Gain Curve- Control Vs RF

RSNA was at a constant high level.

The low pressure baroreceptors were challenged by infusing saline over a 30min period, also known as a volume expansion. Infusing saline at an increasing but steady rate increases BP gradually. As BP increases over this 30 minute period RSNA should decrease to combat the effects. This is exactly what happens in the controls. Again, as can be seen in figure 5 this reflex is blunted in the RF model.

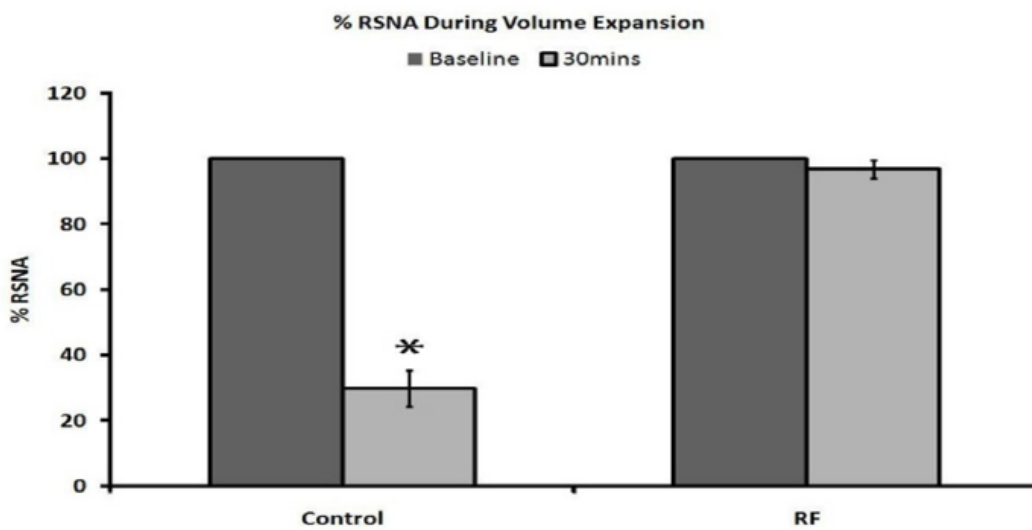


Figure 5: Graphs comparing reflex decrease in RSNA in control Vs RF rats

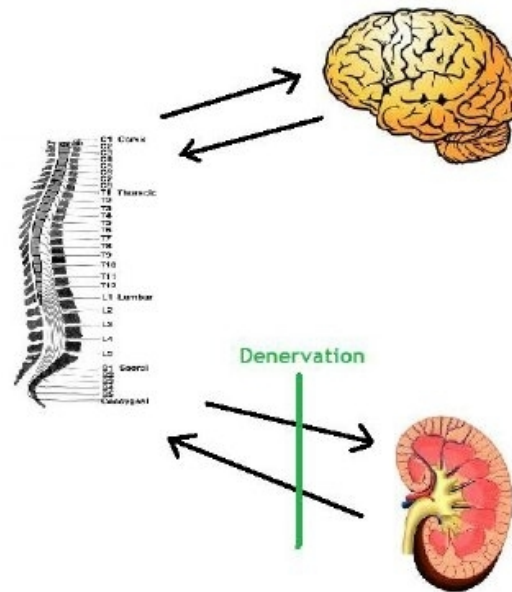


Figure 6: Diagram of renal denervation

Both baroreflexes were significantly different between control and RF models. Controls showed that during periods of increased BP, RSNA was decreased. However this was not true of the RF models. In both experiments RF models were not able to control BP *via* RSNA and the kidneys.

### Discussion

Sympathetic hyperactivity plays a vital role in the hypertension associated with renal failure. As previously discussed hypertension is common in renal failure. Signals arising in the failing kidneys may mediate sympathetic activation with a simultaneous increase in renal afferent nerve activation.

A new therapeutic approach in treating patients with resistant hypertension, and that has shown significant success, is renal denervation (see figure 6). This involves disrupting the neural pathway between the brain and the kidneys, thereby stopping any inappropriate sensory information being sent to the brain which would then cause changes in RSNA. Doing this would not only stop the inappropriate sensory signal from the kidney getting to the brain, but also stop the brain nerve signals getting to the kidneys.

The next part of my research is to surgically denervate kidneys in the RF rodent models and to again look at their reflex control of BP to determine what effect denervation will have.

Thanks to my supervisor Professor Edward Johns and colleagues.

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# Chatting with the experts: exploring Irish consumer acceptance of new food technologies

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## Introduction

*As consumers, we often wonder about how the food we buy is produced and processed. For example, what ingredients are included or the impact of consuming such products on our health, or family's health and on society? Imagine coming across two boxes of apples in a supermarket; the apples in one box being labelled as 'genetically modified' and in the other box as 'GM free'. Which apple would you choose to purchase? Would the presence of the GM label impact your decision? Would being informed that the 'GM apple' was cheaper or healthier influence your judgment?* These are the type of questions that my research addresses.

Government policy aims to develop Ireland as a knowledge-based bioeconomy and, as a result, has invested significantly in public and private research and development. Many of the outputs of this investment are new food technologies (NFTs) which are scientific and technological developments that may be adopted by industry to enhance the way food is produced or processed. Every food technology was considered 'new' at some point in time. For example, pasteurising milk was considered a radical food technology when first introduced a hundred years ago.

These technologies can provide the food industry with opportunities to gain a competitive advantage by satisfying consumers' diverse and increasingly conflicting demands from foods, including demands for convenient, tasty, healthy and affordable food products. Consumers may be more aware of some NFTs than others. For example, they may be familiar with genetically modifying food (which involves modifying an organism's genetic material using genetic engineering techniques.). However, they may not have heard about using nanotechnology in food production (which involves manipulating ingredients or packaging material at such a small scale it is invisible to the human eye). Equally, consumers may consider some NFTs to be more controversial than others. For example, they may have strong opinions about genetically modifying crops to increase their resistance to herbicides (i.e., weed killer). In contrast, consumers may be less opinionated about functional food products, such as probiotic yogurts, that claim to improve gut health.

## Why consumer acceptance is important

Investing in NFTs is futile if consumers proceed to reject these technologies. As is clearly evident from public negative reactions towards GM foods in the past, consumer acceptance of NFTs cannot be assumed and lack of acceptance can result in significant financial losses. The Government views the Irish food industry as part of the solution to the current recession. This solution will require investment in cutting edge technologies that enhance industry competitiveness. Given the scale of investment required to develop these technologies, it is important to determine which NFTs consumers would welcome and should, therefore, be developed and receive funding

It is widely acknowledged that consumers may evaluate and perceive these technologies differently to scientists and regulators. Therefore, there is now an appreciation of the need to engage with consumers and incorporate their opinions about these technologies. This engagement may also enable consumers to make more informed decisions about these technologies and potentially lead to greater consumer acceptance.

## Objectives of my research

This research explores what Irish consumers think about NFTs, whether they would be willing to accept them and what factors influence their attitudes towards them. In addition, this research explores the impact of new information and engagement with a scientist on consumers' attitudes and acceptance.

The specific objectives of my research are:

- To determine how acceptable consumers consider specific NFTs (and their different applications) to be, and how consumers' awareness and attitudes influence acceptance.
- To explore the subjective values, including perceived risks, benefits and associated trade-offs, that influence (frame) consumers' attitudes and acceptance of NFTs.
- To assess the overall influence of engaging with a scientist and new information on consumers' attitudes and acceptance of NFTs.
- To identify what information causes shifts in consumer acceptance (i.e., potential 'tipping points').

Figure 1 illustrates the potential risk and benefit trade-offs that consumers could associate with NFTs. This figure draws attention to how the weighting of these risks and benefits by consumers could influence overall acceptance (rejection) of a technology.

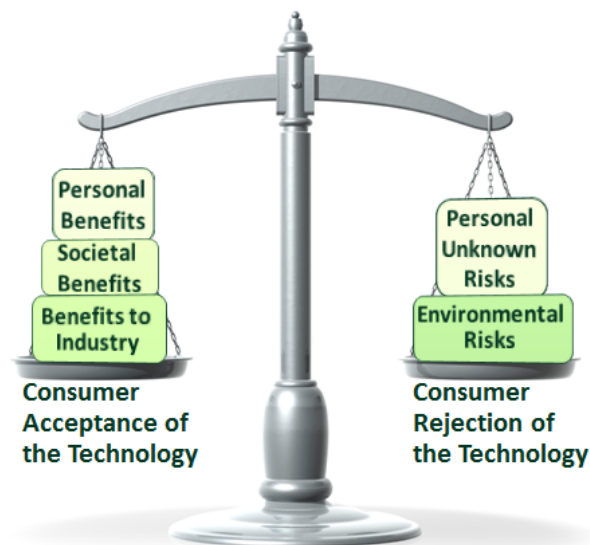


Figure 1: Potential Risk-Benefit Trade-Offs of a New Food Technology

The European Commission [The MASIS Report: Challenging Futures of Science in Society: Emerging Trends and Cutting-Edge Issues, 2009, p.17] has highlighted the need to engage with citizens in terms of scientific developments and “to experiment with ways of interaction, and evaluate where they might lead”. Stage 1 of this research takes these recommendations to engage with the public into account by using a deliberative discourse (structured conversation) between food scientists and consumers for a variety of NFTs to allow for an unfolding of individual consumers’ perspectives as information is presented to them. This approach provided depth rather than breadth in terms of examining consumers’ attitudes.

## Methodology

Four NFTs have been selected to be examined (as outlined in Figure 2) based on their numerous applications, varying degrees of novelty, associated moral and ethical concerns, proximity to market and regulatory issues.

Stage 1 of this research involved observations of a one-to-one deliberative discourse (structured conversation) between food scientists and consumers. During this conversation, the scientist discussed one of the four technologies and its (potential) food applications using simple everyday language. The scientist presented scenarios of different ways in which the technology could be applied during food production, to establish consumers’ reactions towards such information. These scenarios illustrated hypothetical benefits and risks of different food applications of the technology from a consumer, societal, environmental and industry perspective. Video recording captured participants’ non-verbal cues during



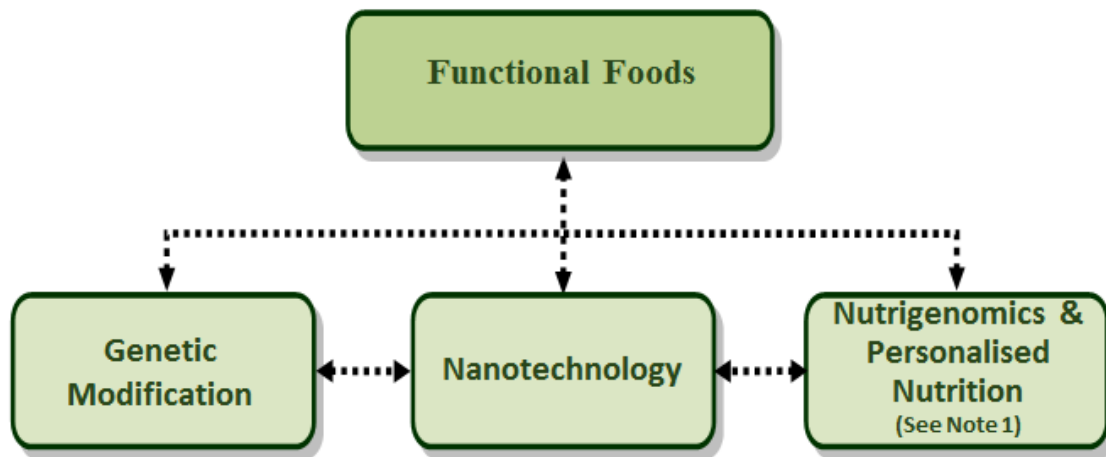


Figure 2: New Food Technologies to be Examined, both Individually (Stage 1) and Collectively (Stage 2)

the discourse that would not have been evident through audio recording alone. Furthermore, pre and post-discourse interviews with participants determined the influence of the discourse on consumers' acceptance and the factors contributing to any attitudinal change. The consumers also completed a brief questionnaire; the findings of which were compared to the qualitative findings.

## Findings to date and next steps

The deliberative discourses proved useful in revealing the multiple factors influencing consumers' attitudes, and acceptance and how consumers constructed meaning and interpreted information about the technology in question. Generally, new information positively impacted consumers' attitudes and increased their likelihood, to varying degrees, of purchasing foods produced using the specific technology. Consumers either 'strongly approved' or 'somewhat approved' of the technology after participating in the discourse. However, other variables may have contributed to consumers' positive attitudes, including the information the scientist presented and interpersonal dynamics (e.g., trust and rapport) between participants.

Consumers were more accepting of the technology if they perceived associated personal and societal benefits to outweigh potential risks. Where consumers considered there to be a direct benefit to them personally or their families (e.g., a health benefit) or to society (e.g., an environmental benefit), they were more positive about the technology. However, if they perceived the technology to create negative consequences (e.g., potential risks to human health), they were reluctant to accept it. The extent of their reluctance depended on the consumers' individual characteristics (e.g., their risk sensitivity and atti-

tude towards technological progress) and also their trust in stakeholders, including food producers and regulators. Finally, consumers' perceptions varied in terms of the applications, benefits and risks presented. For example, some consumers were more in favour of genetically modifying animals using animal genes whereas others preferred the concept of using plant genes.

Building on the findings from the deliberative discourses, Stage 2 will adopt a more traditional research approach. It will use in-depth interviews and a laddering technique, based on means-end chain (MEC) theory, to examine the factors influencing consumer acceptance of hypothetical functional food products produced using combinations of the other technologies. MEC is a framework for understanding the associations consumers make between product attributes and personally relevant and abstract consequences and values. A laddering technique enables an understating of what meanings consumers attach to different characteristics of a product.

Note 1: Nutrigenomics is the study of individuals' nutrient-gene interaction. Its practical applications involve the use of genetic testing for predisposition to diseases that can be mitigated with dietary interventions. It could potentially lead to the development of personalised nutrition which could involve segmenting the population based on pre-disposed illnesses and developing food products based on these profiles.

## Conclusions

This research will contribute to studies completed to date on the factors influencing consumers' attitudes and acceptance of the four selected NFTs. While this research is exploratory in nature, it will provide industry, policymakers and government research agencies with information regarding consumer acceptance, attitude formation and risk perceptions, which can support the promotion and commercialisation of these technologies. Furthermore, this research will suggest some suitable messages and approaches for industry and institutions involved in food risk communications to provide consumers with information about NFTs to aid their evaluations of such technologies. Finally, this research will contribute to the academic debate on the differences between scientists' and lay public's formations of risk perceptions.

Gráinne Greehy is a researcher and 2nd year PhD student in the Department of Food Business and Development under the supervision of Dr. Mary McCarthy. The author wishes to thank her supervisor for her on-going guidance and support and her colleagues in Teagasc and the participating scientists and consumers for their contribution to this research. The author wishes to acknowledge funding received from the Department of Agriculture, Fisheries and Food, under the Food Institute Research Measure (FIRM) initiative to carry out this research.

# Measuring adaptation following a stroke

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## Background

Stroke is the second commonest cause of mortality worldwide. In Ireland, one in five people will have a stroke at some time in their life. Stroke is the leading cause of long-term disability in Ireland and the incidence of this chronic illness is set to rise due, in part, to the increase in the elderly population. The National Audit of Stroke Care, commissioned by the Irish Heart Foundation and Department of Health and Children in 2006, revealed that stroke services are badly organised in Ireland. Stroke interrupts life, arrests previously-cherished activities and decreases quality of life for survivors and their families. The physical and psychological consequences and changes that stroke survivors suffer can be devastating. The degree of physical disability post stroke can range in effect from moderate to severe. Some of the consequences of stroke, such as mild cognitive impairment, while less apparent, make daily living difficult. Changes in physical, psychological and social roles can affect both one's self-image and the individual in a variety of ways. Little attention is given to the social and psychological aspects of stroke, more commonly termed as psychosocial. Social roles and responsibilities are often not addressed in stroke recovery, yet research has emphasised the importance and contribution of social processes in stroke recovery.

Rehabilitation predominately focuses on minimising stroke-related disability and to enhance active participation in everyday life skills but why is it that in some cases, with the exact same stroke-related deficits, different results are evident? Does their personality influence their response to recovery? Are some people less affected by changes to life post stroke? Are these individuals 'hardy'? The interaction between the personality trait of hardiness and the individuals' response to changes post stroke provided the impetus for this research.

Hardy people believe that they can control or influence events that they experience and anticipate the change as a challenge. Hardiness is coined as a response to stresses associated with chronic illnesses. Hardiness represents integration of specific adaptive tendencies to manage stressors such as those associated with psychological, social and functional processes. Stroke survivors are likely to experience a variety of psychosocial and physical stressors arising from concerns about their illness which has implications for adjustment to their stroke diagnosis and impairments. There is increasing emphasis placed on adjustment to chronic illness rather than recovery as individuals may never achieve complete

recovery. Evidence suggests that physical or psychosocial gains come mainly from helping patients to adjust to impairments rather than solely by their reduction. Understanding how people navigate the process of adjustment to stroke and applying this understanding to clinical practice will inform rehabilitation services.

## **Aim**

The aim of this study is to examine the influence of the personality trait hardiness on psychosocial adjustment post stroke.

## **Methodology**

In order to explore this phenomenon, a quantitative descriptive study will be conducted. Stroke survivors who are not living in institutionalised care will be invited to participate in this study. A questionnaire pack consisting of two reliable and valid scales, as well as a short demographic questionnaire to ascertain characteristics of the study population, will be administered to individuals who have survived a stroke. From the literature reviewed, careful consideration was given to capturing the correct data to measure psychosocial adjustment. Two scales were identified as appropriate in measuring hardiness and psychosocial adjustment. These were the health-related hardiness scale and the psychosocial adjustment to illness scale.

The health-related hardiness scale explores the individual's stress response to the stroke based on the sense of commitment, control and challenge that the individual must possess to adapt to their stroke limitations. The psychosocial adjustment to illness scale is concerned with seven areas of psychosocial adjustment: attitudes towards health, work, family living, sexual relationships, social and leisure activities, anxiety and behavioural interactions with family and friends. No empirical study was found exploring how the personality trait of hardiness influences an individual's psychosocial adjustment to stroke. Measuring the personality trait of hardiness and its relationship to psychosocial adjustment post-stroke may help predict the level of psychosocial adjustment post stroke beyond what could be predicted by other functional measures of outcome.

## **Findings**

Data collection will be commencing soon. Work to date concentrated on developing the research question and highlighting the gap in stroke research. To this end, it is clear there

is a paucity of research exploring the personal attribute of hardiness and its influence on psychosocial adjustment to stroke.

## **Conclusion**

Recovery from stroke is a deeply personal and unique process of changing one's attitudes. While it is crucial for recovery to medically stabilize patients and send them home, more attention should be placed on working with patients and their families, to understand the changes a stroke can cause and how they approach the challenge of rehabilitation. Identity plays an important part in psychosocial adjustment especially for individuals diagnosed with a chronic illness such as stroke. Exploring the personality resource of hardiness may help healthcare professionals uncover knowledge that will help optimise psychosocial adjustment post stroke. Research is needed to identify specific individual adaptive resources that enhance, or at least delay, the onset of stress associated with stroke. Ensuring psychosocial adjustment in stroke survivors can prevent the formation of major psychiatric disorders such as depression. Research advancements in this area have the potential to contribute to higher levels of independent functioning and satisfaction in the later years of life for people.

Thank you to my supervisor Professor Geraldine McCarthy. Irene Hartigan is a College Lecturer and a PhD candidate at the School of Nursing and Midwifery, University College Cork.

# Game theory and why logic may not be very “Logical.”

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“Woe to those who, to the very end, insist on regulating the movement that exceeds them with the narrow mind of the mechanic who changes a tire.” (Georges Bataille, *The Accursed Share*)

## Introduction

At the end of Stanley Kubrick’s masterpiece *Dr Strangelove: Or How I Learned to Stop Worrying and Love the Bomb*, Major ‘King’ Kong rides the nuclear bomb to oblivion. The chosen few deep underground in the American War Room have ascertained that the Soviet’s “Doomsday Machine” will automatically retaliate and enshroud the earth in a cloud of radioactive material for 100 years. The pristine logic of the Cold War that culminated in Kong riding the bomb in the film, and brought the world to the edge of oblivion with the Cuban Missile Crisis of 1962, is based on game theory. *Strangelove* is the first popular film or fiction to deal with game theory, and does so with great attention to detail. Thus, it is an excellent starting point for historical insight into the beginnings of what has recently been described in *The New Palgrave: A Dictionary of Economics* as a ‘unified theory’. Game theory is, to state it simply, a mathematical formulation of strategic thinking in competitive situations. If the world is viewed in simplified Darwinian terms, such as ‘survival of the fittest,’ it becomes clear why game theory is now seen as a unified theory. If the world runs on competition, then the general and ‘objective’ maths of game theory can be, and are, applied to everything from biology to economics to war strategies. Despite its virtual ubiquity in the first world, little has been written of it critically. Its influence, however, has permeated the world of fiction, film and television in certain instances and some among these works, such as *Strangelove*, provide fascinating insights into the theory’s workings and reception.

In the early 1960s the United States settled on a strategy of nuclear deterrence, with the tacit agreement of the Soviets, it would seem. The strategy was based upon the assumption that both agents involved were ‘rational,’ and thus the rational Soviets would not strike against the United States, as they couldn’t possibly destroy all the U.S missiles. They would in turn be destroyed by the U.S. Counter-attack, and this, of course, was not in their own rational self-interest. Thus there was struck an ‘equilibrium’ between the two superpowers, upon which the fate of all species rested! This game theoretical strategy

was known as Mutual Assured Destruction, or more commonly by its hilariously ironic acronym; MAD.

Kubrick famously set out to make a straight Cold War thriller loosely based on the Peter George novel *Red Alert*, but the absurdity of the situation became too much. Kubrick retained the attention to detail, however, and all of the logic of deterrence and many of the protocols seen in the film are exactly accurate.

## Two fathers of the Logic

Game theory was first developed as a concerted theory in the 1940s by the Hungarian-American mathematician John Von Neumann, upon whom *Strangelove*'s character is mostly based. Von Neumann contributed to many fields of knowledge in mathematics, physics and more, but it is for his formulation of the 'minimax theorem' that he will be remembered. This theorem seeks to calculate the minimum maximum possible loss in a situation where two agents are in direct competition. This theorem fits the Cold War arms race perfectly.

The other 'father' of Game theory along with Von Neumann, is John Nash, who has been made much more famous than the former by the recent Ron Howard film *A Beautiful Mind*. Nash extended the theory with his 1952 doctoral paper, known as 'Nash's Equilibrium.' It seemingly proved that an untold number of 'rational' agents, all pursuing their own gain, did not lead to chaos but could instead lead to a point of equilibrium. This was taken as mathematical proof of Adam Smith's hidden hand, that the pursuit of selfish gain was the fundamental principle of an ordered society, that communal notions were false and that altruism does not exist. Capitalism, in the war of ideologies, was seen as the ordained (not the godless communists), and scientifically 'proven' political system.

Both Nash and Von Neumann worked for a military think tank in the 1950s and 60s called RAND Corporation, (RAND meaning research and development, was a title so dull, it was surely designed to stifle curiosity about its doings, which as a matter of fact, changed the world!) Many engineers, mathematicians, physicists and so on, became enthralled with the rationalist appeal of game theory. Numbers are, after all, 'immutable' i.e. they cannot be argued with. What began initially as a loose set of theorems regarding poker strategy was transformed into what is now called a 'unified theory,' incorporating its first application, nuclear strategy, and later economics, and today is used in everything from bureaucratic management systems to biology and zoology.

The Cuban Missile Crisis happened two years before *Strangelove* was released and the Secretary of Defence at the time, the ultra-rational Robert McNamara, has since stated that it wasn't logic and rationality that prevented nuclear war: Instead, he bluntly states, "we lucked out." While advocates of game theory, of whom there are very many (and

undoubtedly it has many useful applications as a modelling tool in some areas of knowledge) would possibly argue that the holocaust happens in *Strangelove* because of imperfect information and human error, they will fail to see that this is precisely the point.

## What does this have to do with me?

One may ask at this point; ‘yes, but what does this really have to do with an English research project and what does this have to do with me?’ And it would be a timely question as this article is necessarily brief and the subject is complex and potentially far reaching. Let me refer, then, back to *Strangelove* once more. At the end of the film, of course, there is a nuclear holocaust, despite the fact that it is neither the Soviets’ nor the Americans’ intentions to cause one. The absurdity in Kubrick’s film stems from the fact that all the pristine mathematical logic of game theoretical deterrence has led to a nuclear holocaust. The notion that mathematical logic exists somehow, independently of the messy arbitrations of humanity in flux, and that we can ‘rationally’ organise society around its logic is absurd. In this regard, what branch of human study could be better equipped to deal with human foibles, messiness and indeterminacy than the study of English? These human factors are, after all, its *raison d’être*!

The urge to circumvent human fallibility with immutable numbers is a folly that can be traced back to Enlightenment texts such as William Petty’s *Political Arithmetick* (1690) (based upon Ireland) or Thomas Hobbes’ mechanistic view of the world in *Leviathan* (1651). The notion that society can be managed and improved with science and reason is as strong as it ever was in the Enlightenment era, but in light of the historical knowledge we should have accrued since then, is an even bigger folly. In *Straw Dogs*, the English thinker John Gray viciously attacks this kind of attempt to circumvent so-called human fallibility with science or mathematics.

“These are not flaws that can be remedied. Science cannot be used to reshape humankind in a more rational mould. Any new-model humanity will only reproduce the familiar deformities of its designers. It is a strange fancy to suppose that science can bring reason to an irrational world, when all it can ever do is give another twist to normal madness. These are not just inferences from history. The upshot of scientific inquiry is that humans cannot be other than irrational.”

While Gray seems delightfully brutal, his assertion that we cannot be rational could be rephrased simply thus: rationality is subjective. What is rational to do here in Ireland is not necessarily rational for an indigenous Brazilian tribe. This, of course could be applied on an individual basis too, if you like! Ironically, by its own standards, this renders game theory useless. Rationality, according to its own assumptions, is what the individual does to pursue his or her own advancement in any given situation. All else is dismissed from



its assumptions. James Buchanan, the American political theorist who developed 'Rational Choice Theory' (a game theoretical management system), dismissed what he called relative terms such as 'patriotism' or 'common good,' upon the basis of which old bureaucracies were run, as relative, or subjective, thus meaningless terms. How can 'rationality' be deemed a fixed, universal 'truth' while 'common good' is dismissed as too subjective to be meaningful?

It is very important to note here, that these assumptions of selfishness are synthesised from those of the theorists, as well as their intellects, which are in turn absolutely beholden to their personalities and their surrounding political environments. Von Neumann, for example, was self-described as “violently anti-communistic and much more militaristic than the norm,” while also apparently being possessed of a compulsion to commit adultery. Trite correlations between Von Neumann's sexual compulsions and his fetish for missiles aside, the virulent anti-communism that was rife at the time, particularly among those who worked on Cold War strategy, fuelled the radical individualism at the heart of his theory's assumptions, as this was misguidedly seen as somehow 'opposite' to communism's doctrine.

In answer, briefly, to the second part of the question posed above (i.e., what does all this mean to me) I will ask you to think about the performance target. As adults who have probably been employed in recent years, we are surely all familiar with them. They are part of a broader management system known as 'systems analysis' and are statistically derived target-numbers that employees have been asked to fulfil, within the remit of their employment. Essentially, it is the modelling of the workplace on the competitive arena of free-market capitalism. Again, it is based on the assumption that humans are fundamentally self-motivated. In 'owning' your target, so to speak, you are motivated by your fundamental selfishness to be more productive. This is the management model by which the vast majority of bureaucracies, corporations and institutions are run nowadays, along with systems analysis and the emerging Public Choice Theory in politics.

## **Society is shaped by its organising systems**

Although vastly different to *Dr Strangelove*, the recent television series *The Wire* offers a contrary view of the performance target. In its depiction of the municipal institutions of the U.S. City of Baltimore, the performance target does not bring about efficiency and rationality. Instead, the statistics are constantly manipulated, in a self-fulfilling realisation of the system's assumptions of individualistic greed, engendering institutional corruption.

In light of recent sociological findings about the huge effect environment has on collective and individual behaviour, as popularised by Malcolm Gladwell in *Tipping Point*, or the more heavyweight *Systems, Not People make society Happen* by Michael King, these texts suggest a problem of self-fulfilment in these systems that now rule our world. If society is

organised around the tenets of selfishness and greed, this is what people will try to adapt to.

## **New paradigms to live well together?**

If the study of English is the desire to know ourselves and each other, it is surely an arena to bridge the non-existent gap between human 'flaws' and pristine 'logic.' There is no such opposition. Nor is there an opposition between science and English, both are constructs of human activity. There are only human foibles, messiness and indeterminacy, which should be factored into our paradigms of how to live well together instead of being denied. The poetic indeterminacy of life may be lost in the quantitative valuation of ever more realms of our lives, in terms of dollar value, unless we embrace the limits of our logic.

With appreciation and gratitude to my co-supervisors Dr. Gwenda Young and Dr. Alan Gibbs, who have been patient, intuitive and excellent in their support.

# The art of death and childbirth in Renaissance Italy

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Figure 1: Domenico Ghirlandaio, Portrait of Giovanna degli Albizzi Tornabuoni, Museo Thyssen-Bornemisza, Madrid.

## Background and context

Pregnancy was a dangerous event in the life of a fifteenth-century Florentine patrician woman. One-fifth of all deaths among females that occurred in Florence during this period

were in fact related to complications in childbirth or ensuing post-partum infections. In the years 1424-25 and 1430, the Books of the Dead recorded the deaths of fifty-two women as a result of labour. As conditions for pregnant women did not improve in the ensuing half a century, childbirth remained a dangerous event for women to endure. Husbands took many precautions to ensure a successful birth as can be seen in the vast array of objects associated with this event created at this time. People turned to religion and magic in order to ensure that both the mother and child would survive this perilous process. Death in childbirth affected women from all classes and wealth did not act as a deterrent. The loss of a fertile young woman was detrimental to both her family and to society in general. Not only did her natal and conjugal families lose out on the children she may have had in the future, the loss of the child that she carried (which was commonplace) denied the family the opportunity to forge advantageous marriage alliances and heirs to the family name and wealth.

In a society which had recently experienced the devastating effects of the Black Death, leading to the loss of approximately 80,000 of its citizens, the civic authorities of the city-state began to actively promote the need for the production of children to counter-act the dramatic population decline. A family-centred ideology emerged at the core of Florentine society. In the writings of resident authors such as Leon Battista Alberti, marriage and family were regarded as the building blocks of a strong and prosperous society. The need for children was of paramount importance to the citizens of Florence as a means of ensuring the continuation of family lineages and the prosperity of the society which they were born into. The production of children was thus perceived primarily as for the good of both the family and society rather than just for individual satisfaction. The inhabitants of the city-state and particularly the women were under immense societal pressure to carry out their civic duty by producing offspring. As women were the bearers of children, their roles within their marital families centred upon their ability to fulfil the role of motherhood and produce as many children as possible for their husbands.

## **My research**

The purpose for my research is to investigate the representations of women who died as a result of childbirth created during the Renaissance period and why these women were chosen to be commemorated and honoured by their husbands and male family members through the medium of the visual arts. It is clear through the examination of these art works that a woman received a privileged status through her death in childbirth, particularly if she had already provided her husband with a male heir. Although the depictions of women who died in this manner do not usually reference what caused their demise, these works promote motherhood to contemporary Italian viewers in a number of ways. This argument stems from an idea put forward by the historian David Herlihy who states

that, due to motherhood, Renaissance Italian women were elevated in status. The thesis has been divided into four case studies of specific women and the works created in their honour; two from the Republican city-state of Florence and two from the courts of Lucca and Urbino. Through the series of case studies covering the various social and political contexts present in Italy in this period, it is possible to compare and contrast how these women were perceived by their peers-especially their male counterparts- and the impact of the socially prescribed gendered roles on how these women were depicted and portrayed by artists. The following brief synopsis of a painted portrait of a Florentine woman demonstrates that, within the context of the republican city-state, a woman was clearly defined by her role as mother and contributor to her husband's dynastic lineage.

## **Giovanna degli Albizzi Tornabuoni**

Giovanna was born into one of the most influential and powerful families of the period, the Albizzi. At the age of eighteen, Giovanna entered into another powerful Florentine family, the Tornabuoni, through her marriage to Lorenzo Tornabuoni. Marriage was the key event in the lives of Florentine citizens, particularly for women as they were dependent upon matrimony alone to define their status. Girls were conditioned for their nuptials from an early age. The similarities in the ages of the bride and groom is considered unusual in the Florentine context; usually the man would choose his bride when he was twenty to twenty-five years old and, if he should feel that his position would improve, he would wait until he reached thirty to marry. The bride was usually in her early teenage years at the time of betrothal. Gert Jan van der Sman argues that the similarity in their age suggests that their union was for dynastic purposes. On 11th October 1487, Giovanna successfully gave birth to her first child, a boy who was named Giovanni after his grandfather, the family patriarch. Giovanna died less than a year later on 7th October 1488, as a result of childbirth. Of particular interest are the series of images created by the prominent Florentine artist Domenico Ghirlandaio commissioned by her grieving husband and also her father-in-law shortly after her death.

## **Ghirlandaio's portrait**

The *Portrait of Giovanna degli Albizzi Tornabuoni* dating from 1488 includes a number of interesting elements such as the Latin epigram. It reads as:

'Ars Utinam Mores Animum que Effingere Posses  
Pulchrrior In Terris Nulla Tabella Foret'

[Art, if only you were able to portray character and soul, no painting on earth would be more beautiful]

The identity of the author of these words has been a matter of much contention amongst art historians. Maria DePrano presents the most relevant interpretation and identification of the true author of the verse by arguing that it was Lorenzo's composition which had been based upon an epigram written by the ancient Roman poet Martial with a minor change in the verb conjugation to make the words more personalised. Lorenzo verbalises his sorrow over the sudden death of his wife. Not only did he lose his beloved wife who he had been married to for only a brief period of time, he also lost the child which she was giving birth to. Their first-born son, Giovanni, who was less than a year old at the time of her death, lost his mother. Therefore the epigram is one of both anguish and lament by a grief-stricken husband beseeching art to bring his wife back to life. The position of the inscription within the portrait itself is interesting and deliberate on the part of the artist as the bottom left hand corner is partially obscured by the sitter's beautifully elongated neck. The viewer is left in no doubt that the words of this epigram are in fact referring to Giovanna herself, her character, mind and feminine virtues. It is important to note that the majority of inscriptions included in the portraiture of Florentine women were located on the reverse side of the images. Their placement on the reverse suggests that they were intended to be viewed by a select private audience such as the patron who commissioned the work and close family. In the case of Ghirlandaio's portrait, the inscription's prominence within the work itself must be interpreted as a public statement, intended to be viewed by a wider audience.

The open nature of this personal statement of Lorenzo's lament is furthered by the work's original location. This image is one of the only female portraits of the Renaissance period whose exact location was documented in an inventory. It was located in Lorenzo's personal chambers in the *chamera del palcho d'oro* ('chamber with the gold ceiling') of the Palazzo Tornabuoni and hung in this room for nearly ten years after her death when Lorenzo had in fact remarried. The private chambers of Florentine patrician men were quasi-public spaces within the palazzo and the camera was in fact the most controlled space, only accessible to those who were admitted to the space by its owner. Those who saw the portrait would have been invited by Lorenzo himself into the room. It was within these spaces that men placed their most valuable art works and prized possessions so that their wealth and prestige could be exhibited and seen. By placing Giovanna's portrait in this chamber, Lorenzo not only gave Giovanna a prized position within his household but simultaneously suggested that her image and thus Giovanna herself was in fact a cherished possession of his. The inscription acts as a public acknowledgement of her worth and significance to her husband and adds to the sense of high regard she achieved posthumously.

## The significance of physical appearance in female portraiture

The manner in which Ghirlandaio represents his sitter including the profile format and her appearance added to the perception of her privileged status within the Tornabuoni family. In classical times, the use of the strict profile pose was allied to biography so that these portraits came to stand for their sitters' virtuous behaviour. Its use in Florentine art asserted similar virtues upon those represented. With her eyes and face averted, Giovanna's depiction was particularly apt in a society which idealised the images of women in terms of their chastity and modesty. Her upright posture emphasised through the pose demonstrates her chaste nature, considered the most fundamental virtue for a patrician woman to possess as it was deemed vital to ensure the legitimacy of the offspring she produced. It also allowed the viewer to appreciate Giovanna's beauty, as the observer can clearly see her domed forehead, elongated neck and high hairline, features considered beautiful in Florentine society. Beauty was regarded as another significant quality for women to possess which was clearly emphasised by its reference in the portrait's inscription. The domestic environment was seen as the space reserved for women and Jacqueline Marie Musacchio points out that many Florentine women spent a large portion of their lives being controlled by male family members and contained within the walls of the family *palazzo*. Alberti argued that it was in fact natural for a woman to remain inside and to tend to the household while the man's place was outside the home, tending to all other matters. In a culture which believed that a woman should give the impression that her body was contained and protected with her limbs controlled, the use of the profile in female portraiture was perfectly suited to demonstrate this ideal. This is furthered by Giovanna's physical containment within the confines of the Netherlandish motif of the dark tomb-like niche. Therefore Giovanna is shown here as exemplary and virtuous in the 1488 portrait.

Giovanna's pose and appearance also held importance with regards to the exhibition of the wealth and prestige of her marital family. Extravagant costumes and jewellery were symbols of affluence and status in this society. The dominance of the initial 'L' on the sleeve of Giovanna's *giornea* (dress) refers to her husband and thus denotes her as Lorenzo's wife. The use of heraldic or familial devices on women's clothing demonstrates how women were perceived in terms of their families- firstly their father's and then, through marriage, their husband's. A woman was thus never viewed as an individual with a separate identity who earned honour for their own merits, but was only seen in terms of her ability to assist in the continuation of the patriarchal lineage of the family. Each of the objects included in the portrait were carefully chosen to provide a further insight into the sitter's personality and nature which the artist could not evoke in the portrait. The prayer book symbolised the piety Giovanna possessed and the string of coral beads alluded to the use of talismanic objects to safeguard the wellbeing and health of the newborn child. Of particular interest is the dragon pendant with its reference to the symbol of St. Margaret,

the patron saint of childbirth, to whom women in labour prayed to ensure a safe delivery. The dragon pendant is an unusual inclusion as no other example of such a necklace has been found in a Quattrocento female portrait. The incorporation of the coral beads and dragon necklace in particular subtly allude to the circumstances surrounding her death. The artist successfully constructed an image of Giovanna as a paradigm for the ideals a woman was expected to possess and an exemplar which other women should aspire to imitate in their own lives.

## Conclusion

Giovanna's fate was shared by many of her contemporaries, including her closest female kin. Her mother, Caterina Soderini, mother-in-law Francesca Pitti Tornabuoni, and sister-in-law Ludovica, all died as a result of childbirth, demonstrating the devastating effects of this event on Florentine families. The emphasis on the commemoration of Giovanna in the painted portrait by Ghirlandaio expresses how she was perceived as having played a crucial role in this family in ensuring its continuation and was thus regarded as a valued member due to her role as the mother of the Tornabuoni male heir. Lorenzo, through the medium of art, venerated his spouse for her achievements as a woman through the realisation of her civic duty as a wife. To commission a painted portrait of an individual at this time was to commemorate the sitter for their accomplishments, confirmed in the writings of Alberti who asserted that: 'Through painting the faces of the dead go on living for a very long time'. Accordingly, Giovanna was commemorated for posterity as an exemplar amongst her sex, the highest of accolades.

Final year MPhil student in the Department of History of Art under the supervision of Dr. Flavio Boggi. I would like to acknowledge and thank Dr. Boggi for all of his help and support. I would also like to thank the Thyssen-Bornemisza Museum for the use of the image and Ms. Gretta McCarthy for her technical support.



# **“It’s me or the website!” Investigating people’s confidence with Internet use**

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## **Introduction**

Whether at work or play, more people than ever encounter the Internet on a daily basis. In June 2010, there were an estimated 1.5 billion Internet users worldwide. This widespread interest has emerged as a result of extensive use of the Internet within social contexts, the workplace, education and many other environments. With such prevalent use of the Internet today, it is important to understand how people interact with it.

Some recent observations of Internet users have identified differences between men and women in their confidence with Internet use. While men tend to attribute difficulties navigating a website to a poorly designed website, women often assign these difficulties to personal lack of ability. In Psychology, this belief or confidence in personal ability is known as self-efficacy.

In addition to this, it is also thought that people’s attitudes affect behaviour. Thus, it is important to take one’s attitude towards the Internet into consideration when measuring self-efficacy. Taking the above observations into account, my research investigates and measures people’s attitudes and self-efficacy with using the Internet. This paper will particularly focus on the self-efficacy element of my research.

## **Measuring attitudes**

In Psychology, attitudes are typically measured by a questionnaire or scale. Generally, methods of attitude measurement are based on the assumption that attitudes can be measured by the opinions or beliefs of people regarding the attitude objects. Likert’s method of summated ratings is the most commonly used scale for measuring attitudes. A Likert type scale involves asking participants to indicate the extent to which they agree or disagree with each statement on the scale.

There have been a number of attempts at developing an Internet attitude scale in the past decade. However, none of these attempts have resulted in satisfactory means of measuring Internet attitudes. The most significant problem which occurs is confusion and lack of clarity between the terms “attitude” and “self-efficacy”. Within the discipline of Psychology, attitudes and self-efficacy are identified as separate concepts. However, much of

the research in the area of Internet attitudes carried out to date includes self-efficacy as a subscale, or a component of, an attitude. An Internet attitude can be described as one’s evaluation of and/ or feelings toward the Internet. Internet self-efficacy is described as one’s belief in their capabilities to achieve specific goals with the Internet. A crucial difference between these two terms is that an Internet attitude refers to a person’s *feelings* about the Internet, while Internet self-efficacy focuses on how a person evaluates their personal *capabilities* to successfully complete tasks on the Internet. Self-efficacy and attitudes are independent of one another, and the difference between feelings and capabilities suggests that self-efficacy should not be regarded as a component of an attitude. Therefore, in my studies, attitudes and self-efficacy are identified separately in their application to Internet research.

## Measuring self-efficacy

Research which has looked exclusively at measuring Internet self-efficacy has also encountered problems. In particular, the major problem lies with the methodology employed to measure self-efficacy. Self-efficacy is measured through the use of psychometric scales. However, unlike many attitude scales which require participants to indicate whether they agree or disagree with a statement, the standard methodology for measuring self-efficacy is to ask participants to indicate the strength of their belief on an interval scale rather than “agreeing” or “disagreeing” with the statement. To date, however, Internet self-efficacy scales have incorporated the former method, that is, the use of a Likert type scale.

The methodology for measuring Internet self-efficacy requests participants to indicate the strength of their belief that they can complete a range of tasks on the Internet. In addition to this, it is vital that participants are asked to judge their operative capabilities as *of now*, and not their past capabilities, potential capabilities or their expected future capabilities. Bandura, the principal researcher on self-efficacy in Psychology, maintains that when participants have rated their sense of capability on all the tasks specified on the scale, the efficacy scores should then be summed and divided by the total number of statements. Bandura proposes that this then indicates the strength of the individual’s self-efficacy. However, it is possible that the results of such tests may say more about the amount of exposure a person has had to the Internet than about their assessment of their own capabilities with the Internet. It makes sense that the more a person works with the Internet, the better that person hopes they will be at using the functions provided by it, and the more functions they will be familiar with. Therefore, my research suggests that in such studies self-efficacy is actually confounded with *frequency of use*. In other words, self-efficacy scores are largely dependent on how much or how little a person has completed the tasks in question. If this is the case, then previous experience with Internet tasks also needs to be taken into account when determining self-efficacy scores. Thus, the current measurement of self-efficacy needs to be re-examined and a new measurement

which takes frequency of use into account should be applied to Internet research.

## **Aims of my research**

This current paper outlines a study which was carried out to investigate whether or not frequency (experience) of use is a significant predictor of Internet self-efficacy.

In order to investigate whether self-efficacy may be confounded with previous experience; it was decided to carry out a preliminary study to see if frequency of use of a task was reflected in confidence scores in the ability to complete that task. The website which was chosen for this study was the Blackboard Learning System at University College Cork. The objective was to develop a method of measuring self-efficacy that would show differences between groups on various demographic indicators that have been mentioned as possibly associated with differences in self-efficacy. For example, my observations (as earlier outlined) suggest that men demonstrate more confidence in their use of the Internet than women. Other research also suggests that prior Internet experience, outcome expectancies and Internet use are related to Internet self-efficacy judgments.

## **Participants**

The participants were recruited for this study using ad hoc sampling methods. All students were Applied Psychology students attending University College Cork. The final sample consisted of 140 students, 37 (26.4%) of whom were male, and 103 (73.6%) of whom were female. The ages ranged from 17-59. Students were recruited from first, second and third year Applied Psychology classes.

## **Materials**

The final questionnaire consisted of two main sections. Participants’ demographic information including gender, age, length of time using Blackboard, frequency of Internet use, and uses of the Internet was obtained. The second section listed all possible twenty-one tasks that can be performed on the Blackboard Learning System. The Blackboard Learning System was specifically chosen for the purpose of this part of the study as all participants had equal exposure to the website and all participants were expected to be familiar with the website.

## **Procedure**

The Blackboard Self-Efficacy Survey was distributed to students at the beginning of lectures and tutorials within the School of Applied Psychology, University College Cork. I indicated the nature of the study to each of the groups and requested that all Applied Psychology students in the class fill out the questionnaire. Participants were reassured that the questionnaires were completely anonymous and no participant could be identified in

any way from the data collected. Questionnaires were subsequently distributed to all participants and they were instructed to rate how frequently they performed each task and how confident they felt about achieving each task. Students were given approximately ten minutes to complete the survey. Questionnaires were returned to me upon completion and participants were thanked for their participation and co-operation.

## My Results

Participants’ ratings on frequency of use and confidence ratings of tasks were scored in the following way:

Table 1: Scoring of task ratings for frequency of use and confidence

Frequency of use	Confidence	Task Score
Never	Not at all confident	<b>1</b>
Once a month or less	Slightly confident	<b>2</b>
Once a week or more	Moderately confident	<b>3</b>
Once a day	Very confident	<b>4</b>
Several times a day	Extremely confident	<b>5</b>

The median confidence rating of all tasks was computed and generated the results in the table below (the median was used as a measure of central tendency for this data set as it was the most appropriate for this data, and was used instead of the mean value. The median is the middle number in the data when the data is ranked in order from lowest to highest).

Table 2: Summary table of median confidence ratings

Median Confidence score	Task Number
5	1, 4, 8, 12, 15
4	16, 20
3	7, 9, 10, 13, 19
2	2, 3, 5, 6, 11, 18, 21
1	14, 17

The highest median confidence rating for tasks was a score of 5 indicating a confidence level of ‘extremely confident’. There were five tasks which achieved a median score of 5. These tasks, 1, 4, 8, 12 and 15, achieved the highest confidence ratings from participants. There were two tasks which achieved a median score of 1, indicating a confidence level of

‘not at all confident’; tasks 14 and 17. The following table gives examples of tasks which achieved median scores of 1 and 5.

Table 3: Examples of statements which achieved extreme median values

Task Number	Description	Median confidence score
1	Viewing announcements	5
4	Viewing, downloading or printing documents	5
14	Creating ‘to-do’ lists for myself	1
17	Participating in or viewing ‘Wikis’	1

The median frequency rating of all tasks was calculated (Table 4):

Table 4: Summary table of median frequency ratings

Median Frequency rating	Task Number
3	1, 4, 8
2	7, 10, 12, 15
1	2, 3, 5, 6, 9, 11, 13, 14, 16, 17, 18, 19, 20, 21

The highest median frequency score for tasks was a score of 3, indicating a frequency of ‘once a week or more’. There were three tasks which obtained a median score of 3. These tasks were 1, 4, and 8. Many tasks achieved a median score of 1, indicating a frequency of ‘never’.

## Conclusions

From the initial self-efficacy data analysis, it is evident that frequency of use plays a key role in the ratings of confidence in ability to perform tasks. When tasks were rated as being frequently completed, these tasks also tended to obtain high confidence ratings from participants. Similarly, tasks on which participants indicated they had little or no experience also tended to achieve lower confidence scores from participants. The initial assumptions that there is a direct relationship between frequency of use and self-efficacy scores has been supported. The next stage of my research explores the implications of this relationship.

Thanks to my supervisor, Dr. Jurek Kirakowski, School of Applied Psychology, UCC and to all participants who partook in this study.

# The implications of a high energy dense diet on the health of Ireland's children

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The energy density of foods is a major contributor to the global obesity epidemic — World Health Organisation 2003

## Figuring out dietary energy density

Energy density (in relation to food) is a relatively simple concept; it refers to how densely packed with energy a food is and is calculated simply by dividing the calories in the food by the weight of the food. An apple is an example of a low energy dense food while a biscuit is a high energy dense food. Dietary Energy Density (DED), however, is slightly more complex; it is calculated by the same method but it is calculated for a person's diet rather than a single food. This is easier said than done because in a typical day people don't only eat food, they also drink beverages. Enter the biggest hurdle in calculating DED — drinks. The inclusion of drinks in the calculation of DED can be very misleading; a pint of water for example has zero calories and lots of weight, giving it an energy density of zero. Let's envisage a scenario where DED is calculated for two people, Paul and Fiona, including everything that they eat and drink for a day. Paul eats fruit for breakfast, a salad for lunch and a stir fry of vegetables for dinner and has one glass of orange juice; Fiona eats a chocolate bar for breakfast, no lunch and a 16 inch take-away pizza for dinner but drinks 10 pints of water. Fiona will end up with a lower DED than Paul, even though Fiona ate all the energy-dense foods. There is an on-going debate as to what is the best approach to deal with drinks and DED. The most obvious solution to this problem and the one that is gaining the most popularity in the scientific community is to remove all the beverages from the diet and calculate DED for the food portion of the diet only. When we apply this solution to the Paul and Fiona scenario, Paul will end up with a low DED and Fiona with a high DED, which better reflects their diets.

## Why look at dietary energy density

High DED has been repeatedly associated with increased energy intake and weight gain. Studies have also shown that a high DED may increase a person's risk of having metabolic syndrome (a term used to describe a group of risk factors which when they occur together can increase the risk of coronary heart disease, stroke, or type II diabetes) and, worryingly,

DED has been also linked in children with increased fatness. The World Health Organisation (WHO) has recognised energy density as an important dietary factor for determining obesity risk and a major contributor to the global obesity epidemic.

The crux of the link is that individuals can only fit a certain amount of food in their stomachs until they are full. One of the ways in which our body tells our brain that we are full is from the pressure sensors on the walls of our stomach; a full stomach puts pressure on sensors which begins a chemical reaction sending a message to the brain which ultimately leads to a signal to the hand to put the fork down! If an individual chooses a high energy dense diet; they can ingest a large amount of calories by eating a small amount of food, but they will still have room in their stomach and might still feel hungry and may eat again, whereas, an individual who selects a low energy dense diet is limited by the volume of their stomach, these people can eat more food for the same amount of calories becoming fuller faster.

That seems to make sense, so why would anyone eat a high energy dense diet? The simple answer is always the logical choice and in this case it's palatability — which is science for, *yummy*. High energy dense foods taste good. The creamy buttery taste of fat and the sweet deliciousness of sugar are the two most inherently desirable tastes to humans. Sweet foods like biscuits, because of their dryness are one of the most energy dense foods out there and fatty foods like 'chipper' chips are high energy dense because fat itself has so much energy per gram.

So now that we know how to calculate DED, why the nutritionists think it's important and how it works in the body, I'd like to point out another facet of DED - a high DED not only can affect our weight but can affect our nutrient intakes too, leading to poor dietary quality. This is an emerging concept and it is this aspect of DED that is the focus of my work. The following are results found in a nationally representative sample of Irish children; similar trends were found in teenagers and in adults, but as it is with our nation's children that we have the most opportunity to turn the tide, I thought I'd start there.

## **The nutritional implications of a highly energy dense diet for Irish children**

In a nut shell, the higher the DED the less nutritious the diet becomes. To arrive at this statement I examined the effect of DED on the quality of children's diets using habitual food and drink consumption data of a representative sample of Irish children aged 5-12 years collected during the National Children's Food Survey (NCFS) (2003 – 2004). I calculated each child's DED and then, as there are no established cut-off points, split the children into three equal groups; those with low DED, medium DED and high DED.

The first result of note was that children with high DED ate less food but had the same amount of calories. The implications of this finding are that these children have less eating

opportunities to consume the full cohort of nutrients that will allow for optimum nutrition. Protein, carbohydrate and fat are the building blocks of food, and the amount that they each contribute to the energy in a person's diet can have repercussions on the individual's health. As a general rule a higher quality diet will include more protein and carbohydrates and less fat. When compared to those with low DED, children with high DED had higher fat intakes and lower protein and carbohydrate intakes.

"Eat your brown bread, it's full of fibre" and "that's full of sugar, it'll rot your teeth" may just sound like something your mother used to say to make you eat the food you didn't like and stop you eating treats, but there is solid scientific fact behind them. Fibre is a key player in dietary quality and a great tool in staving off the obesity epidemic, and sugar, particularly added sugar, really will rot your teeth. Children with high DED had lower intakes of fibre and higher intakes of added sugar than their low DED counterparts.

Vitamins and minerals are crucial in a person's diet, in fact the word vitamins stems from the Latin for "vital for life". I examined 22 vitamins and minerals and found that the higher DED became the less of each and every vitamin and mineral the children consumed. There are certain targets set down for how much of each vitamin and mineral a person needs to remain healthy, a worrying outcome of my analysis is that the percentage of children that met these targets was far lower in the high DED group than in the low DED group.

It's all well and good to talk about protein, carbohydrates, fats, vitamins and minerals, but no one actually goes out and picks up a bar of iron or a slice of fat and eats it; they eat food. A very clear picture of the types of foods that children with high DED are eating emerged from my work. These kids were given by their parents or chose for themselves; real butter over a low fat spread, chips instead of potatoes and sugary drinks over water or juice. They had less fruit and veg in their diets and more chocolate and crisps than those with low DED. In essence they had more 'bad' food choices and ate more of these 'bad' foods than the low DED group.

## Conclusions

The evidence that a high DED is associated with poorer dietary quality is quite compelling. Irish children with high DED eat more calories and fat and get fewer vitamins and minerals in their diets. Overall they have less nutritious diets and are at higher risk of being overweight and developing nutrition related diseases and illnesses in later life, than their low DED counterparts. We can improve the quality of their diets by promoting a low energy dense style diet; which includes lots of fruit and vegetables, potatoes, brown bread, yoghurts and fresh meat.

With thanks to the fieldworkers who collected the data, the Irish Government for funding the project under the National Development Plan 2000-2006 and Professor Albert Flynn for his supervision.



# the fight for Palestine

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Eleanor Roosevelt was an American Hero. She had overcome great personal adversity by the time she read the Universal Declaration of Human Rights to the General Assembly of the United Nations in December 1948. The occasion represented the pinnacle of her life's work as an esteemed humanitarian. The title, "First Lady of the World", bestowed upon her by President Harry Truman was considered well deserved in view of her efforts for social justice and the protection of minorities — for those whose lives had been shattered by the Great Depression, for African Americans and for European Jewry when it was targeted by Hitler.

While the stories of the years of her marriage to Franklin Delano Roosevelt have attracted the attention of historians and resulted in numerous scholarly and popular works, the post-White House period has been thus far neglected. It is this latter stage that my research considers. It is acknowledged that her efforts during those early years have made her worthy of the high esteem in which she is held. However, from 1946 onwards, her ardent support of the cause of the Zionists for the creation of the state of Israel reveals a blindspot in her thinking, for it meant that the rights of the native Palestinians were ignored. Such disregard conflicts with her heroic reputation and has not been previously recognised. Perhaps by considering the cultural influences of her times, an understanding of this paradox can be gleaned

At present it seems that the Americans, more than most, like to have their heroes and their myths. Accounts of benevolence accompany periods of hegemony and serve to legitimise it. While mythology is built upon grains of truths it does not usually stand up to thorough scrutiny. Eleanor Roosevelt, although voted by *Time* magazine to be of the most influential women of the twentieth century, nevertheless still had her follies and foibles, and personified the biases and prejudices that were part of the US discourse. This became apparent in her disregard for the "Oriental" people of Palestine — a phenomenon which was coined as Orientalism by Edward Said. This is a form of cultural outlook that includes aspects of racism; it attributes certain negative racial characteristics to a whole body of people and allows the beholder to feel superior. Typically to the Westerner of an Orientalist lien, those living east of Greece are irrational, sensual, demonic, untrustworthy and incapable of self-governance.

Such racist views were commonly held amongst her aristocratic peers: African-Americans generally were visible only as servants, anti-Semitism was rife and Orientalism was subliminally absorbed by the mainstream. That she rose above much of this is attributable

to her own identification with the excluded. Despite her privileges, her childhood was forlorn as she endured the abuses of her parents' flawed union: those of a cold distracted mother who measured a woman's worth by her beauty and of a drug addicted and alcoholic father. Bereft as an orphan by the age of ten, Eleanor Roosevelt tried to fill the emotional gaps in her life by pleasing others. Her diminished self-esteem hungered for approbation. She struggled later to satisfy her domineering mother-in-law by being a dutiful wife to Franklin Delano Roosevelt but was rewarded only by marital infidelity. For her this had been a shattering discovery. That she had just cause to feel excluded is a valid assumption.

As family had failed her, she threw her enormous energy into her work. Her attempts to give voice to the silenced amongst the marginalised Americans were naturally followed by efforts to alleviate Jewish suffering after the Holocaust. There was obvious appeal in that, as a widow with great prestige after 1945, she could work to assist the Jews in Europe's Displaced Persons' Camps to fulfil their dreams of a Palestine homeland. However she did receive powerful warnings from well-placed and informed members of the US State Department that the resolution of the 100,000 refugees in Europe was likely to create another and numerically far greater displacement in Palestine. That she could not see or did not care is puzzling.

## **Supporting Zionism**

The Zionists had long campaigned for an independent homeland in their Promised Land. In 1917, because it suited the British war agenda, Lord Balfour declared their aspirations as a feasible project which His Majesty's Government could support despite the fact that Sir Henry McMahon had already given the same promise of possession of Palestine to the Arabs in 1915. Although, through the millennia, the Jews had suffered the fate of the social pariah, it was as a result of the Holocaust that Eleanor Roosevelt's Christian conscience was activated to atone for this neglect and for her it became a blinding crusade. She adopted a moral stance bound up with the Balfour "promise" and tacit American support from each President, starting with Woodrow Wilson in 1917. This was despite changed circumstances in Palestine through to 1947, when the campaign for partition reached its zenith. Her support of the Zionist rationale, that Jews would only be secure from harassment in a sovereign state of their own, has certain logic. Yet her work within the UN had provided the opportunity to be fully conversant with the interests and concerns of those seeking self-determination, as was large parts of the colonial world. The conflicts in Palestine between the Jewish settlers and the native Arab Palestinians, who sought affirmation of their majority rights, had been well aired.

Eleanor Roosevelt was able to overlook the Arabs voices who protested that the Holocaust had not been of their making, therefore its problems should not be for them to resolve.

Because Palestinians had already had to accept 600,000 Jewish immigrants, they argued that it was the turn of the Westerners, who articulated such concern for the Jewish plight, to take their share. Their view was disregarded. Their representatives in the Arab National League refused to accept the majority decision of the General Assembly and long warned of the violence that would be the result of the forced partition of Palestine. When David Ben Gurion announced the creation of the State of Israel, on 15 May 1948, the civil war which had been waging between the Arab Palestinians and the Jewish settlers turned into an international conflict with the invasion of Palestine by the joint forces of Egypt, Syria, Iraq and Transjordan. The Israeli victory generated the 700,000 Palestinian refugees who were to languish in appalling conditions in camps for decades.

Eleanor Roosevelt's attitude towards the Palestinians begs questions of her renowned humanitarianism. One aspect of her industriousness was the dissemination of her views through journalism. It is in the often hastily written and therefore somewhat unguarded statements of her daily "My Day" columns which reveal certain blindspots that can only be explained through an Orientalist framework.

Her constant references to the positive attributes of the Jewish immigrants, their integrity as a people, their industriousness in making the "desert bloom" in Palestine, their tenacity in the face of adversity, demonstrated her clear favouritism. Even when their paramilitary forces blew up the King David Hotel in Jerusalem in 1946 ensuring multiple fatalities, or when they assassinated Count Bernadotte, the UN mediator in 1948, she was unable to condemn these actions. Instead she offered exculpatory explanations as her biases were demonstrated.

## Opposing voices

Palestinian concerns were dismissed with platitudes as she hoped, that further to a fait accompli and the establishment of Israel, they would "quieten down". She wrote that the usurpation of their homeland by the Jews "will not hurt the Arabs, in fact they will profit by it, but we do not always like what is good for us in this world".

Amongst her files there are some poignant letters written from Palestine. Following the Deir Yessin massacre on 12 April 1948, in which 250 Palestinian villagers were murdered by Jewish forces, Wadad Dabbagh appealed to Eleanor Roosevelt for help as she had heard her speeches and was confident in her advocacy of justice. Her letter was respectful and considered as she described the atrocities being perpetrated on the unwitting and the innocent. However, her concerns were dismissed as Eleanor Roosevelt told her that these things happen in wars and that the Arabs were protesting "wrongly", as she believed that they ought to have acquiesced to the UN decision. Further correspondence revealed that this had not been the humanitarian response that Ms Dabbagh had been expecting.

American citizens, too, wrote to her to express their concerns. Lydia Bacon had had some experience in the Middle East. She believed that it was wrong to partition a state as small as Vermont. She recounted instances of prior American injustices towards non-white people: the Mexicans, the American-Indians and the African-Americans. She asked that “if Americans feel so badly for the Jews, why do we not give them one of our states? How can we give away another’s country?” In her column, Eleanor Roosevelt ridiculed this thought as “funny”. She argued that the citizens of a US state could not be arbitrarily displaced, and she put it to the author that she had not given her position much thought. She was countered by another perturbed citizen, who wrote that the comparison between Eleanor Roosevelt’s support for the usurpation of territory in Palestine from the Palestinians, in favour of the Jews, was identical with the analogy proposed by Ms Bacon, which Eleanor Roosevelt had described as thoughtless.

The Truman administration considered reversing its own vote, which had supported the partition of Palestine, in view of the continued turmoil and bloodshed there and the impracticality of enforcing the division. Such threat to the prestige of the UN as a decision-making body almost caused Eleanor Roosevelt’s resignation. For her, it was paramount for the UN recommendation to be enforced if the organisation was to be an effective force for peace. In this instance, the human rights of Palestinians, who formed a majority in their country, were secondary. The schism that her resignation would effect, whatever about undermining the UN, would certainly undermine the President’s potential for re-election. Truman’s swift and assuaging response prevented that cataclysm. And thus did the vagaries of US domestic politics undermine the Palestinian rights. This was not the stuff from which heroes or humanitarians were made.

In order to ensure the successful enforcement of partition, Eleanor Roosevelt herself had previously written to the Secretary of State, George Marshall, who, on the advice of such policy advisers as George Kennan of the Policy Planning Staff and Loy Henderson of the Division of Near Eastern Affairs, opposed hasty action. These experienced policy-makers argued that the turbulence in the Middle East acted against US interests. However Eleanor Roosevelt brushed aside their concerns and urged a lifting of the US imposed arms embargo in order that the Jewish community in Palestine could be equipped to adequately fight the Arabs. She also sought US tanks and planes to subdue them. In his rebuttal, the former US World War II general reminded her of the humanitarian aspects of the delicate problems affecting the beleaguered country. The irony of an army general having to discreetly recommend peaceful measures to a humanitarian is profound and further reveals the dichotomy.

There is no doubt that Eleanor Roosevelt devoted herself to assisting the plight of society’s victims. However it appears to be only to those who were either immediately visible to her within American society, such as the African-Americans, or to those with whose culture she could identify, that her sympathies were extended. She admired the industrious efforts

of the Jews in Palestine and the zeal with which the American Zionists approached their cause. This harmonised with her own Protestant work ethic and with her perception of the advantages of American-style development abroad. She appears to have had little contact with Arabs and no understanding of their culture. The Palestinians, because they were distant and were perceived to possess all of those negative “Oriental” attributes, could be dismissed as unworthy — their plight largely of their own making. She thus accepted the racist stereotypical portrayals of the East that were current in the America of her era. That those views were not universally shared amongst her peers and amongst the public reveals Eleanor Roosevelt’s limitations and exposes aspects of her character which allowed actions/interactions that have not been previously investigated or analysed.

Many thanks to my Supervisor, Professor David Ryan, for his welcome advice and assistance.

# Size matters: exploring the links between food portion sizes and diet quality in Irish children

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## **Bigger portions: what's the big deal?**

Food portions have increased over the last 20 years. This has been shown to be true for the foods we eat at home, those consumed at restaurants and fast-food outlets, and for foods sold in packages. Along with this increase in food portion sizes has been an increase in both child and adult obesity, leading to the obvious question: could larger food portion sizes be contributing to the obesity epidemic?

The World Health Organisation (WHO) has cited large portion sizes as a 'possible' dietary risk factor for obesity, which according to their definition means that 'more trials are needed to support the tentative associations'. Their caution is based on the fact that the evidence comes mainly from cross-sectional studies, which typically include a large number of individuals but are essentially observational, and therefore cannot conclude that the relationship between large portion sizes and obesity is a causative one. The WHO acknowledges that evidence based on clinical and laboratory investigations has been supportive, but realistically the controlled feeding studies that have shown that larger portion sizes increase one's energy intake at that meal cannot ethically be continued to show that larger portion sizes may cause weight gain to the point of obesity. So, the causative relationship between portion sizes and obesity, although inherently assumed true by many and a much-loved media topic, is something of a closed avenue. Indeed, it may be more relevant to investigate how food portions of different sizes impact on other aspects of one's diet, and where better to examine this than among children, who are not just our future but the future users of our stretched health services.

## **Previous research**

Studies have shown that young children, unlike the rest of the population, tend not to massively overeat. During the early years of life, eating tends to be driven by hunger and satiety cues alone, and, unlike teenagers and adults, young children have been shown to balance their energy intakes over a 24 hour period, such that high energy intake at one meal is typically followed by low energy intake at the next, and *vice versa*. As children

grow, however, they begin to eat in response to external cues such as the presence of palatable food, the time of day and the social situation, and so, inevitably, food portion sizes begin to influence energy intake in children, typically from about 4 years old. Aside from influencing energy intakes, however, little attention has been paid to how food portion sizes may influence other aspects of dietary quality in children, such as intakes of fat, iron, fibre and other important nutrients. This research 'gap' has provided an opportunity for the current work to be carried out.

## **The Irish link**

The aim of the current work was to use data from the Irish National Children's Food Survey (NCFS) to investigate how different portion sizes of a range of foods impact upon other markers of dietary quality on the days that they are consumed. The NCFS was carried out between 2003 and 2004 to establish a database of habitual food and drink consumption in a representative sample of Irish children aged 5 to 12 years. Five hundred and ninety-four children from across the country kept a detailed record of all the foods, drinks and supplements they consumed over a seven-day period, with help from their parents. In addition to this, anthropometric data (i.e., height, weight, leg length, waist and hip circumference), physical activity data and health and lifestyle characteristics were collected from both the child and their parents. Seventy-six per cent of all food items consumed on the survey were weighed using a digital scales, with a further 11% assigned weights from manufacturer's information (e.g., one can of Coke = 330ml). As dietary surveys go, this represents a large proportion of reliable weights, making the data particularly suitable for an analysis involving portion sizes.

For the current work, portion size (g) was defined as the weight of food consumed per eating occasion, and was estimated for each day that the food was consumed. Where a food was consumed on more than one occasion on one day, the largest portion size was assigned. The portion size data were then split into 'thirds' (small, medium and large portions), with aspects of dietary quality compared across the three groups.

Because the same portion of breakfast cereal may be considered a 'large' portion for a 5-year-old girl but a 'small' portion for a 12-year-old boy, simply splitting the portion size data into 'small', 'medium' and 'large' segments could not accurately reflect how different portion sizes affect other aspects of the diet. To get around this, each food type included for analysis was individually examined to see whether there were significant differences in the portion weights consumed by boys and girls, or by younger and older children. (Unsurprisingly, it was seen that boys typically ate larger portions than girls of the same age, and that portion weights of most foods increased with age.) Wherever significant differences were noted, the data were stratified (arranged in layers), meaning that the resulting three portion size groups represented relatively 'small', 'medium' and 'large' portions for that particular food. In other words, those in the 'small' portion group included a

mix of boys and girls of different ages, all of whom consumed 'small' portions of the food relative to their peers of the same age group and gender. Once the portion weights were arranged into these three groups, it was possible to look at mean intakes of a selection of nutrients on the days in which the foods were consumed, to see whether differences occurred between the groups.



Figure 1: Food portions were split into three groups for analysis

(Photo with permission from [www.calorieking.com.au](http://www.calorieking.com.au))

## Key findings

The analysis showed clear evidence for the 'sugar-fat seesaw' phenomenon, in that children who ate larger portions of high-sugar foods (e.g., sugary sweets and sugar-sweetened beverages) were seen to have decreased intakes of fat on that day, and those who ate larger portions of high-fat foods (e.g., pizza and chips) had decreased sugar intakes on that day. This finding has significant implications for interventions aimed at improving the quality of Irish children's diets. It suggests that, as recommended by experts in this area, a key measure in enabling children to meet their fat and saturated fat goals would be to encourage the substitution of high-fat foods with starchy foods like potatoes, rice or pasta; starch, essentially, being a healthier and less refined form of sugar.

Table 1 provides a snapshot of my findings. It describes the percentage of total energy provided by saturated fat (mean values) on the days in which the named foods were consumed. It is recommended that children obtain no more than 11% of their total daily energy from saturated fat, with increasing intakes known to increase the risk of coronary heart disease. We can see from the table that all of the mean values exceed this, and so in general, this population goal is not being achieved by Irish children. As we look from 'small' to 'medium' to 'large' on the table, it is possible to see how the percentage of energy from saturated fat changes as the portion size of each of the foods examined increases. The column labelled 'P' uses arrows to denote statistically significant increases



Table 1: Saturated fat as a percentage of total energy on the days in which the foods were consumed

Foods	Portion size groupings			
	Small	Medium	Large	P
Pizza	13.5	14.4	14.4	
White bread and rolls	14.4	14.0	13.3	↓
Brown bread and rolls	14.4	13.7	13.3	↓
Boiled potatoes	14.7	14.1	13.2	↓
Chips	14.0	13.9	13.4	
Breakfast cereals	14.2	14.0	13.5	↓
Fruit	14.4	13.7	13.2	↓
Vegetables	14.5	13.8	13.8	↓
Roast meats	14.1	13.8	13.6	
Frying meats	14.7	14.8	15.0	
Eggs, cooked	15.0	14.2	15.9	↑
Milk	13.1	14.4	15.2	↑
Cheese	14.5	15.1	16.7	↑
Chocolate	14.2	14.8	15.7	↑
Sugary sweets	14.2	13.6	12.6	↓
Fruit juice	13.8	13.8	13.4	

or decreases in saturated fat as a percentage of total energy as portion size increases. The table, therefore, shows that larger portions of white and brown bread, boiled potatoes, breakfast cereals, fruit, vegetables and sugary sweets are associated with a reduction in saturated fat on the days in which they are consumed. An increase in saturated fat is observed with increasing portions of eggs, milk, cheese and chocolate.

## Discussion

The issue of food portion size is becoming ever more topical. This has not gone unnoticed by food manufacturers, who have come up with various ‘helpful’ techniques to discourage consumers from overeating: 150g crisp packets are now marketed as ‘sharing’ packs, the idea presumably being to stop eating when you reach 35g, which is the standard pack size. Multipack crisps offer another opportunity to consume a smaller portion (typically 25g versus 35g); however, to access smaller pack sizes it is necessary to buy a stock of them together, and willpower is then required to ignore the remaining goodies. Fast-food outlets are aware of the portion size issue too, and while it is still entirely possible to purchase enormous meals, there does seem to be some acknowledgement of the issue, as witnessed by McDonald’s recent withdrawal of its supersize menu option.

While the issue of food portion size seems to be growing in importance, it tends to dwell



Figure 2: Bread and milk — still staples among Irish children but portion size matters

on the portion sizes of less healthy foods, giving less attention to the portion sizes of healthier foods and the effects that these may have on the overall diet. The current work takes a somewhat new angle in investigating associations between portion sizes of a wide variety of foods, both ‘healthy’ and ‘less healthy’, that are commonly consumed by Irish children and how these may impact on the diet.

## Conclusion

In May 2011, the Irish Medical Times reported the plans of the HSE to tackle the so-called ‘Big Six’ diseases, that is, the six main chronic diseases suffered in Ireland which account for up to 90% of chronic disease morbidity, with associated lost work days and long-term healthcare expenses. The diseases are stroke, acute coronary syndrome, heart failure, chronic obstructive pulmonary disease (COPD), asthma and diabetes. Dietary factors play a major role in the onset of many of these illnesses, or, put more positively, it is possible to prevent the occurrence of a significant proportion of these illnesses by focusing on improved nutrition and maintenance of a healthy weight, particularly from childhood.

Findings such as mine are only relevant if they can be applied to real life. Food portions have been cited internationally as a ‘crucial issue’ to be included in food based dietary guidelines; however, the most recent dietary guidelines for Irish children are somewhat vague in recommending that ‘a balanced intake of all foods in the appropriate amounts should ensure the optimal development of a child’. Because my findings describe specific associations between food portions and other important markers of dietary quality, they should be useful in the development of more practical food-based dietary guidelines aimed at Irish children in the future, for which there is clearly a need.

Jacqueline Lyons is a PhD student in the School of Food and Nutritional Sciences under the supervision of Professor Albert Flynn. The author wishes to acknowledge funding from the

Size matters: exploring the links between food portion sizes and diet quality in Irish children

JACQUELINE LYONS

Irish Government under the National Development Plan 2000-2006.

# Why do skeletons lie about their age?

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## Introduction

Age is, essentially, a dichotomy of socially defined hierarchies and chronological measurement. On the one hand, an individual is labelled according to a socially defined passage of time (e.g., infant, adult, etc. . . ), which reflects their level of participation within the community, and, on the other, according to a chronologically measured passage of time. Whilst these elements are mutually exclusive in their construct, to varying degrees they are dependent on each other for their definition. It is the variation in these definitions that presents a bioarchaeological paradox. The labels of one element have been borrowed by the other, resulting in semantic confusion of social and metric labelling, which has negatively impacted on any attempt to answer one of the most basic of osteological inquiries, age-at-death estimation.

Is a 14 year old in India, who is betrothed, works full time and contributes financially to the household an adult or child? Is a 30 year old in Ireland, who is single, unemployed and who lives in the parental home an adult or a child? Different cultures will define them very differently. In the forensic analysis of human skeletal remains, there is little room for such subjectivity. As such, the intransigence of metric definition disenfranchises the individual of much of their identity and much of what defines the culture of which they were a part. Attempting to identify the activities in which an individual was engaged over their lifetime will go some way to redressing that imbalance.

## Hypothesis

Fundamental to any forensic investigation of archaeologically retrieved human skeletal remains is the estimation of age-at-death. Because of known chronologies for bone growth and tooth eruption, pre-adult and young adult age estimation is a fairly straightforward and accurate procedure. On the other hand, methodologies used to establish an accurate age-at-death of adult skeletal remains apply chronological age to the natural maturation and degenerative processes of specific anatomical points of reference. However, these methodologies have been shown individually to be inaccurate through consistently over-aging younger adults and under-aging older adults (by up to 20 years).

The primary aim of this research is to determine why methodologies which incorporate anatomical sites subject to general repetitive lifetime activities (as most of them are) give consistently inaccurate age-at-death estimations.

One of the anatomical points of reference used by osteoarchaeologists to estimate age-at-death in adults is the auricular (ear-shaped) surface of the sacro-iliac joint. The joint is located where the sacrum (base of spine) joins the ilium (top part) of the os coxae (pelvic bones). Patterns and combinations of different features (for example, pores and bony growths) can be seen on individual joint surfaces. It is the presence or absence of these patterns and combinations that are associated with different age groups.

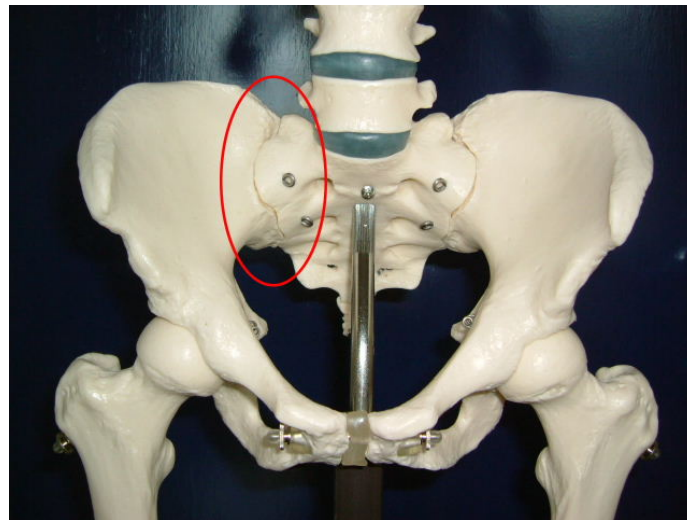


Figure 1: Sacro-Iliac Joint

This joint is particularly important to osteoarchaeologists because of its high rate of preservation in archaeological contexts. Because the joint is held in place by strong ligaments, the surfaces of the joint are protected during the decaying process and subsequent ‘settling’ of earth surrounding the individual.

However, methodologies motivated by this joint have shown to be as inaccurate as the other techniques available to forensic anthropology, and, as with techniques using other anatomical points of reference, the pattern of inaccuracy has so far not been satisfactorily explained.

Research carried out by radiologists has demonstrated that, far from being a completely fixed joint, as previously thought, there is a downwards movement during walking, while the hips rotate from side to side creating a shearing effect (Kampen and Tillman 1998). Given the function of the sacro-iliac joint in weight bearing and weight distribution to the lower limbs, it is argued that repetitive occupational stress from the individual human experience has a fundamental bearing on development and degeneration of the joint and in particular on features on the auricular surface, irrespective of chronological aging.



Figure 2: Auricular surface showing 'Groove' feature.

## Materials Used

An assemblage of skeletal remains of known age at death was archaeologically retrieved from the crypt of Christ Church, Spitalfields, in London. The collection amounts to a total of 987 individuals. Of those, 250 are of known age-at-death, sex and occupation (unique in an archaeologically retrieved collection). These include a wide variety of occupations, including those involving heavy lifting and manual labour. This assemblage was added to a comparative sample from the University of Coimbra, Portugal, of individuals from the late 19th and early 20th centuries of known age-at-death and occupation.

Twenty-six features on and around each auricular surface were investigated and tested as to association with pre-defined occupation types. Many of these features were common to all previous methodologies. Several previously ignored features were included, as they showed the potential to be influential in the formation of the different patterns used for estimating age-at-death. These included markers on the bone surface that indicate where ligaments and muscles are attached. For these particular features, the premise is simple: the larger the marker, the stronger the attachment, the bigger the muscle, the more biomechanically loaded the activities that led to the muscle growth. The individual occupation types were grouped according to four basic groups, representing activities subject to decreasing definitions of assumed mechanical stress: Artisans, representing, for example, manual labourers; Domestics, representing light manual activities; Master Craftsmen/Weavers, representing skilled work that did not involve the heaviest of assumed mechanical loading; Professionals, the latter assuming a limited lifetime exposure to biomechanical stress.

## Findings

Of the 26 features that were investigated, all demonstrated different degrees of association with specific occupation groupings. Some features were significantly associated with a particular individual occupation type. It should be possible to statistically refine the specific occupations from within each group in order to isolate similar long term activity types from past populations.

Some features were associated with all occupation group types but to either decreasing or increasing degrees of significance, depending on the assumed biomechanical loads associated with each occupation group. These patterns were also demonstrated within broad age groups. This shows that the rate of appearance of certain features on the auricular feature is influenced less by actual aging than by the biomechanical stress involved in certain occupation types and the time span over which those activities are regularly performed.

## Conclusion

The impact of repetitive occupational stress determines which features on and around joint surfaces are the result of habitual activities over an extended period of time during an individual's life. Where these features are used in methodologies to estimate age-at-death, a labelling bias is unavoidable when an attempt is made to assign a chronological age to an individual. Isolation of the bias will facilitate more accurate forensic interpretation of age of an individual and the potential to identify even broadly definable activity types within human skeletal remains which will benefit not just forensic and osteoarchaeological interpretation of the individual, but also demographic interpretation at a community and cultural level.

The theorisation of 'age' in archaeological thought has facilitated debate on the degree to which the application of a chronology to biological remains is influenced by cultural and social definition of age, and the activities associated with it. Within the debate, there is a resistance to the idea that features on bone surface derived from muscle and ligament attachments are clear indicators of specific cultural or occupational activities. Research has already indicated muscle stress markers for activities as specific as kayaking and horse riding and more recently on specific occupations such as weaving. One main point of contention in the debate, however, is the suggestion that collective activities will have a cumulative effect on the skeleton in respect of bone change.

This research has shown that not only does the stress from repetitive occupational activity leave specific features on the bone surface, but that they are in fact responsible for the inaccuracies in forensic methodologies for estimating age-at-death. As a consequence, it shows the need to address the evidence of lifetime activity on human skeletal remains in a

manner which requires a reappraisal of our definition of the role of our ancestors in their community and how this can be best portrayed outside of the age labelling bias of the present.

I wish to acknowledge the help and support of Rob Kruszynski at the National History Museum, London, and all the staff in the Department of Anthropology at the University of Coimbra, especially Dr. Ana Luisa Santos. I am grateful, also, to Beverly Schmidt at the University Of Connecticut for her encouragement and patience and thank Dr. Barra Ó Donnabháin for his supervision.



# Are we citizens adrift or citizens assured?

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What does citizenship mean to you? What role does your nationality play in your identity? I am a person of dual nationality; I am born in America and my father was Irish. I grew up never feeling truly American, as my mother was Italian and my dad, having lived most of his adult life in California, remained pure Irish, from the friends he played golf with to an accent none of my American friends could understand. I remained 'on the fence' regarding my American citizenship. Although we lived in southern California, all our family friends came from Ireland and my house was always filled with people visiting from Europe.

After America went to war, I moved my family to Ireland in search of a different way of life far from the hectic insanity of Los Angeles and I found myself in Cork in 2003, in a completely different world. In some ways, I felt I was home; I finally understood the part of me that was Irish and yet, there are times when I still feel an outsider in the same way I did in America, not really feeling American and not quite Irish.

In my choosing of the subject of my dissertation, *Alexis de Tocqueville, Democracy America: The Influence of French Citizenship on the Theoretical Vision of Tyranny of the Majority*, I can explore the manner in which our citizenship influences our visions of other countries and cultures. By gaining a better understanding of citizenship, one can recognize the bias that exists as a characteristic of nationality. In seeking to safe-guard the power of the individual; citizen participation requires a perspective aware of any prejudice created by culture. There must be recognition of the influence of cultural practices and an understanding of how historical references impact on a citizen's view of citizenship, in order to obtain the power to create change and move forward.

## **Connection, participation, and patriotism**

After one year of research, I am hardly an expert on the complexity of citizenship. However, I do believe that, in order to be a true citizen, three components of citizenship must take place physically and mentally. The citizen must feel a connection, participation, and a sense of patriotism to the country of their birth or the country of their choice.

Let's examine those three ideas further. The idea of obtaining a connection to something bigger than ourselves, whether it is a political concept, a religious viewpoint or a society as a whole is an interesting and enlightening prospect for any human being. Everyone on

earth is seeking answers and desires a place by which they can offer their own individualistic characteristics to an enormous melting pot of millions of other human beings. It is in our nature to crave acceptance and seek out similarities of ourselves in others. Citizenship creates a partnership with a country and the inhabitants of that country. In other words, we become a member of that club, an organization that can offer a safe place in which to show our true identity.

In my research, I am discovering that, if one observes human behavior, they can discover a link between the citizenship and opinion. Our thoughts and reactions to circumstances stem from the historical events of our nation's past. For Alexis de Tocqueville, the death and destruction of his ancestors during the French Revolution would have a profound effect on his own vision of France and subsequently, America. In Ireland today, one may relate to their ancestors' need to immigrate and establish a life away from their native homeland. However, the citizenship connection will not cease to exist upon the departure of the citizen. The boundaries of citizenship are uniquely limited to the participation of the individual. Therefore, as ex-patriots are permitted to vote in elections, Irish citizens retain their right to create change.

Participation is the best way a citizen can influence decisions both politically and socially. Participation requires a motivation to become involved, and in my research, I have discovered that in all nationalities studied so far, the common link appears to be that citizens often do not participate for two reasons. One is a sense of powerlessness and a belief that their vote will not matter and their voice will go unheard and the other reason is basic cynicism about how politics will play out in their country, and that there is no real solutions to political issues. They prefer to not include their votes or ideas as they have already chosen to give up on their citizenship and believe that their opinions can no longer make a difference. In many ways the media and sometimes politicians themselves, help that ideology to thrive. Yet, without participation, citizenship is weakened and there is an exclusion of voices that have something to say. We all have something to contribute to our country as each of us has a unique vision of life. Therefore, in order to share our knowledge, participation in the making of the laws and the choosing of our politicians must occur in order for our ideas to matter and for change to be created.

Patriotism has been described by great literary minds over the centuries as a result of a successful relationship between the State and the people. In other words, I feel good about my country; therefore, I am patriotic. However, what about when things get tough, when the economic climate is so bleak that people feel they have to flee to other countries to earn their crust of bread? My dad immigrated to America and I returned to Ireland. I am here now because I believe every country has so much to offer and we need to seek out opportunities to make things work with a positive energy. I know it is appealing to immigrate to other countries when times are tough or when a country chooses to go to war and you are pro-peace. I know it is easy to listen to the media tell us the sky is falling

and we are all doomed. It is normal to want to walk away and create a new beginning. Therefore, as patriotic citizens, it is necessary to take action when times are difficult. It is important to establish a belief in your country again. That does not mean one should not experience other countries and cultures. A citizen can retain the ability to contribute to changing their country and changing the rules. That is why you can vote when you live abroad, you still have your say. The question is; are you a citizen on a raft, waiting for rescue, despondent and discouraged, or are you the citizen assured that feels empowered and motivated to create a better world?

## **Discovering our citizenship identity**

The complexity of citizenship means it can be broken down to many different components. However, it is important to recognize the significance of connection, participation, and patriotism as three ways we can demonstrate our citizenship identity. Therefore, it is important to discover the connection between ourselves and the nation of our birthright or our adopted homeland in order to better understand ourselves. Perhaps it is necessary to participate as a citizen to create change and for our country to progress and if so, we need to find our patriotism and allow that bond to bring a positive energy into our lives. In order to better understand our identity, we need to ask ourselves what citizenship means to our individuality, and how our citizenship influences the way we see our world. When we reflect on our nationality, can we remove self-interest in order to do what is best for our country as a whole? Maybe not, yet we can try to balance the scale between what is best for ourselves and what is best for the state by bringing together a connection to society, a participation to create change and progress, and most importantly, loving our country where we are born and/or the country we have adopted. In my research thus far, I have learned that the path we take in life is often influenced by our ancestors. The vision we see of the world is dependent on our childhood memories and the historical events of our nation. I fear for the perspective of future generations growing up in a world of such negativity and greed. As citizens, our only recourse is to demand changes be made both politically and socially in a worldwide desire for equality and freedom. Creating this kind of partnership requires the ability to look beyond self-interest and seek out the actions one can take to improve their country for future generations. The devotion to our future fellow citizens defines our humanity.

Angela Mazza is a student for the Department of French Language and Cultural Studies and supervised by Dr. Paul Hegarty and Dr. Patrick Crowley. The author would like to acknowledge the advisors and the entire French Department for their support, wisdom, and kindness.

# Palliative care for all . . . . Really?

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## Introduction

I have a friend, who, alongside her family, struggled with her father's illness for over two years. He travelled a slow and difficult road towards the end of his life. He was diagnosed with a chronic respiratory illness a few years ago, with a life expectancy of six months. The mainstay of their support was the family GP and infrequent visits to the Consultant. When palliative care was suggested by a friend, as a support, their response was 'but he hasn't got cancer'. After a little encouragement and a speedy referral, the local community palliative care team came into their home and he and his family's journey became a more peaceful and managed one. Their journey was transformed, not because palliative care services altered his diagnosis in any way, but because they supported the patient and his family in dealing with the present and immediate future. Palliative care services assisted in managing his symptoms to minimise distress to him, and facilitated his family in keeping him at home, as was his wish, for his final days.

The palliative care needs of people with significant chronic respiratory disease and heart failure have been recognised in international studies for over a decade. However, traditionally, palliative care has been seen as almost synonymous with cancer care, to the detriment of those diagnosed with any other non-malignant (non-cancer) significant chronic illness.

## Background

Palliative care is defined was by the World Health Organisation in 2002 as '... an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual'. Since the early 1990s, international health policy has acknowledged that palliative care should be available to people with diseases other than cancer, yet palliative care provision in non-malignant illness is still not well developed in an international context.

When examining palliative care provision within Ireland, access of patients with non-malignant diagnosis to palliative care services suggest that only 9 % of all referrals to

the palliative teams were from patients with a non-malignant diagnosis. Traditionally, palliative care has been offered most often to people suffering from cancer, despite the four highest causes of death being chronic illnesses other than cancer. So do we find ourselves in a situation of a 'two-tiered' delivery of care for the palliative patient? Patients with cancer and their families are offered and encouraged to utilise the palliative care services, yet patients with non-malignant chronic illnesses remain self-caring.

Why is it that patients with non-malignant illnesses are not being referred to palliative care services? It could be partly because the disease trajectory of cancer is more predictable including predicting life expectancy, which makes recognising and planning for the needs of patients and their families easier. As well as the uncertainty in identifying the trajectory of the disease process, there is also the difficulty in relation to the reluctance of people to speak about death and dying. It is almost as if death is a more immediate thing when talked about. This would be true of patients with all types of diagnosis. Yet, this reluctance seems more prevalent in relation to significant chronic illnesses, from both a patient and healthcare professional point of view. Again, this may be because of the unpredictable nature and potentially lengthy duration of the non-malignant chronic illness. There is evidence to suggest that there may be a lack of knowledge or understanding of palliative care on the part of many medical teams, as well as a lack of understanding on the part of many patients and the role of palliative care. This lack of understanding is surely an influencing factor in referrals to the palliative care services.

But am I making something of nothing here, is it an issue for patients with significant chronic illness, to have limited access to palliative care? Does it affect their symptom management and quality of life? Would it not be interesting to see how do patients with significant chronic illness manage without a palliative care input?

## **Method**

The aim of this study is to explore the experiences of palliative patients with chronic illness in relation to their own symptom management as this management is the purpose of palliative care services. Symptoms are considered in a broad sense, in relation to physical, psychological and spiritual, as per the definition of what palliative care is. The chronic illnesses considered in this study are Chronic Obstructive Pulmonary Disease (COPD) and Heart Failure. Patients are being asked to share how they are managing the symptoms of their disease. Patients share their story with me, by means of interview. Grounded theory involves analysis of the information, to allow development of theories about the patients experiences based on their interviews, rather than on my prior beliefs about the topic. Ethical approval has been granted for this study. Recruitment is ongoing and patient interviews have commenced.

## Conclusion

The information will provide a framework for improvements to clinical practice by helping caregivers understand chronically ill patients' palliative care needs. The findings will be discussed with groups responsible for delivering palliative care and developing policy relating to palliative care in Ireland, with the aim of achieving improvements for chronic illness management.

Ann McAuliffe is a PhD Student at the School of Nursing and Midwifery under the supervision of Professor Eileen Savage and Dr. Tom Andrews.

# Constructed wetlands in Ireland

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## Domestic wastewater treatment in Ireland

In comparison to other European countries, Ireland has a very large rural population. As of 2006, 42% of Irish people lived in rural areas. In cities and towns, wastewater is generally treated by centralised treatment plants. However in rural areas, wastewater from domestic treatment is typically decentralised, i.e., wastewater is treated on-site. The most common method of on-site wastewater treatment is private septic tanks and associated percolation areas. In all, there are 400,000 septic tanks in use around the country.

These septic tanks and percolation areas are in various states of maintenance. Often, septic tanks are leaking or incorrectly constructed. Percolation areas are frequently clogged and do not treat the wastewater adequately. Typical treatment efficiencies of this system are of the order of 40% removal of organic matter, and 15% removal of nitrogen and phosphorus. Faulty septic tanks and percolation areas are viewed as a major environmental concern by the EU. In Ireland, there is no legal obligation to monitor the effluent from septic tanks and percolation areas. In October 2009, Ireland was taken to the European Court of Justice by the European Commission for failure to put in place adequate legislation to cover septic tanks and percolation areas. Recently, in May 2011, the Commission brought Ireland to the European Court of Justice for a second time, seeking to have a fine of €2.7m imposed, along with a daily penalty of over €26,000 for Ireland, as no legislation had been put in place.

Clearly, the government will be forced to act to address this issue. A likely solution is the upgrading of existing septic tanks and percolation areas. This cost is likely to be borne by the homeowner. With this in mind, it is obvious that an effective and affordable domestic wastewater treatment method is required in Ireland.

## Nature's kidneys

In our bodies, kidneys serve many functions. A primary function of the kidneys is to filter blood to remove waste materials. This process also occurs on a very large scale in wetlands, where wastes are removed from the waters that pass through them. For this

reason, wetlands are frequently referred to as “nature’s kidneys”. There are many types of natural wetlands, including marshes and swamps.

A natural wetland is an area that is submerged by water for periods long enough to keep the soil conditions saturated. There are a number of physical characteristics of natural wetlands that contribute to their waste-removal abilities.

Firstly, water moves slowly through wetlands. This allows the settling of suspended materials and the adsorption (attachment) of pollutants to the soil substrate. The phosphorus in wastewater has a high affinity for iron, aluminium and calcium in soils. Phosphorous binds to these elements in the soil, and over time the amount of phosphorus in a wetland steadily increases.

Secondly, high levels of microorganisms are present in wetlands. These microorganisms utilise and transform nutrients and pollutants in the water as part of the nitrogen cycle. For example, nitrifying bacteria in the wetland soil convert ammonium to nitrate, which can be taken up by plants. At the same time, denitrifying bacteria convert nitrate in the soil to nitrogen gas, which enters the atmosphere.

Finally, wetland plant species use large amounts of water during their growing season. Bulrushes, for example, are known to triple their biomass (the weight of the above-ground material) in one year.

## **Constructed wetlands**

Constructed wetlands are engineered systems designed to replicate the wastewater treating ability of natural wetlands. Most constructed wetlands are similar in make-up. A basin approximately 1 m deep and 5-25 m wide is excavated from the ground. It is lined with an impermeable plastic membrane, or semi-permeable clay soil. A mixture of soil, sand and gravel is used to fill the basin. Aquatic/wetland plant species, e.g., rushes and reeds, are planted on the surface. Wastewater enters at one end and flows slowly across the surface or through the substrate. As it does so, it is treated by the plants, substrate and microorganisms. The treated wastewater is then discharged at the end to a receiving water body (Figure 1).

There are a number of advantages to using constructed wetlands. Treatment efficiencies are typically very good. Removal rates of up to 95% of organic matter, nitrogen and phosphorus have been reported. Running costs are quite low as the plants and soil microorganisms treating the wastewater do not need any fuel/electrical supply. The biomass can be harvested and changed in to wood-chip pellets. The system can be regarded as sustainable and wetlands can be built to fit the landscape.

There are, however, disadvantages. During winter, many plants are dormant and soil



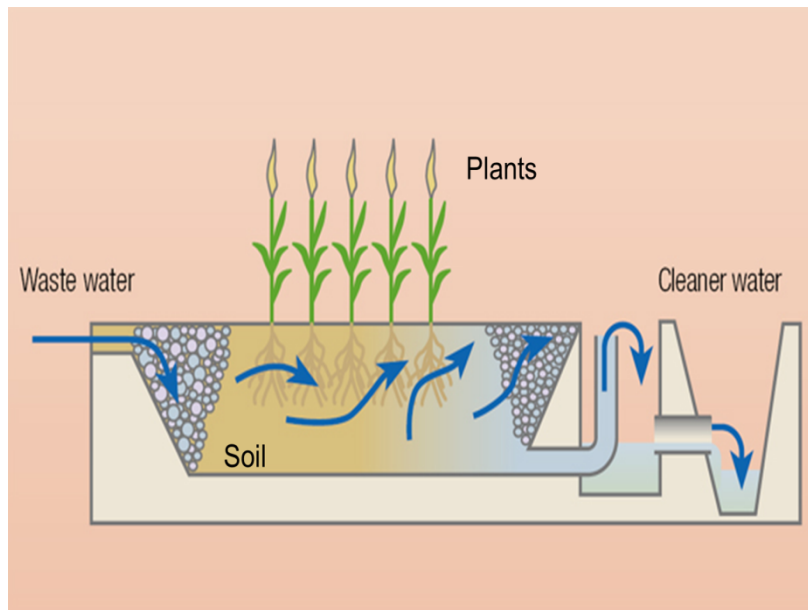


Figure 1: Schematic of wastewater flow through wetland © United Nations Environment Programme 2003

microbial action decreases due to lower temperatures. This limits both the amount of wastewater that can be used by the plants, and the level of treatment that can be achieved. Unlike septic tanks and percolation areas, the effluent from constructed wetlands must be monitored. This imposes a financial cost on the wetland owner, and has hampered the spread in popularity of wetlands in Ireland.

The biggest issue facing constructed wetlands is the large area of ground or “footprint” that is required to achieve the desired treatment levels. Many constructed wetlands for individual houses require the same footprint as that of the house itself. This limits the uptake of the system due to inadequate space availability or high land prices.

## Zero-discharge constructed wetlands

A zero-discharge constructed wetland is similar to a conventional constructed wetland system, with one major difference; there is no effluent output at the end of the treatment process. All the wastewater is used up by plants *via* transpiration, or by evaporation from the soil/water surface. The system is sealed by an impermeable liner, so there is no seepage to groundwater.

As mentioned above, currently in Ireland there is no legal obligation to monitor output from septic tanks and percolation areas, even though treatment efficiencies are known to be low. While it is widely accepted that treatment efficiencies from constructed wetlands are much higher, effluent from these systems must be monitored. With no effluent to monitor, zero-discharge constructed wetland systems are ideally placed to offer high treatment

efficiencies without the associated monitoring costs.

## Research goals

My research focuses on the application of constructed wetlands for domestic wastewater treatment. In particular, I wish to explore how to increase the efficiency of wastewater treatment and use by wetlands. This will hopefully lead to a decrease in the footprint required. A smaller footprint would make this system more attractive to homeowners. This would then hopefully increase the uptake of the system.

I will be exploring the applicability of zero-discharge wetlands in Ireland. Very limited research on this system has been carried out in Ireland to date and it will be interesting to compare the applicability of this type of system in Ireland with areas where it is more widespread, e.g., Denmark.

My research to date has largely been focussed on wastewater use. The more wastewater that can be processed by the system, the more efficient the system can be. A more efficient system requires a smaller footprint to treat the same volumes of wastewater.

Currently, I am investigating water use by willow trees. The use of willow species in constructed wetlands is widespread. Willows are fast-growing wetland species, capable of growing up to 3m in one growing season. A characteristic of willow trees that makes them very suitable for wastewater treatment systems is the fact that they are tolerant of coppicing. Coppicing is the cutting-back of trees to stump level to produce many new shoots. The coppicing of willows during their inactive winter period produces high levels of re-growth in the ensuing spring. The willow species I am working with is *Salix viminalis*. This species is common across northern Europe. Currently, I am investigating the difference in water use between coppiced and un-coppiced willows. I will also be investigating the use of water by willows across a 3-4 year life cycle.

In the future, I will be investigating the optimum plant assemblages for use in constructed wetlands, with a view to getting year-round treatment of wastewater.

## Conclusions

There is a clear need for a small-scale wastewater treatment method in Ireland to replace the septic tank and percolation area system. Constructed wetlands are capable of delivering the desired treatment efficiencies. The low maintenance costs and aesthetic qualities of wetlands contribute to their suitability for domestic settings. Research into reducing the footprint required for constructed wetlands, and into zero-discharge wetlands which

do not require monitoring, could lead to a greater uptake of this sustainable treatment system.

The author wishes to thank Professor Peter Jones and Dr. Pat Whelan for their supervision and the Irish Research Council for Science, Engineering and Technology (IRCSET) Embark Initiative for funding this research.

# Sean O’Faoláin, *The Bell* and the voice of Irish dissent

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## Introduction

In October 1940, *The Bell* magazine was launched in Dublin under the editorship of Sean O’Faoláin. ‘Whoever you are’, declared O’Faoláin in his initial editorial, ‘Gentile or Jew, Protestant or Catholic, priest or layman, Big House or Small House — *The Bell* is yours’. These words rang true throughout O’Faoláin’s tenure at the helm of this influential periodical and ensured he was at the centre of the national dialogue concerning Ireland’s identity. My research will identify and examine how his highly politicised — and often censored — editorials served as the springboard for an exploration of the collective malaise of a burgeoning yet often stunted post-revolutionary society.

## A most debatable state of flux

Ireland of the 1940s is often maligned as a cultural wasteland, isolated politically and artistically as the war against Fascism raged elsewhere. As the new Ireland attempted to define itself, Seamus Deane remarked upon the era in rather bleak tones: ‘Ireland ceased to be a mythological centre and became a provincial backwater’. However, this view is something of an exaggeration. In *The Emergency* (1978), Bernard Share remarks that these years of isolation did show some signs of cultural and intellectual vitality and were marked by a rising agitation against the country’s ruthless censorship policy. O’Faoláin himself had raised the ire of the Censorship Board in 1936 when his novel *Bird Alone* was banned and, in response to this, he made it his business to launch consistent attacks on the board, considering their mentality to contravene revolutionary aims to be a sign of ‘nationalism-in-decay’.

This research focuses on *The Bell* magazine, as it was the ideal platform for O’Faoláin to launch his principled opposition to the attitudes represented by the unremitting wave of censorship and to open the eyes of the public to the world beyond Ireland, a world in which the country’s future was to lie. To achieve the latter, he had to focus his countrymen on the current state of their own country and O’Faoláin’s ‘spikily infuriating common sense’ came to the fore in his editorials, as he repeatedly exasperated the pro-censorship

lobby. He asserted that the board was completely out of touch with Irish cultural appetites, pointing to a large amount of respected writers who had fallen foul of the board's blinkered vision. These appetites, O'Faoláin believed were 'in the most debatable state of flux.'

A number of articles and pieces, originally published by O'Faoláin in the pages of *The Bell* — such as *The Tailor and Ansty* — were homages to a rural Irish tradition consisting of earthy language and 'innocent laughter' which again proved too much for the Censorship Board. These conflicts represented a public battle waged by an 'official' Ireland against what it left outside itself. My research will investigate how O'Faoláin, through the pages of *The Bell*, encouraged both his readers and his writers to appreciate the idea of the local or rural as part of an international viewpoint; the traditional Irish world is both preserved and criticised in its pages.

## **The crucial role of the periodical**

O'Faoláin's biographer Maurice Harmon once opined that 'to make a complete bibliography of almost any Irish writer or to get a proper understanding of contemporary issues at any particular period it is necessary to examine the relevant periodicals...in pointing to a rich source of information that is frequently ignored...' Indeed, the study of periodical literature is sadly neglected. However, these magazines, particularly from the early 1940s onwards, trace a series of important events and innovations which lie just below the surface of Irish society and ultimately contain the seeds of the more dramatic changes in Ireland which were to occur in later decades.

As far back as 1971, Richard M. Kain, invoking George Moore, referred to the periodical genre as an 'untilled field'. One of the defining characteristics of periodical literature is that it serves as an initial training ground for upcoming writers, a resource for more established writers to experiment and as a forum to expound upon the burning issues of the day. In fact, *The Bell* itself in particular is a vital account, teeming with satires, sketches, advertisements, letters, all creating a constant and passionate dialogue about 1940s Ireland.

With O'Faoláin as editor, each issue of *The Bell* produced a unique sense of cohesion amongst disparate groups of individuals, linked together through a collective sense of identity which also offered a focus with which to interpret the world. Gerry Smyth remarks that '... the essay, the editorial, the work-in-progress and the review are present-orientated discourses... They are discursive in the sense that they are recognisable interventions in on-going debates.'

This research into *The Bell* will demonstrate how it became one of the defining literary and cultural magazines of its era, particularly due to O'Faoláin adapting a heavy social and literary responsibility. The magazine was a refuge for forward-thinking writers, thwarted

by the burden of anti-intellectualism in Ireland itself, with the likes of Brendan Behan, John Montague, Michael McLaverty and James Plunkett all benefiting from publication in the magazine at an early stage in their careers.

### **Sean O'Faoláin: cultural theorist**

Research into Sean O'Faoláin is a similarly underdeveloped field and I intend to rectify this by reading O'Faoláin as a cultural theorist. Pre-empting the dawn of cultural studies, O'Faoláin demonstrated his clear sense of the transformative potential of culture and of the written word as a refreshing contrast to the suffocating influence of the Irish State which insisted upon national inflexibility and closure.

O'Faoláin and *The Bell* laid the groundwork for a period when the analysis of culture within society was to become a crucial aspect of intellectual debate. In this instance, O'Faoláin's interests were shared with the cultural theory espoused by Raymond Williams, whose studies served as a major outlet for socio-political inquiry and criticism. Terry Eagleton could just as well have been speaking about O'Faoláin when he remarked that Williams' pioneering work 'insisted that culture meant not just eminent works of art, but a whole way of life in common; and culture in this sense included language, inheritance, identity and religion'.

As the Ireland of the twenty-first century recoils from a period of immense upheaval, our need for cultural commentators such as Sean O'Faoláin is more profound than ever. This research will posit O'Faoláin as a man who was both self-consciously Irish and an Irishman of the world, and as a vital figure in Ireland's intellectual development as a nation.

I would like to thank his supervisors Professor Graham Allen and Dr. Éibhear Walshe, School of English, UCC.

# 'Oh those long months without a word from home', Migrant letters from mining frontiers

**Alan J. M. Noonan**

School of History

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'Oh those long months without a word from home, my neighbours get letters but I none' — Chauncey Carr Jr (Letter to his family, 31 January 1864, Carr Family Letters).

## **Past communications**

Recent economic woes in Ireland mean many are once again emigrating in search of jobs. Emigration can be an emotional event for the emigrant, and those they leave behind. However, this generation will experience emigration differently to any previous generation. The advent of the internet and webcam services means that there are no longer any communication delays between emigrants and their friends and family because of vast geographical distances. It is easy to forget how recent these changes have been. In 1873 Michael Flanagan an emigrant in California, wrote to his family home in Ireland marveling at a photograph of his brother; 'It is a most useful art this photographing by which one can send from one end of the world to the other a pretty correct representation without writing a word about it' (M. Flanagan, 5 July 1873, Flanagan family letters, Miller Collection, University of Missouri). Our own technological advances have transformed emigrant's interactions with their families at home, allowing people to see and speak to one another instantaneously, a communication revolution which has reduced the humble letter, and indeed the material photograph, to relics of a bygone era.

While researching my dissertation on Irish miners, titled *Wandering Labourers: The Irish and Mining throughout the United States, 1845-1920*, I found one of the richest veins of information was migrant letters. Within these we can find fascinating details of the lives and thoughts of these migrants, their relations, and their friends. The focus of this article is on these letters from miners, particularly Irish miners, in the nineteenth century. Over this topic hovers the questions, how will future researchers grapple with new technologies as a source of information, and will digitisation render the historian's task more difficult if no physical trace is left of contact between loved ones?

1875, Crawford Art Gallery, Cork).



Figure 1: : An Irish child reads an emigrant letter from America to her family (James Brenan, *Letter from America*,

## A global network

In the nineteenth century, the Irish Diaspora was a global phenomenon centred on the United States and the British Empire. Letters and newspapers were the global communication networks of the nineteenth century. As with the internet, not everyone could participate in this medium. The barrier to access in the nineteenth century was illiteracy, a common problem for many emigrants. For those at home in Ireland it was less of a problem, as they could find someone locally to read the letters sent to them, often a young person in school (see Figure 1) or a priest. As public education spread across Ireland and letter writing became more popular, it allowed more migrants to remain in contact with each other and their families throughout the world. This communication network was especially important for miners. A highly mobile transitory workforce, they depended on information about mining opportunities elsewhere with better wages. Examples of this global network in action are the letters between the four Flanagan brothers; Michael



(quoted above), Patrick, Nicholas, and Richard. After hearing from Patrick that pay was high in Australia, Michael took the long trip in search of work and his brother. He noted; '... I was over a week on the diggings before I found Pat. One day I was winding my way amongst the barks and slabs which compose the township and I saw advancing before me a curious looking bushman and as I came closer and got a little nearer him I found I saw the face before but not until he put out his hand and began laughing did I fully recognise the man I was in search of... His appearance would nearly put one in mind of a Maori' (M. Flanagan, Brisbane, Queensland, to his uncle, 18 February 1865).

The brothers worked there for a time before joining the gold rush to New Zealand a few years later. Another brother, Nicholas, decided to forego mining and instead settle in Ohio, where he worked on a farm. He later told his brothers that, '... I was sorry for a while after I came to this country that I did not go to Australia but I got over that and now I like this country tip top and I intend to make my home in this country' (N. Flanagan, 5 January 1869). After this he details the local wages (\$1.48 a day) and ends with his assessment of the United States stating, 'I think there is no better country than this for a man that would have a little capital'. Patrick Flanagan led the way to California, much to the chagrin of his brother, Richard, back in London who was surprised to hear from Michael that Pat had moved on without informing them at home; 'I felt a good deal disappointed that you told nothing of your plans or arrangements for the future... At first I could hardly credit it, as I thought he would [sic] not have undertaken such a step without letting someone at home know of it directly' (R. Flanagan, 20 August, 1870). Yet Richard tempered his letter towards the end, reviewing his brother's decision he wrote, 'I think he has done wisely as it is most undoubtedly a splendid country — far exceeding in many advantages any your [sic] Australian Colonies' (R. Flanagan, 20 August, 1870). Many were not quite as enthusiastic about the United States. John Hall was a recent immigrant labouring in the coal fields of Pennsylvania, and when his sister asked for his impression of America he wrote the following back to her, 'I do not like it at all... any person who can live at home at all had better stay there for in this country there is neither comfort nor pleasure' (J. Hall, 27 November 1888,).

'What wages do they pay in the shops in Manchester for a good workman at the anvil & what chance is there to get work', Irishman James Williamson wrote bluntly to his brother John in England (James Williamson, 2 October 1850, Williamson family letters, Public Records Office of Northern Ireland). He was a Californian gold digger and was seeking a different occupation and a different home. Writers were not always as direct as James Williamson, and most appreciated any letters at all from people they knew. 'There is nothing gives [sic] me greater pleasure than to get letters from my friends even if they are short ones' wrote the Irish Bartholomew Colgan in Carson City, Nevada, to his fellow emigrant, Thomas Dunny in Illinois (B. Colgan, 13 June 1862 Dunny family letters, Schrier Collection, courtesy of Kerby Miller). The quote from Chauncey Carr Jr in the introduction and in Figure 2 demonstrates the desperate longing of migrants for letters

from home. Letters were not always reliable; sometimes they were delayed, damaged, or even lost, 'You need not be disappointed at not hearing from your friends at home. You see one of my own letters has miscarried and I have thro' the Dead Letter, or Returning letter office [sic] a letter that Rick wrote to you when at home here last September twelve months' (R. Flanagan, 24 January 1867).

Both Patrick and Michael Flanagan eventually settled in the Napa region of California. Three quick deaths in the family left the father alone back in Ireland and he pleaded for Michael to return home, 'I would wish very much to see you before I die. If I thought you were married or had a family to provide for I would not ask you to come home' (John Flanagan, 7 April 1890). Michael dutifully returned home and continued to write to his brother Patrick who remained in California. In those letters Michael regretted his repatriation for many years, before eventually making peace with his decision in his old age. Before he made the final journey back to Ireland, he wrote the following lines:

This journey frightened me a little, but whether for good or ill I shall risk it anyways, if it ends well it will be fully as much consolation to me to see you as it will be you to see me again. Instead however, of the lad of seventeen years you saw last you will meet a grey old man of fifty (M. Flanagan, 20 May 1890).

## Printed letters

Historians find letters in many locations and collections but emigrant letters could also be found in newspapers, often as warnings. A letter, from the chief mate of a ship in California to his brother in Belfast, was reprinted in *The Belfast News-Letter* on 15 February 1850 as a guide to the jobs and wages in distant lands of the California gold rush, 'An old friend of the captain's came on board the other day, and stated that in four months he had realized 9,000 dollars at the "diggings"'. These letters also existed as a warning to any prospective emigrants in Ireland. The migrant in the letter goes on to detail about the friends' exploits, 'He dined on shore that evening, brought his gold with him, got into a gambling house, and was cleared of every ounce of it'.

Some of these letters were humorous spoofs written in the same tone as emigrant letters, which indicates how common these letters were amongst the public. *The Belfast Commercial Chronicle* printed one such letter under the title 'AN IRISHMAN'S LETTER FROM CALIFORNIA' on 15 April 1850 from a 'Terence Finnegan' to 'Bidly' in Ireland. 'Accushla, sarching [searching] for goold [gold]; but a body might as well look for new pitayies [potatoes] in Thriffalgar-square [Trafalgar Square]'. The piece continues to mock Irish accents throughout detailing the following pun as a humorous misunderstanding, 'You may have read in the papers that the diggers goold [gold] in quartz [quarts]; but don't believe it, Bidly. I'll be on my oath none of them ever found a pint of it'. Terence ends the fake letter pleading Bidly to ask his friends to hold a raffle and send him the fare back to

Virginia Jan: 31 1864  
Dear wife & Children  
I sit  
down to scratch a few lines to  
you after waiting several long weeks  
for a letter from some of you but I have  
waited in vain so I write again we  
are all well except Ortentia (or nearly  
so) she has the rheumatism very bad  
been laid up most of the winter  
Warren has also been troubled with it  
or the neuralgia for four weeks I have  
had some of it but pain I can stand  
very well if I can but have the use  
of my limbs but I am doing nothing  
now to make any thing I am paying  
16 dollars per week for our board at John  
McElDownys who is making a new claim  
or settlement locating himself near  
the sinks of the So. son of Humboldt  
River, we are starting another city &  
mining camp there under very  
favourable circumstances to tell you  
the truth our people have found  
good silver mines nearly all over the

Figure 2: : The first page of Chauncey Carr Jr's letter home, the quote at the start of this article is from later in the same letter, and it echoes his first line here which reads, 'I just sit down to scratch a few lines to you after waiting several long weeks for a letter from some of you but I have waited in vain'. (Nevada Historical Society)

Ireland.

## Bearer of bad news

In their letters, emigrants often asked for news and gossip about friends and family they have left behind or who had also emigrated. Often these replies must have made for difficult reading. After detailing the recent death of her four-year-old daughter from scarlet fever, Ellen Wogan continued her letter to her brother in the far West, 'Dear Brother you would like to hear from all your old school-fellows. There is not one here that I know of they are all dead and scatered [sic] away' (Ellen Wogan, 2 September 1870). Such news understandably caused migrants to despair at their lot in life,

'I have mined so long I am hardly good for anything else' wrote another Irishman, William Kennedy, and he continued:

Oh dear oh dear how I can look back and see all the old familiar places and faces and imagine myself back there a boy hen [boyeen?] going to school with my old School mates — bare foot running races on the green grass and wading in the Lagan in the afternoons coming from School. Oh dear oh dear those times will never come back to me (W. L. Kennedy, 3 February 1870, Kennedy family letters, Public Record Office of Northern Ireland).

Despite his melancholy turn he ended the letter determined that 'I will see all the old places, once more before I quit this world' (W. L. Kennedy, 3 February 1870). A long wait for a reply would often mean the worst, 'I have not had a letter from home now — from any one of our family for more than a year — Isabella used to correspond with me regular untill [sic] lately and I fear very much either she has been very sick or is dead — the latter I fear' (W. L. Kennedy, 3 February 1870).

The development of instantaneous global communication is a tremendous boon to emigrant networks, including the Irish Diaspora, and will change them in a myriad of different ways. Perhaps the most important of these changes is that recent emigrants need not face the terrible uncertainty earlier emigrants faced, and for that we can be grateful.

Thanks to my supervisor Dr. Andy Bielenberg, and to Professor Kerby Miller who generously granted me access to his collection of letters on my visit to the University of Missouri, Columbia.

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# Is there a Sheriff anymore? Vietnam's legacy on US-Nicaraguan relations during the Carter Era, 1977-1981

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For too many years, we've been willing to adopt the flawed and erroneous principles and tactics of our adversaries, sometimes abandoning our own values for theirs. We've fought fire with fire, never thinking that fire is better quenched with water. This approach failed, with Vietnam the best example of its intellectual and moral poverty. But through failure we have now found our way back to our own principles and values, and we have regained our lost confidence. **Jimmy Carter, May 22, 1977, Notre Dame University.**

My project explores the extent to which the Vietnam legacy influenced US-Nicaraguan relations during the transition of power that took place in Nicaragua during James Earl Carter's presidency. The Vietnam legacy is characterised by the increased influences of the US Congress, press, public and Latin America on US executive decisions. Understanding the role of the Vietnam legacy shows that the Carter administration had not regained the US's 'lost confidence.' The US's anxiety over Vietnam remained and left a void in the Western Hemisphere when Nicaragua needed guidance and assistance from the US during its political transition.

## Nicaragua: a landscape of revolution

On July 19, 1979, the forty-year old traditionally US backed dictatorship led by Anastasio Somoza Debayle was overthrown in Nicaragua by a coalition of Nicaraguans encompassing the business, academic, religious and working classes. Somoza's opponents went on to create a new government for Nicaragua. Although they were initially euphoric in the aftermath of Somoza's ouster, it did not take long for underlying political and economic differences to fragment Nicaragua's new government. This was exacerbated by their inheritance of a country on the brink of bankruptcy and heavily burdened by the need to reconstruct Nicaragua's infrastructure in the aftermath of the civil war.

The political transition that took place in Nicaragua was heavily influenced by the foreign policy pursued by the US government headed by President Jimmy Carter. By researching newly declassified US government documents it is possible to trace the executive's increased acknowledgment of the powerful role of the US Congress and the domestic press

in influencing executive decision making towards revolutionary events in Nicaragua. The Carter administration was trying to decrease its role as leader to the continent, promoting a policy of non-intervention to encourage Latin American countries to determine their own destinies. Countries such as Venezuela and Panama played a major role in influencing events in Nicaragua by aiding opposition to Somoza, while both the Somoza regime and the Sandinista-led opposition attempted to manipulate the US government's anxiety over its traditional role as Sheriff. During the Carter administration, thus, Nicaragua was a key symbol of the US government's acknowledgement of its declining role as guide to democracy in Central America. Although no particular Latin American country would become the key leader of the hemisphere, countries like Venezuela and Panama began to act on their own accord to influence the hemisphere and not necessarily follow the United States.

On July 20, 1979, a new coalition government predominantly led by the Sandinista National Liberation Front (or the Sandinistas) took over from Somoza in Nicaragua. The Carter administration saw the Sandinistas as Marxist and was increasingly fearful of revolution and the ideology of Communism spreading across the rest of Central America. In another Central American country, El Salvador, the civil-military Revolutionary Government Junta deposed Salvadoran President Carlos Humberto Romero on October 15, 1979, only a few months after the Somoza regime collapsed in Nicaragua. Cuba's increased influence in Nicaragua, through its provision of teachers, doctors and military training to Nicaragua, was interpreted by the United States as Cuba and the Soviet Union attempting to spread revolution in Latin America. In response, the Carter administration pursued a policy emphasising the provision of economic aid for reconstruction as a means of containing the possibility of Central America looking towards Cuba as its revolutionary guide due to its own revolution in 1959. The Carter administration also hoped that economic assistance would prevent any possibility of the region looking towards the Soviet Union as the key influence on its society. Carter and his administration in effect were combining the two contexts of the Vietnam legacy and the Cold War to create a new style US policy.

The Carter administration found it difficult to release the economic assistance required for Nicaragua. The Central Intelligence Agency (CIA) felt such economic assistance would be diverted by the Sandinistas to spread revolution across Central America. Consequently, the CIA continued to hold up the economic assistance by presenting its findings to Congress of alleged Cuban/Soviet activities in the region. In the midst of US assistance being delayed, the Nicaraguan government began to crack, with leading moderate figures leaving its main governing body. As a result the Sandinistas found themselves having to keep the country afloat and took a series of actions to uphold order such as postponing upcoming elections, putting restrictions on the press and arresting members of the business class that had been once central and influential to Nicaragua's new government.

## **The Vietnam legacy and its importance**

The Vietnam War is fundamental to understanding subsequent US foreign policy decisions. In its aftermath, the United States grew anxious of its role as leader and guide of the world. Individual memory by Vietnam veterans' accounts of the war contributed to the increased anxiety of the US's role in the world. The collective memory, furthermore, of US participation in the war created by the press and attempts by Congress since 1975 to influence executive decision making contributed to this anxiousness. The combination of public opinion against war and US foreign policy intervention since 1975 has been dubbed the 'Vietnam Syndrome.' The term was coined in the early 1980s by a right-wing conservative opposition led by Ronald Reagan. They protested the Carter administration's policies that promoted human rights and arms restrictions on the grounds that the US's global power was decreasing and the Soviet Union's was increasing. Past scholarship has illustrated that the memory of Vietnam and its legacy persuaded Carter to pursue a new US foreign policy based on the promotion of human rights as opposed to intervention in international affairs. However, although Nicaragua acted as a testing ground for Carter's human rights policy, the extent to which the Vietnam legacy influenced US policy towards Nicaragua during this period has not been explored by historians in detail.

The main influence on my study of the Vietnam legacy and US-Nicaraguan relations has been the work of other scholars in relation to the Vietnam legacy, memory and syndrome towards US foreign policy around the world. This scholarship has examined different elements of the war's legacy ranging from the Nixon to the recent Bush administration. Although these studies take in many countries, such as Iraq, a primary-source based study has yet to be produced that evaluates the impact of the Vietnam War's memory, legacy and syndrome on US policy towards Nicaragua.

## **Library and archival research in the United States**

My project is primarily based on researching government and media sources in the United States. In December 2009 and September 2010 I conducted research at the Carter Presidential Library, Atlanta, Georgia, and obtained government documents declassified as recently as 2008 and 2009. At the core of these sources are high-level decision making on Nicaragua by key figures of the Carter administration, such as Secretary of State Cyrus Vance, National Security Advisor Zbigniew Brzezinski and President Jimmy Carter himself. In August 2010, I obtained valuable material on US-Nicaraguan relations from collections on the State Department, the Bureau of Inter-American Affairs and the Office of Central American Affairs at the National Archives, College Park, Maryland. In August 2010, I also achieved an insight into the Congressional influence on the Carter administration's policy on Nicaragua by obtaining copies of the Congressional Hearings from the Law Library of



Congress, Washington, D.C. UCC's School of History travel grants scheme has provided invaluable funding and assistance to make such trips a possibility. The School of History also provides temporary loan of laptops for research trips and digital camera tripods.

I have been on a fellowship in Glucksman Ireland House, New York University since November 2010 and will be in New York until August 2011. This has allowed me to avail of important primary source material in relation to US-Nicaraguan relations. Through New York University's electronic resources and the Digital National Security Archive, I have researched US government documentation available at the National Security Archive, The George Washington University, Washington, D.C. I have also availed of New York University's holdings on newspapers like *The New York Times*, *The Washington Post*, the *Christian Science Monitor*, BBC Summary of World Broadcasts and translations of Central American and South American broadcasts by the Foreign Broadcast Information Service (FBIS). While based in New York, I have also been able to research English and Spanish language newspapers in the New York Public Library and the Howard-Tilton Memorial Library, Tulane University, New Orleans. Furthermore, I have been able to study Nicaraguan governmental material and personal papers of major Nicaraguan political figures at the Hoover Institution, Stanford University, California.

## **The importance of newly declassified US government documents**

Recently declassified Carter Presidential Library material has provided an invaluable insight into the high-level decision making of the Carter administration, which has not been available to previous scholars on US-Nicaraguan relations. Much of the material in relation to Carter was produced from a contemporary perspective in the 1980s and 1990s, by authors such as Robert Pastor (1987). These works, thus, were unable to avail of these primary documents. Furthermore, more recent works on the topic by Morris H. Morley (2002), Mauricio Solaún (2005) and Pastor's second work on Nicaragua, published in 2002, could not avail of primary source material declassified as recently as 2008. Morley, Solaún and Pastor drew primarily on oral interviews, newspapers, and the government documents they could source did not document high-level decision making. I will build on the important work by these authors, by producing a study that encompasses the newly declassified primary documentation on US-Nicaraguan relations, thereby evaluating the Carter administration at a pivotal changing point in the US's foreign relations. By understanding the fears and anxieties the Carter administration felt towards intervening in Nicaragua's revolutionary upheaval, comparisons can be made with subsequent US administrations. Above all, we could expand our understanding of the possible fears and anxieties felt by the Obama administration in creating its foreign policy towards countries currently experiencing revolution.

I would like to thank my supervisor Professor David Ryan and all my colleagues in the School of History, University College Cork for their continuous help and advice. I would also like to thank Ruth Martin, Cambridge University, for reading previous drafts of this article. Many thanks also to the editors and article reviewers at the Boolean.

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# Dadaab. . . a forgotten city in the 21st century

**Damien Mc Sweeney**

Department of Government, UCC

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If we don't end war, war will end us — (HG Wells)

My research examines the whole humanitarian response system, looking in particular at how it responds to complex emergencies. Using the Dadaab refugee camps close to the Kenyan/Somali border as a case study, the many and varied issues at play in this ongoing intervention are being investigated. Some of these range from the insecurity of the region due to geography, bandits and Islamists, interclan feuding, ethnic tensions, logistical difficulties, interagency coordination, the quality and effectiveness of the Kenyan security forces as well as the tensions between the host community, the refugee community, the Government of Kenya, the international community and UNHCR in agreeing on an appropriate response to this complex emergency. It is envisaged that this research will be fed back to the Irish Government and UN agencies such as UNHCR in order to suggest practical but effective ways of improving the security situation on the ground there, thus leading to increased protection of the population in Dadaab.

## Introduction

Let's close our eyes for a minute and imagine that the Ireland we know today doesn't exist. Let's assume that, after the 1916 rising and subsequent independence of the 26 Counties, Northern Ireland took a different path, gaining independence as the Radical Christian state of Ulster in 1960. Impoverished and underdeveloped after years of occupation, it took just nine years of failed governments before a coup would take place, leading to the takeover of the country by a brutal and corrupt Dictator. His claim of Donegal and Monaghan being part of Ulster would lead to three wars with the Republic of Ireland (itself still a poor developing country), as well as famine, death and extreme suffering in his own country. This Dictator was then overthrown in 1991 by a loose coalition of armed militias who then turned on one another as the country splintered and descended into chaos with different regions ruled by warlords, pirates, bandits and radical Christians. Three armed humanitarian interventions by the UN failed leaving Ulster without a functioning government since 1991. Fourteen peace conferences eventually saw a US-backed Transfederal Government elected in 2004 but the reality today is that the TFG only controls a few blocks in Belfast City centre and would immediately fall if it wasn't for the armed support of a few thousand European Union troops. The rest of the Ulster is controlled by a radical Christian group called "the Young Crusaders" who impose an extreme form of law based

on obscure passages from the bible. Some of these laws include the practice of slavery, the burning of non believers (infidels) and adulterers to death, the stoning to death of rape victims, homosexuals and blasphemers, as well as the overall aim of the imposition of this law on everyone in the world.

In response to the displacement of tens of thousands of people in 1991, UNHCR was invited by the Republic of Ireland's government to set up refugee camps. These camps were located 50 miles from the border in an obscure, underdeveloped and lawless region of Donegal and were constructed to hold 90,000 refugees. Radical Christians, bandits and corrupt Gardai have continuously preyed on refugees trying to get to the camp, with Amnesty International and Human Rights Watch reporting regular rapes, sexual assaults, torture and killings by the various groups including the Irish police and army. In recent times, fighting between the TFG and the Crusaders escalated resulting in another mass movement of refugees towards the camps, which now holds 400,000 people and are bursting at the seams. The population is completely dependent on aid as the Irish Government operates an encampment policy forbidding anyone leaving the camps and the international community barely acknowledge the existence of the Donegal camp, at this stage; the biggest in the world...

Now open your eyes and decide, could something like this happen in the 21st century, with all of humanity's progress and technology. The answer is yes, not only has it happened but it continues to happen even today. Substitute Ulster with Somalia and Donegal with Dadaab, and you have the truth. Welcome to Dadaab, the largest refugee camp in the world, the "city" the world forgot.

## **Dadaab... where the hell is that?**

Located in the North Eastern territories of Kenya, Dadaab is a small outpost town approximately 50 miles from the Kenya-Somali border (Figure 1). The North Eastern province is a very insecure area, with special Kenyan government permission being needed before any travel is allowed by anyone to Dadaab. The presence of bandits and Islamist militias such as Al Shabaab, as well as the periodic outbreaks of inter-clan feuding, means that the threat of violence and kidnapping to humanitarian workers is very real. As a result of this threat, as well as armed attacks on humanitarian workers in the past, the UN mission in Dadaab operates under phase three security restrictions; travel is by convoy and armed police escort, there is no free movement of staff without armed guards in the camps and humanitarian workers are under curfew in a secure compound from 6 pm to 6 am. This insecurity and the subsequent restrictions has a detrimental effect on the humanitarian operation there because of the insufficient time workers are allowed to spend in the field due to curfew, with this then impacting negatively on services such as protection and field operations.

The Dadaab refugee complex was established in 1991 following the collapse of the Somali Government of Dictator Siad Barre. The region where the Dadaab camps are located is remote, harsh, hostile, semi-arid, and suffers from flooding in the rainy season and temperatures of up to 48 degrees Celsius in the dry season. It was sparsely populated by nomadic Somali-Kenyans before the arrival of refugees fleeing the chaos in Somalia. There have been hostilities between Kenya and Somalia ever since independence in the early 1960s, with Muslim Somalia claiming the Somali-inhabited Northern Frontier District (NFD) as a missing Somali territory and supporting regional independence movements, to the anger and suspicion of the mainly Christian Kenyan government. The scale of refugee flight across the Kenyan border in the early 1990s overwhelmed both the small local nomadic population and the scarce natural resources of the area. UNHCR was thus invited by the Kenyan government to set up camps in Dadaab to deal with the humanitarian emergency. The Dadaab complex consists of Dagahaley, Hagadera (Figure 2) and Ifo (Figure 3) refugee camps, with a population (as of August 2011) of 400,000 people, comprised mainly of Somali refugees (94%) with small numbers of Sudanese, Ugandans, Eritreans and Ethiopians (UNHCR Kenya, August 2011). Within Kenya itself, Dadaab presently is the fourth largest population centre after Nairobi, Mombasa and Kisumu, unacknowledged and forgotten in the desert.

### **Sorry... we're full!**

When they were established in 1991, the refugee camps were originally to accommodate 90,000 refugees and presently hold nearly four times their intended capacity. The fact that the camps have existed for over 20 years have resulted in them now holding three generations of refugees. Over 6000 grandchildren of the original arrivals have been born in the camps with little or no hope of them, like their parents and grandparents before them, ever leaving. The camps are now bursting at the seams as resources and infrastructure within the camps have been stretched to their capacity. In 2008 the UNHCR declared the camps full and, because of the lack of land available for new arrivals, it has been impossible to provide over 150,000 new arrivals with a plot of land. These instead have been forced to stay with relatives and clan members, but even that has now run its course. The new devastating famine that is ongoing in Somalia at present, coupled with an escalation in fighting between the TFG and Al Shabaab has caused huge displacement and a massive influx to the camps, recently reaching 10,000 per week. This has resulted in 70,000 people living in illegal settlements outside the camps because there is no more room. These settlements have little or no access to essential services such as water and sanitation, are very insecure and open to attacks by the armed bandits operating freely in the area, as well as wild animals such as hyenas which have a history of attacking children there. Especially at risk are women and young girls who go to find firewood, with many rapes and sexual assaults occurring.

The UN Dadaab operation has two *de facto* operations running side by side: the long term protracted refugee population on the one hand and the emergency operation (influx of new arrivals) on the other, both of which offer a mountain of challenges. The long-term protracted refugee population could be looked at as a developmental type intervention, with the camps in need of updated and more permanent infrastructure in terms of improvement in water systems, provision of additional schools, hospitals, police posts etc. Services such as the education and health services were already in need of expansion prior to 2008, when the new increased influx of refugees from Somalia began.

The second, emergency-based operation is focused on coping with the new arrivals and providing the most basic resources and services. In situations of displacement, there is always loss of personal property. Very often people flee with little more than the clothes they are wearing. In addition to food, people affected by crisis need basic life saving non-food items for their survival. UNHCR therefore struggles to provide items such as blankets, sleeping mats and plastic sheeting to safe-guard them from rain, sun, and other environmental conditions. As well as this, when resources allow, they provide kitchen sets including pans, plates and spoons which are essential items for every family, soap necessary to ensure personal hygiene, and jerry cans which are needed to collect drinking water and to keep it safe from contamination. Clothes or material for making clothes and shoes may also be needed. In addition, women and girls need sanitary supplies. Children too have specific needs especially those who may have been orphaned and require baby food, clothes, diapers etc.

The Kenyan Government implements an encampment policy which dictates that all refugees in Kenya live within the limited confines of the refugee camps. Thus, the majority of refugees in Dadaab are primarily dependent on UNHCR and its Implementing/Operational partners such as the World Food Programme (WFP) for food rations and other assistance. This policy dictates that refugees are required to stay within the perimeters of the camps unless given explicit permission by the Kenyan authorities, in the form of a travel document called a movement pass. This lack of mobility effectively “imprisons” refugees and limits their ability to accomplish commercial growth and independent enterprise. In many cases also, new arrivals whose lack of knowledge in relation to Kenyan law and these travel restrictions have been arrested and imprisoned. Many Human Rights organizations such as Human Rights Watch consider the Government of Kenya’s encampment policy a violation of International Humanitarian Law and have documented many cases of rape, sexual abuse, extortion and refoulement (the forced return of refugees and asylum seekers to persecution, torture, and situations of generalized violence that seriously disturb public order. Kenya is bound by the 1951 UN Refugee Convention, the 1984 Convention against Torture, and the 1969 OAU Refugee Convention not to carry out refoulement) by Kenyan police against refugees while in their custody.

## The situation deteriorates further

The recent escalation of the fighting and violence in Somalia has led to another significant increase in the influx of refugees with Dadaab now registering over 35,000 new arrivals per month, and this number showing no sign of abating. This increase is adding further pressure to already scarce resources, inadequate infrastructure and insufficient services while leading to a further deterioration of conditions in the camps. This deterioration is in turn leading to further suffering, increased conflict between the new arrivals and the older arrivals, refugees and the host community as well as inter-clan violence. It is also causing great concern to the Kenyan government, who have stepped up security in fear of the infiltration of Kenya by Al Shabaab operatives with the aim of carrying out terrorist attacks similar to those in Kampala in July 2010, which killed 74 people. As this complex emergency worsens, a significant increase in people's vulnerability is occurring, leading to increased protection and security concerns. The research that is being carried out will examine these many and varied concerns in detail, look at the work being done (or not being done) in these areas and, where appropriate, suggest ways of improvement or solutions. Hopefully, it will assist in making life a little less dangerous in Dadaab, a forgotten city in the 21st century.

*Damien Mc Sweeney is a PhD candidate from the Department of Government supervised by Dr. Andrew Cottey. He was deployed to Dadaab as a member of Irish Aid's Rapid Response Corps to work with UNHCR for eight months in 2010. His research is focusing on Humanitarian Interventions especially in the area of protection and security of vulnerable populations in complex emergencies.*

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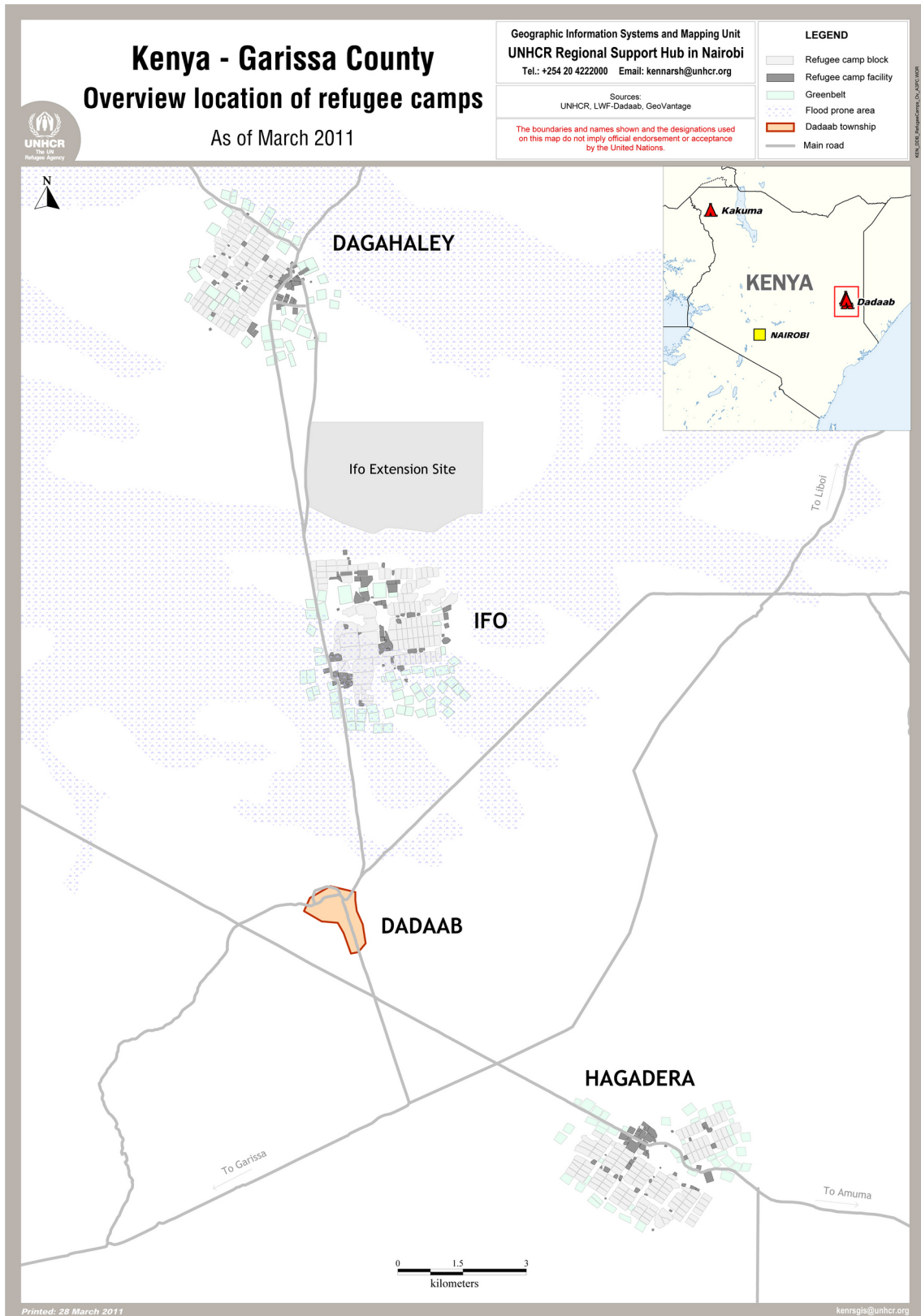


Figure 1: An Overview of Dadaab Refugee Camps (UNHCR, March 2011)





Figure 2: a section of Hagadera camp, home to over 110,000 refugees



Figure 3: Newly arrived Somali refugees waiting outside UNHCR registration in Ifo camp

# Changing shapes: How the trachea of the leatherback turtle responds during deep diving

**Colm Cornelius Murphy**

Department of Civil and Environmental Engineering

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Two roads diverged in wood, and I-  
I took the one less travelled by,  
And that has made all the difference. (Robert Frost)

## Background

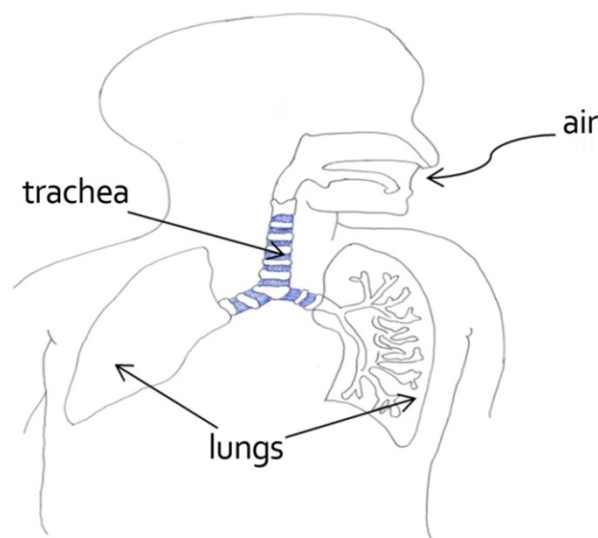


Figure 1: Human breathing system

This research is primarily an engineering project. It focuses on analysing the behaviour of structural materials and identifying the properties of materials that govern the behaviour. The topic arose out of a need to classify how the trachea of the leatherback turtle (scientific classification: *Dermochelys coriacea*) responds to the extreme water loadings it is subjected to during deep diving (>300 metres). In the following sections a detailed background and overview of the work undertaken to date is presented. The work is an interdisciplinary project and is essentially a zoologically applied model based on engineering principles. For reference, a graphical representation of the trachea and breathing system is

provided in Figure 1. For a more detailed description of both the trachea and deep diving the reader is referred to the article published by the author in Volume I of the Boolean, the URL link for which is <http://publish.ucc.ie/boolean/2010/00/MurphyC/27/en>.

## **Basis for Research**

Every material has its own unique properties which govern its behaviour under external loadings. Different materials will react differently under the same external load. Take the three little pigs story for instance. When the wolf huffs and puffs both the straw and timber houses fall down but the brick house does not. The brick house obviously has more resilient material properties than either the straw or timber houses. In order to find out how the leatherback trachea responds to the enormous pressures encountered during deep diving, the material properties of the trachea must be known. At present these material properties remain unknown. This research aims to characterise the material properties of the cartilaginous rings from which the leatherback trachea is composed and, from this, investigate how the entire trachea responds to pressures encountered during deep diving.

## **Methodology**

Normally in engineering problems the material properties are known and the responses of that material are unknown. For example, when designing skyscrapers the properties of the materials employed such as concrete and steel are used to determine the responses of these materials under extreme conditions such as earthquake loadings or wind loadings. In other words known inputs are used to calculate unknown outputs. With the leatherback trachea the opposite is true. The material properties of the cartilaginous rings are unknown. However it is possible to measure output responses such as the load required to produce an applied displacement. This data may be represented in graphical format (Figure 2). The red dotted line in this graph denotes the output response from applying a sequence of displacements to one of the rings. Using a structural model that replicates applying the displacements to the ring it is possible to obtain similar graphs. The shape of these graphs will depend on the material properties used in the model. One set of material properties may produce the green line whilst another set may produce the purple line.

When certain material properties are used in the model though, they will produce data that matches or almost matches (blue line) the data obtained from applying the displacements to the ring. When this occurs, the material properties in the model may be deemed to be reflective of those of the cartilaginous ring. This process of comparing output results in order to find input parameters is more commonly referred to as inverse engineering

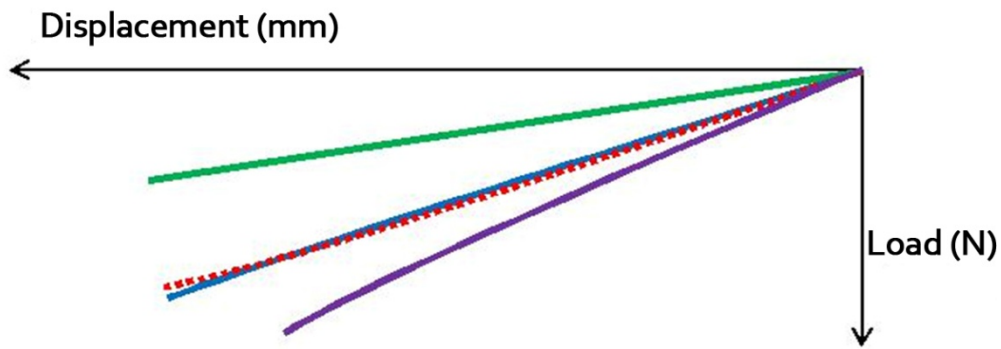


Figure 2: Load-displacement data

and comprises a major portion of my research. An optimisation technique that minimises the error between the laboratory and model data with respect to the material properties in the model is applied to obtain the ‘best-fit’ model. The material properties in the model are based on theory. Most of the time spent on the research to date has been devoted to finding the material model which produces the most accurate results. It has involved numerous laboratory material testings, theoretical material research and computer programming. During this time the models have become more sophisticated and reliable. There is a noticeable difference between earlier and more recent models, both visually (Figure 3) and in the results produced.

## Results

The results presented confirm the feasibility of applying an inverse methodology to ascertain the material properties of the tracheal cartilage of the leatherback turtle. The changes in shape of the ring observed during the testing correlate well with those in the model results (Figure 4), suggesting that an appropriate material model was used in the structural analysis. Several material models have been considered so far. The results of more recent and more developed models are showing improvements in accuracy, as evidenced by

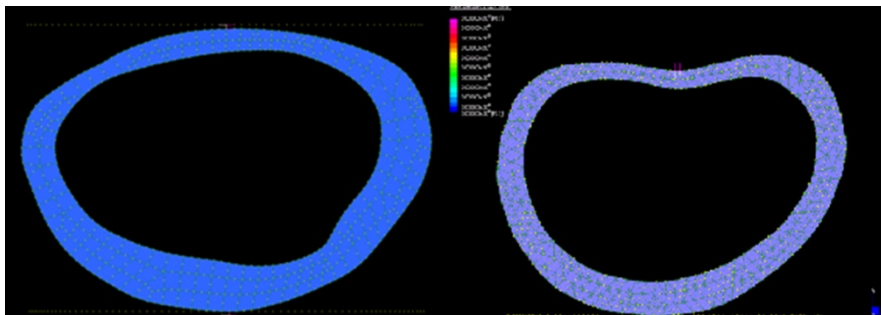


Figure 3: Comparison of preliminary model (left) with more recent model (right)

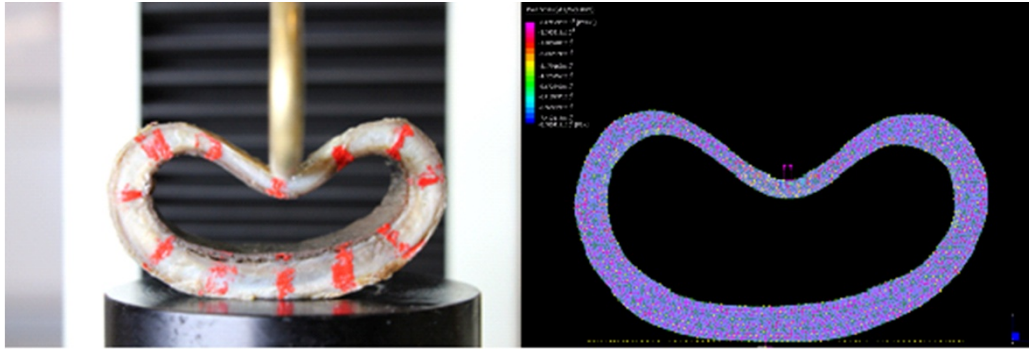


Figure 4: Displaced shapes of ring in laboratory testing (left) and structural model (right)

the comparison between the results data for preliminary models, which have a noticeable discrepancy, and more recent models (Figure 5), which have less.

Note that the graphs in Figure 5 are for separate loading conditions. Similar results would have been obtained though had the same loading conditions been applied to both sets of data.

## Benefits and Future Research

Future work shall continue to improve on the accuracy of the models. Once the material properties have been ascertained they shall be used to model the response of the entire trachea to the pressures encountered during deep diving, as opposed to a single ring. To model the hydrostatic pressures a uniform pressure distribution that increases with depth shall be applied on the trachea's external side. The benefits of undertaking this research are wide-ranging. From an engineering point of view it provides a unique forum in which to apply the concept of inverse engineering for material classification, allowing for advantages and limitations to be assessed. The results may also assist zoologists researching the study of deep diving not only in the leatherback turtle but indeed many other mammals and reptiles, possibly including Man. Knowledge of the material properties of the tracheal cartilage of the leatherback turtle shall facilitate the modelling of the entire trachea during deep dives, thereby producing realistic and accurate measures of the physical response of the trachea to increasing hydrostatic pressures. Lastly, the results may even inform studies in clinical research and surgical procedures, particularly in the area of tracheomalacia, a condition that causes premature tracheal collapse during increased airflow. Using the inverse methodology described medics could obtain indicative measures of the material properties of the tracheal cartilage, which could help with the treatment of the condition.

Colm Murphy is a third year PhD student in the Department of Civil and Environmental Engineering and is working under the supervision of Dr. Denis Kelliher. The research is being carried out in conjunction with Emeritus Professor John Davenport of the School of Biolog-

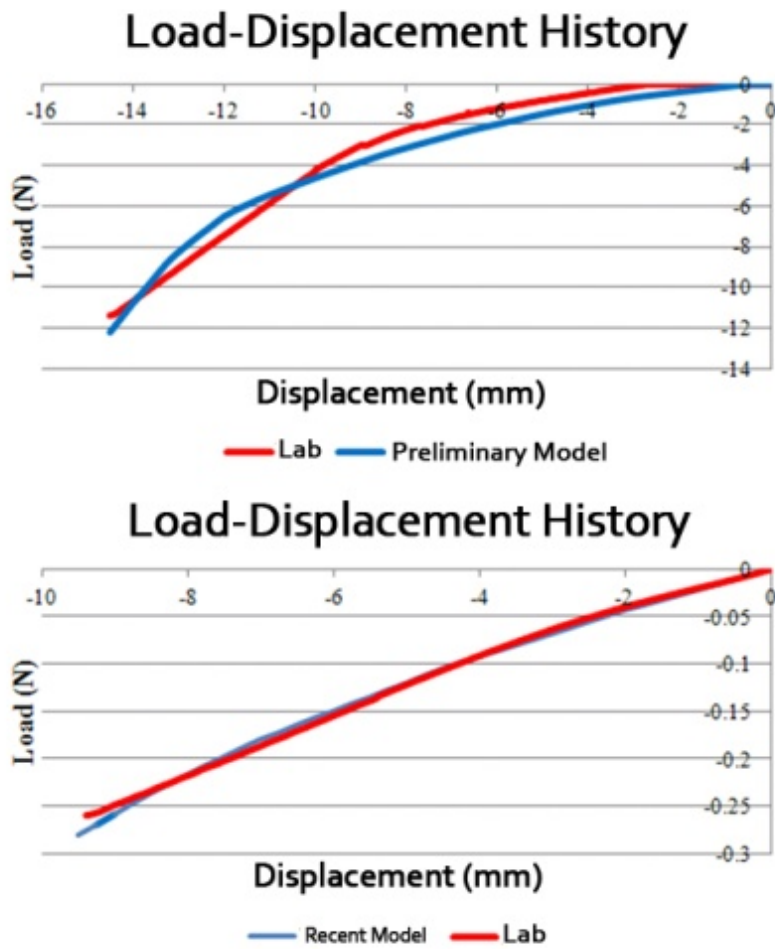


Figure 5: Comparison of data for preliminary model (top) and recent model (bottom)

ical, Earth and Environmental Sciences. It is being funded by the Irish Research Council for Science, Engineering and Technology (IRCSET) through their 'EMBARC' initiative.

# Energy efficiency in universities: the need for guidance and a strategic approach

**Sean Murray**

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## Efficiency's role in meeting targets

The leaders of many countries are discussing ambitious targets for reducing emissions of greenhouse gases (GHGs) as a means of mitigating the worst impact of climate change on the environment and our economies. In 2007, EU leaders endorsed an integrated approach to climate change and energy policy. They committed Europe to transforming itself into a highly energy-efficient low carbon economy through their **20-20-20** targets, according to the European Commission, Climate Action. These targets are ambitious and consist of:

- A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels
- A commitment that 20% of EU energy consumption will come from renewable resources
- A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

Figure 1, below, shows that the carbon dioxide equivalent of all greenhouse gases (CO<sub>2</sub> eq.) from the energy sector is the second greatest contributor of greenhouse gases. This fact creates an opportunity to explore ways to reduce the emissions from the energy sector. However, the methods need to be targeted to the most significant culprits in a cost-effective manner in order to have maximum effect on the reduction of emissions from the energy sector.

(Source: EPA Environment in Focus website)

## Universities and the Energy Sector

Universities and the energy sector would not be a marriage one would immediately think of but the connection between both will be enhanced by this research in the future. Universities worldwide are the source of education and the home to immeasurable amounts of research. The Carbon Neutral Buildings Project is one research project ongoing in University College Cork. The research is based on the retrofitting of existing buildings in the

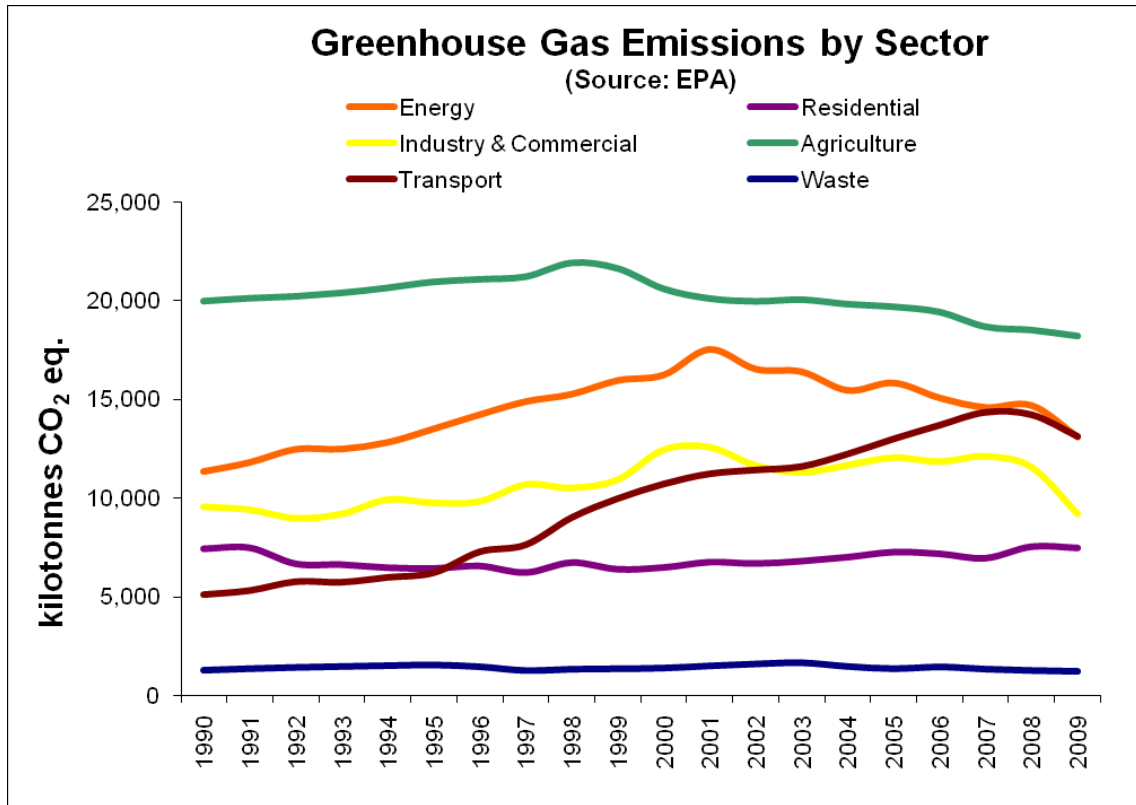


Figure 1: : Greenhouse Gas Emission fluctuation over time, by Sector

college campus and its aim is to remove barriers to the achievement of energy efficiency in existing buildings and, by association, to reduce carbon emissions.

In their make-up, universities have a vast amount of building stock at their disposal, buildings which range in age from tens to hundreds of years old and also greatly vary in size. A university's running costs is largely made up from its energy bill, as providing heating and lighting at the peak time energy-using time of the year, the winter, would be very expensive.

The afore-mentioned university buildings hold massive potential in the form of retrofit case-study buildings which would provide much needed data on retrofit performance, a lack of which exists according to the Rocky Mountain Institute, a leading United States research organisation. This university-created case-study data, coupled with the credibility associated with university research, holds great potential for universities to lead large strides in the energy sector.

### Focus of my research

In general terms, *retrofit* means to modernise or expand using modified parts or equipment. In relation to current buildings, both domestic and non-domestic, retrofitting would



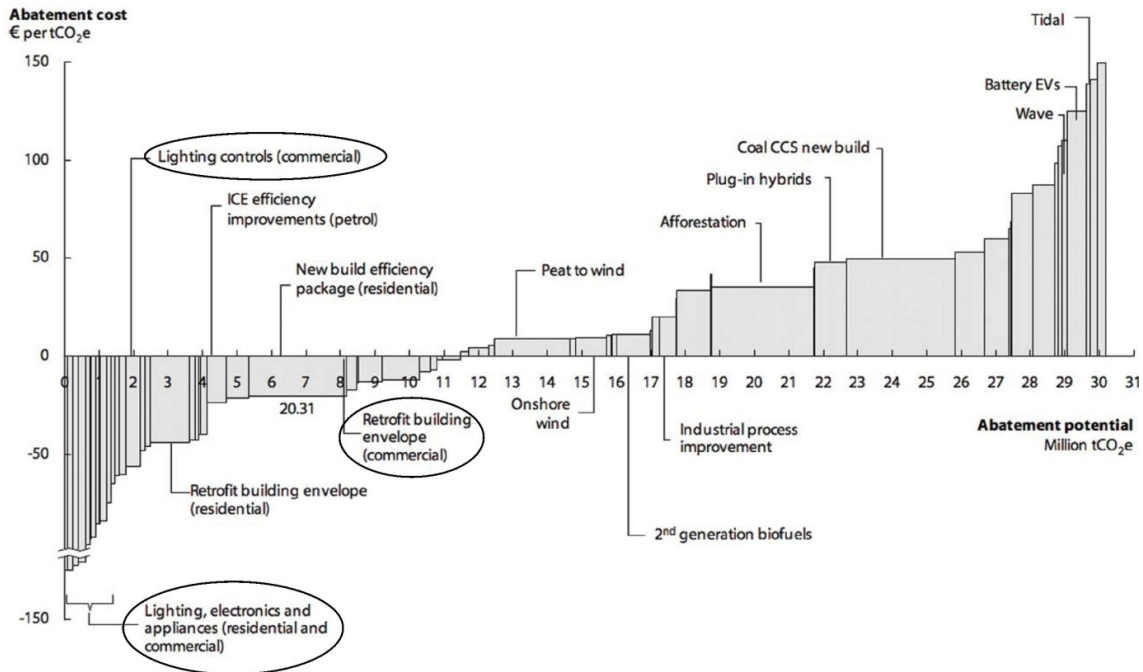


Figure 2: Ireland's Greenhouse Gas reduction cost curve, illustrating that retrofitting commercial buildings has a negative net societal cost.

take the form, for example, of changing windows from single- or double-glazing to triple-glazing. Other examples would be such things as changing the lighting fittings or changing the heating system, or the heating system controls.

The achievement of energy efficiency in existing buildings can only be realistically achieved by retrofitting and therefore retrofitting is generally seen as an untapped resource. The benefits of retrofitting can be clearly seen in the Global GHG abatement cost curve, presented in Figure 2. The Greenhouse Gas Abatement Cost Curve, developed by McKinsey, estimates the prospective annual abatement/alleviation cost in euro's per ton of avoided emissions of greenhouse gases, as well as the abatement potential of these approaches in million tons of emissions.

The abatement cost is calculated as the annual additional operating cost less potential cost savings divided by the amount of emissions avoided. This formula implies that costs can be negative if the cost savings are considerable. From the Global GHG abatement cost curve, it can be seen that retrofitting has a negative cost associated with it, suggesting a savings potential.

(Source: SEAI's, Ireland's Low-Carbon Opportunity, An analysis of the costs and benefits of reducing greenhouse gas emissions, report.)The relationship between energy efficiency

and society in general isn't overly strong but is slowly developing. The introduction of grants and incentives by the Irish Government, through the Sustainable Energy Authority of Ireland, such as the Better Energy Homes scheme on a domestic level or the Better Energy Workplaces on a non-domestic level has somewhat enhanced society's perception of energy efficiency. However, the lack of evaluation and subsequent data on the success of the schemes leaves a grey area in relation to energy savings achieved and also in relation to making a case for retrofitting in the future.

There are a number of methods to change this relationship between energy efficiency and society. One such method is the development of a decision-making software tool for retrofit analysis, which my research is focused on. This software tool would allow building owners to realise the savings and incentives achievable by energy efficiency retrofits.

This retrofit tool will take in data about a building's geometry and physics, from which suggestions on retrofit measures could be made and the effectiveness of each measure could also be calculated. This allows building owners the use of a non-specialist software tool to calculate potential energy savings and carbon emissions and by association retrofit costs and payback periods. This tool would then provide society with case-studies and data to enhance the energy efficiency perception.

The development of this tool will be done through choosing a sufficient modelling technique to base the tool on, then developing a unique user interface for the software. The modelling technique chosen to be used will be based on the analysis of two case-study buildings on the campus of UCC.

## **Case study buildings**

The Carbon Neutral Buildings Project, in co-operation with The Building and Estates Office of UCC, has instigated the retrofit of two buildings on campus, the Civil and Environmental Engineering Building and the Crossleigh building. The retrofit of the Civil & Environmental Engineering Building took place during the summer of 2009 while the retrofit of the Crossleigh building took place a year later, during the summer of 2010. Both retrofit projects are outlined below.

### **Civil & Environmental Engineering Building — case study building no. 1**

The Civil & Environmental Engineering building is located on the University's main campus and has been an integral part of the University since its early years. The building was designed by William Hill and constructed in 1910 and is now listed on the University's conservation plan. This status ensures that the external facade of the building is to remain

intact and, to a certain point, has ensured that the majority of the building's original characteristics have also remained intact. The building, in its construction, consists of thick brick walls with an external plaster facade, single glazed windows and serious lack of lighting and heating control. This would be typical of many buildings of that era, not only across Universities in Ireland but also of other public sector and commercial buildings.

The pre-retrofitted building, in its multi-purpose state, sufficiently met the requirements of the academic staff and administrative staff as well as the requirements of the students. However, in terms of energy efficiency, thermal comfort and overall building performance, the building was sub-standard. With a heating system consisting of three single-pipe heating circuits running constantly for twelve hours per day for the entire heating season, lights that were on constantly from early morning to late at night without daylight harvesting or occupancy sensors fitted, and windows which had become gradually more leaky with every layer of paint added, there was major scope for improvement from an energy performance perspective.

The retrofit measures undertaken were:

- Building Management System (BMS) installation, with integral weather compensation.
- Thermostatic Radiator Valves (TRV) installation.
- Heat Meter installation.
- Light fitting replacement along with Passive Infrared (PIR) sensors and Dimming Controls.
- Insulation of the attic.

## **Crossleigh Building — case study building no. 2**

The Crossleigh building, a former dwelling house, was acquired by the University in the 1940s, during a time when extra space was needed due to the University's expansion. Strategically located to the east of the original campus Quadrangle, its first purpose was to provide a home for those who had been lodging in the East and West wings of the Quadrangle. The building is now the home of the Department of Applied Social Studies and has been so for the past number of decades.

There are many similarities between this building and the Civil & Environmental Engineering building from a pre-retrofit point of view in that both buildings serve the needs of the occupants. However, given that the heating system consisted of electrical storage heaters, the oldest of which would have been up to 40 years old, control was possible but the energy performance of the system was poor. Also, the lighting fittings in place were the older, less efficient, T12 fittings without dimming controls and occupancy sensors.

The retrofit measures undertaken in the Crossleigh building were:

- Replacement of electrical storage heating system with a gas fuelled heating system.
- Fitting of dry-lining insulation on all externally exposed walls.
- Upgrading lighting fittings to high efficiency T8's to include occupancy and dimming controls.
- Installation of heat meters to monitor heat usage in the building.

### **Case study building analysis**

The analysis of the case study buildings will comprise of numerous tasks. These tasks, outlined below in Figure 3, will then form the basis for arguments for a certain modelling technique, which will be used to develop a decision-making software tool which in turn will be used to improve people's awareness of energy efficiency potential.

The tasks to be completed on both buildings will be pre-retrofit and post-retrofit monitoring and modelling. The monitoring will be in the form of monitoring actual energy usage in the buildings using meters installed as part of the retrofit project. The modelling takes the form of static simulation modelling and dynamic simulation modelling. The static simulation modelling is a simplified modelling technique, while the dynamic simulation modelling is a sophisticated technique requiring a lot more time and detail to complete.

The overall analysis of both retrofit projects will also provide a quantitative assessment of the achievement of the retrofits carried out.

### **Improvements and future implications**

An energy assessment is a practical review and analysis of energy management and usage in a chosen target, like a building, with the objective of understanding the energy dynamics of the target under study. An energy assessment is typically carried out to ascertain methods by which energy usage can be reduced, without affecting the output/function. In terms of a building, the output/function would largely be the comfort levels of the occupants. An energy audit should first determine the significant energy users and then seek to prioritise the opportunities for energy savings, from the most to the least cost-effective.

Assessment of savings as a result of retrofit measures is not always as straight-forward as it might first appear. This is particularly true in the case of multiple retrofit measures taking place at the same time. For instance, upgrading a heating system to include weather compensation while also upgrading the lighting to lower energy consuming lights will mean that the full affect of the heating system upgrade will not be fully realised. This is due to the fact that the building will not have the same casual gains from the lights as

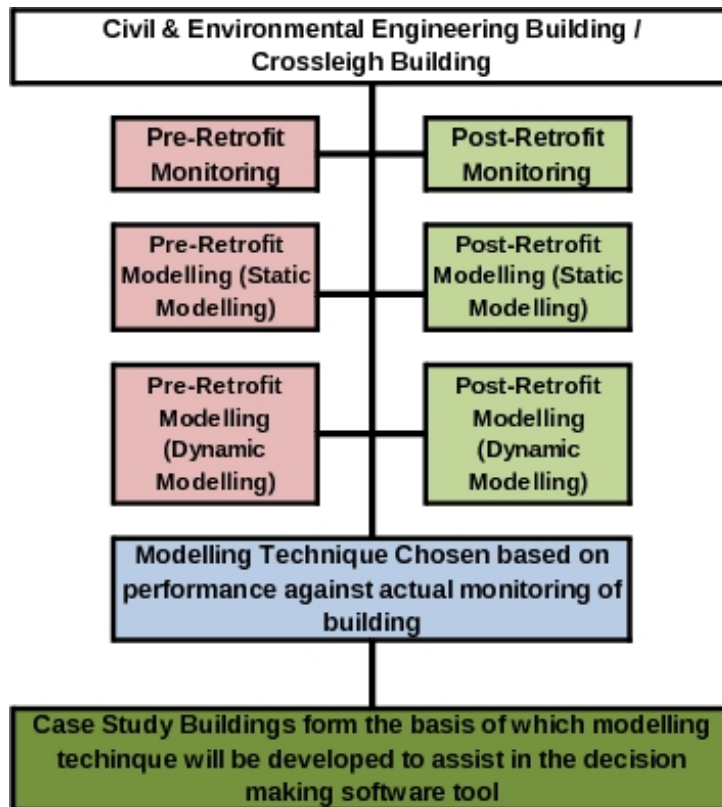


Figure 3: 3: *Outline of procedure for Case Study Buildings Analysis*

it had previously. Thus, the heating system will have to replace this heat gain lost in the lighting upgrade. It is our intention that the decision-making retrofit tool proposed in this research will consider such intricate interlinking of retrofit measures.

According to the World Coal Association, proven coal and gas reserves are equivalent to 46 and 63 years consumption at current production rates. From that perspective, *“efficiency is better than fuel”* and improving energy efficiency is being recognised by most incoming policy makers as the necessary first course of action in tackling the depleting fossil fuel supply.

The greatest barrier being cited in the prevention of widespread adoption of retrofits is the lack of data in retrofit performance in terms of energy savings and financial backing according to a Pike Research white paper in 2010. It is the aspiration of the Carbon Neutral Buildings Project to work on a solution to this finding, in the white paper, in the form of a user friendly, low cost, simplified modelling software tool which will assist building managers and practitioners alike in delivering greater energy efficiency and energy savings. It is envisaged that this tool will provide the data required on retrofit performance, whilst also reducing the high upfront costs of energy modelling.

## Outlook for research

Retrofitting is a method of achieving energy efficiency for buildings for the future. The initial capital cost investment, the associated payback and the scale of the retrofit all need to be considered when undertaking a retrofit project. These facts, coupled with the perceived barriers towards retrofits, highlight that there is a great need for guidance in this area. This need can also be seen to stem from the requirement to allow people to make a judgement on their own individual case, as each project's retrofit potential is different.

The form which the guidance should take could be one of many. Guidance documents could be seen to be the norm, being issued by the country's energy agency such as SEAI in the case of Ireland. However, documents can often be quite large, and can contain information which might be irrelevant to most people. This could then turn people off attempting to carry out retrofits. Furthermore, documents often tend to only deal with idealised situations, which try to capture as broad a range of buildings as possible. While this will help a certain proportion of users in some ways, it will inevitably lead to confusion, as every situation will be unique.

The Carbon Neutral Buildings Project sees the need for guidance as being the need for an alternative to a guidance document. It envisions an interactive application which is user-friendly, easily interpreted and basic in function. This would take the form of a software application with a straight-forward user interface. This software tool will have accurate output for a minimal input taking the form of basic building information.

This interactive application would assist energy managers or people who own or run non-domestic buildings and are looking at possible ways of cutting the running costs of the building. It will provide first hand evidence of the possible savings achievable from retrofits without the expense of complicated modelling or simulation. Payback periods for initial capital investment will also be included in the guidance tool to give a well rounded overall picture of the benefits to the proposed renovation which is being assessed.

**Sean Murray is a student in the Department of Civil & Environmental Engineering UCC, under the supervision of Dr. Dominic O' Sullivan and would like to thank Dominic for his contribution to this research.**

# What is the perioperative nurses main challenge when caring for the surgical patient?

**Brid O' Brien**

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## Introduction

This study looked to speak and listen to nurses working in the perioperative setting to identify and resolve their main challenges and concerns. Perioperative nursing is defined as the care of the patient before, during and immediately after surgery and has a rich history. Being at the frontline of care, the challenges and concerns nurses continually face in their daily working lives impact on the care they deliver to the patients in their care. The nurses who participated in the study were all qualified and ranged from working in the perioperative setting from six months to thirty three years and were in both management and non-management positions.

## Background

The aim of this study seeks to identify patterns of behaviour occurring daily in the perioperative setting. It seeks to identify the main concern of nurses working there and how they resolve issues that arise. Perioperative nursing can be defined as the provision of nursing care by a Registered Nurse preoperatively (before), intra-operatively (during), and postoperatively (after) to a patient undergoing an operative or invasive procedure. It is practiced today in many different areas, e.g. hospital operating rooms, interventional radiology suites, cardiac catheterization laboratory (room in a hospital where diagnostic imaging equipment is used to support the catheterization procedures) surgeon offices, endoscopy suites, ambulatory surgery centres and emergency trauma units. Perioperative nursing is a complex and exciting specialty.

The Core Nursing Skills of Perioperative Patient Care involve: critical thinking, aseptic technique (procedure performed under sterile conditions), working with diverse patients and evidence based practice to ensure that quality care is delivered. It also involves maintaining safety, educating patients, adhering to legal guidelines, policies and procedures ensuring that care is administered in an ethical way. The fundamental nursing values (knowledge, skills, and judgment) are ever present when working in the perioperative setting. These are the basis for quality care that surgical patients have relied on and

can expect when being cared for by any perioperative nurse. Perioperative nursing is not just technical work that a nurse can do. A significant part of perioperative nursing is the delivery of scientifically based care which involves understanding the need for certain methods of care and when to initiate them. Knowledge of surgical interventions, instruments and equipment is required. Without this the perioperative nurse is unable to prepare for or anticipate the steps in the surgical procedure. It must be remembered that perioperative nursing is a systematic planned process. Many skills are required by perioperative nurses, i.e. nursing care skills (assessment), interpersonal skills, critical thinking and decision making and technical skills to ensure good quality care is given. Teamwork is fundamental in the operating room and occurs from the moment one steps inside the unit. Participation in a multidisciplinary team is part of working in the perioperative setting.

Normally the perioperative period consists of the preoperative, intraoperative and postoperative phase. The preoperative phase begins with the decision to have surgery until the patient is transferred to operating theatre. The preoperative period is the time period prior to surgery. The intraoperative period extends from admission to operating department to the transfer to recovery room. The postoperative period extends from the admission to recovery room to complete recovery from surgery. Surgery is normally classified under three headings: urgent (which implies elective or emergency), risk (which implies minor or major) and purpose (which implies diagnostic, removal, palliative, reconstructive, transplantation and constructive).

Recent reconfiguration changes within healthcare management in perioperative care have resulted in the movement of all major and minor surgery to the larger city hospitals. Contributing factors include government policy, major errors in diagnostic procedures, finance and creating centres of excellence.

## Method

This study was guided by the principles of classical Grounded Theory, which is an inductive and interpretative research methodology which creates research-based knowledge about behavioural pattern as described by Dr Barney Glaser. Following ethical approval, data was collected through individual, face to face, unstructured interviews with thirty seven perioperative nurses with varying lengths of experiences of working in the area. Thirty three hours of observation was also undertaken within the eight different perioperative settings within the Republic of Ireland. Theoretical sampling was utilised for the study which enabled making a decision in keeping with the emerging data to identify new participants to interview. Data was simultaneously collected and analysed according to established classic grounded theory research procedures of open and selective coding, constant comparison, memo-writing, and theoretical sampling.

The interviews were recorded and subsequently transcribed. The interviews lasted between twenty five minutes to ninety minutes. During the initial interviews the nurses



were asked broad based open-ended questions regarding the challenges they face daily and they were listened to without verbal interruption, thus ensuring that the researcher remained open to the data. As the interviews continued, leads were followed and the questions became more focused while remaining open-ended. Following interviewing of the participants, the interviews were coded using substantive coding (open and selective) and constantly compared for similarities and differences. Memos were written in varying lengths recording ideas, developing concepts, identifying and theorising codes and their relationships and hypothesising about connections and relationships between categories. Memos were then sorted and theoretical coding was undertaken as per classical grounded theory approach.

This study is current and the core variable to emerge from the study was minimising risk in a high risk setting (main challenge facing nurses in the perioperative setting). This challenge was resolved by the perioperative nurses through "Anticipatory Vigilance". This is now being written up in an explanatory theory.

## **Conclusion and Recommendations**

This study has provided the opportunity to nurses working in the perioperative setting to share their experiences on how challenges in their work environment are encountered and resolved. There has been a dearth of in-depth research within this area. The area of nurse perception of risk has been largely unexplored to date. The findings from this study will provide valuable insight and awareness for nurses working in the perioperative setting and provide a deeper understanding of the work undertaken by nurses working in this acute setting for those working outside the setting.

The theory identified in this study will be relevant to a number of people both within and outside the perioperative setting. It is hoped that this theory will support perioperative nurses with a clearer understanding of the work they do and how they do it. It will add to the body of knowledge already available. It will support staff in creating best practice guidelines ensuring that perioperative care is given further air time, resulting in the perioperative setting being a safer place to work. This will lead to establishing better quality care for all patients and nurses that spend time in the perioperative area.

It is anticipated that this explanatory theory will inform policy both locally and nationally in the future. It is current in adding to the body of knowledge on risk management and assessment. It will inform and influence practice and future understanding of nursing in the perioperative setting. Nurses working in the perioperative setting have an important role in contributing to positive patient outcomes within the surgical setting and will achieve that through influencing practice.

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What is the perioperative nurses main challenge when caring for the surgical patient?

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# Ireland through French eyes: reports from Ireland in French newspapers in the 20th century

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He would explain to his readers, they who lived in a country millions of miles from Belfast, that a people were outraged, deprived of hope, and so alone. (Sorj Chalandon, French journalist)

## Introduction

The French and the Irish have for many years had a certain affinity and a distinctly positive regard for each other. It may well be that our shared history and Celtic ancestry, or common religion have helped to bring us together and to support each other. For centuries religious links have been forged by successive waves of missionaries who travelled from Ireland to the European continent to spread the faith. While these religious links may not today be as strong as they once were, there are still several extremely strong links between the two countries, for instance in the areas of culture, education or business. In recent times the creative talents of the writers James Joyce and Samuel Beckett and artists such as Walter Osborne, Roderic O'Connor and Eileen Gray have helped to establish and foster the bond between the two countries.

For well over a hundred years, news stories from and about Ireland have featured heavily in the pages of the French press. This was particularly pronounced during the early part of the twentieth century when Ireland was still under British rule. At that time attempts by Irish men and women to bring about Irish independence were written about, in great detail in a wide variety of French newspapers. This research project will look at the unique relationship that exists between Ireland and France through the work of a broad range of French journalists from different backgrounds and political perspectives who came to Ireland to report on specific events for the French press. It is hoped to be able to reveal why the strong links exist by examining the work of these French journalists.

## Grand reporter

Much like the embedded journalists that we hear about today who cover America's wars in Afghanistan and Iraq, the French journalists who travelled to Ireland during the early

part of the twentieth century located themselves at the heart of the action. The French press created the term *grand reporter* to describe this new type of journalist, who would travel from place to place to report on major events around the world as they unfolded. Technological progress and improvements in various modes of transport meant that the *grand reporter* could travel almost anywhere in the world, even at very short notice. French journalists such as Joseph Kessel (1898-1979), Henri Béraud (1885-1958) and Simone Téry (1897-1967) embody this intrepid explorer better than anyone else. During the 1920s, 1930s and 1940s they travelled widely to report from the heart of conflicts in Europe, such as Ireland in the 1920s and Spain's Civil War in the 1930s. Their reports from Ireland were often front page news on the different newspapers that they worked for. It would not be an exaggeration to say that for a number of years at the beginning of the twentieth century, Ireland was a major rallying point for the *grands reporters* on the journalistic pilgrimage around the world. They also travelled to other hot spots such as the Middle East, Russia and Africa to report on many of the major local and international conflicts at that time.

## Reporting major events of Irish history in French newspapers

During the twentieth century French newspaper editors sent the *grands reporters* to Ireland at times of great importance in Irish history. This included times such as the 1916 Easter Rising, the Irish War of Independence, the Civil War and more recently the conflict known as 'The Troubles' in Northern Ireland. It is clear that the French newspaper reading public were interested in what was happening in Ireland, otherwise newspaper editors would not have sent reporters to Ireland. The death of the Lord Mayor of Cork, Terence Mac Swiney, after seventy four days on hunger strike in Brixton Prison marked a significant point in Ireland's struggle for independence. As figure 1 above shows, reports of his death on the 25th of October 1920 were given as much prominence as the death of the King of Greece in the French newspaper *Le Petit Parisien* on the 26th of October.

## Ireland in the 1920s through French eyes

Two young French reporters, who would go on to be very famous authors, reported from Ireland during the year 1920. Henri Béraud was writing for the left leaning newspaper *Le Petit Parisien* and Joseph Kessel was writing for *La Liberté*, a right leaning newspaper. These two young men travelled around the island of Ireland and met with many of the people who helped bring about change, such as the Sinn Féin leadership and some very shadowy figures in Dublin Castle. While in Ireland they reported on some of the events that brought about Ireland's freedom, including the sack of Balbriggan and the killing of a policeman in Belfast, in retaliation for the killing of three Sinn Féiners the previous day.



Obviously well connected, both Kessel and Béraud met the commander of the British troops in Ireland, General Macready. He assured them that he could not discuss matters of politics with them and that his sole purpose in Ireland was to maintain order in the country. Kessel secretly met Countess Marckievitz in a Dublin house while she was evading capture by British forces, after arranging a clandestine meeting with the aid of a Sinn Féin contact. Kessel spoke French with the Countess and he left the meeting in awe of what he perceived as one of the most accomplished and courageous women he ever met. Kessel visited the cities of Belfast and Cork, and while in Cork he talked with a young Professor Alfred O'Rahilly in the grounds of University College Cork (UCC). O'Rahilly was later Registrar (1920-1943) and President (1943-1954) of UCC. Béraud also travelled from Dublin to Cork and Belfast and was struck by the abject difference between the north and the south. While trying to explain the difference between the two parts of the island, he said: the inhabitants of the north go about making their fortune while the southerners believe in miracles.

A young French reporter named Simone Téry travelled to Ireland in August 1921 to find out for her readers whether the truce in the Irish War of Independence was sustainable or not. She met with many of the political leaders of the day and their words were faithfully reprinted on the front page of her newspaper *L'Œuvre*. Téry travelled to County Clare with Michael Brennan, who was the IRA commander in the county, to see for herself how the truce was holding up. She met with leading unionist politicians in Belfast. Back in Dublin, she interviewed political figures such as Eamon De Valera, Michael Collins, Erskine Childers and Desmond FitzGerald. She admired the tenacious spirit of the Sinn Féin leaders and was particularly impressed by Desmond FitzGerald, who was Minister for Propaganda at the time. He spoke to her in fluent French and when she came away from her meeting with him in Dublin's Mansion House, Téry said "l'Angleterre aura du mal à réduire ces hommes-là" (England will have great difficulty in fighting such worthy opponents).

### **Northern Ireland's 'Troubles' as reported in the French press**

The painful recent period of Irish history known as 'The Troubles' was followed intently by many foreign media organisations, particularly French newspapers. French newspaper readers were keenly interested to know how a war could be taking place in Europe, only a couple of hours from Paris by plane. Journalists such as Richard Deutsch (1945- ) who worked for the newspapers *Le Monde* and *Le Figaro* and Sorj Chalandon (1952- ) who wrote for *Libération*, travelled often to Belfast and reported on the growing instability in the region.

Keeping alive the links with the golden age of French journalism, Chalandon refers to himself as a *grand reporter*. He has reported from many war zones around the world, including Lebanon, Iraq and Afghanistan, but says that the conflict in Northern Ireland,

more than any other, has had some kind of pull on him and caused him to return many times over the years to write about what was happening there. He has won many prestigious French literary awards for his novel *Mon traître* which is set in Northern Ireland and was based on his friendship with a high profile Sinn Féin member who was also a British army informant. The book has recently been translated into English under the title *My Traitor* and Chalandon was interviewed by Pat Kenny on RTÉ Radio 1 in May 2011, when it was launched in Ireland.

## Conclusion

Whilst the relationship between France and Ireland has been documented in different forms and by many observers and commentators up to now, it has never been examined through the writings of French journalists before. Therefore, this research project, which uses original newspaper articles to get to the heart of why there are such close ties between the two countries, is both novel and exciting.

By writing about life in Ireland at key moments in the country's birth and growth, French journalists have undoubtedly contributed in a positive way to creating an understanding of what life was like in Ireland. Their writings have given a voice to the voiceless and highlighted many injustices. We are interested in finding out what the journalists' motivations were in relaying news from Ireland to the French newspaper reading public? Could it be simply a case of Ireland and France uniting in the face of a common enemy, i.e., Britain, or is that too simplistic a reading of the Franco-Irish relationship? It is said that journalism is the first draft of history and it is hoped that through this research, we will have a good idea of why there is such a close bond between our two countries.

I would like to thank my supervisor, Professor Grace Neville, the staff of the Department of French and my post graduate colleagues in University College Cork for all the help, encouragement and support they have given me. I would also wish to thank the Bibliothèque Nationale de France (BnF) for permission to reproduce the illustration featuring *Le Petit Parisien*.

# The poetic construction of the self

Niamh O'Mahony

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“When I play with my cat, who knows if I am not a pastime to her more than she is to me?” — (Michel de Montaigne, 1576)

## Introduction

It is particularly appropriate that an introduction to my research into the poetic constitution of the Subject should begin with a reflection on the relationship between a cat and her keeper. The statement quoted above presents the cat as a subject with the capacity to think and comprehend equal to that of her human. In this example, the French philosopher Michel de Montaigne extends that proposition by suggesting that the cat's consciousness might well lead her to perceive her owner as an amusement; “We entertain each other with reciprocal monkey tricks,” he says, “if I have my time to begin or refuse, so has she hers”. The chief philosophical question arising from Montaigne's meditation on feline consciousness is why we so readily and forthrightly disregard the possibility that the philosopher should indeed be “a pastime” to his cat; why are so unwilling to bestow upon an animal a consciousness at least comparable to that of a human? And what does it do to our relationship with that animal that she is not accorded some degree of the consciousness we accord to each other?

This invocation of the philosopher's cat derives directly from the opening pages of French philosopher Jacques Derrida's *The Animal That Therefore I Am*, and is referenced because it remains an incomparable articulation of the problem of self in philosophy. When the attribution of subjectivity to an individual continues to exert such a strong influence over one's expectations of life, and indeed the value placed on that life, it is fundamental that the construction and attribution of subjectivity is understood as thoroughly as possible. To deny particular individuals or populations the same subject-hood we accord to each other encourages a set of behaviours and operations from the most uninformed and ignorant to the most unspeakably violent and inhumane.

Contemporary poetry offers vibrant approaches to this questioning of philosophical subjectivity. Tracing the history of criticism and its various affirmations of the authority of the poet, the poem, and the reader, this study engages a diversity of poetics in examining the development of the subject. Aligning poetry with philosophy in an investigation into the constitution of the subject enhances philosophical understanding of and writing about the



category of “the subject,” while also invigorating discussion of the relations between the text and the person in poetry criticism.

## Philosophy

### **What is a philosophical Subject, and where did it come from?**

The Subject has a long and complex history in continental philosophy, and is dated back to works by the ‘Father of Modern Philosophy,’ Rene Descartes (1596-1650). Descartes’ theorising on the Subject produced one of the most famous phrases in modern philosophy, “I think, therefore I am.” Put simply, “I think, therefore I am” asserts that cognition is the primary condition of being; to think, or to cognize, is to be a self.

As critical thinking developed, the philosophical subject gained currency as a method of categorizing the many different beings in the world. The authority and significance of the being was measured according to its perceived consciousness, and as consciousness was believed to be the defining feature of humanity, the human being was granted the highest position. The classification of life in respect to cognition has been invoked by a vast variety of writers and philosophers in the following years, and has been intrinsic to public debates regarding man’s dominion over nature since before the Industrial Revolution.

### **How has the philosophy of the Subject changed over time?**

The purpose and function of the Subject varies from philosopher to philosopher and from text to text. Historically, philosophers used the concept because it offered them a lowest common denominator for discussion and debate of perceived wider philosophical questions. Others used it to assert man’s authority to exert control over other beings and objects as the most superior of Subjects. Over the past century, the focus has shifted from invocations of the Subject as a critical tool in philosophical writing, to a more considered examination of the experience of Subject-hood. Moving towards an analysis of the relationship between Subjects, Emmanuel Levinas discussed the striking differences of one Subject and an ‘Other’. For Levinas, philosophical Subjectivity always manifested itself as “welcoming the Other, as hospitality.” It is in the interaction of one Subject and an “Other” that “the idea of infinity is consummated,” Levinas says, because the fundamental differences between Subjects makes it impossible that we should ever fully know or understand one another

French philosopher Jacques Derrida developed Levinas’ understanding of the Subject further. He looked at the treatment of animals in society to learn more about the development and application of human selfhood or Subjectivity. For Derrida, the most important question was not whether an animal has reason or not, but whether it could suffer. By replacing

cognition with suffering as the primary condition of being, Derrida challenged the logical justifications of decisions and policies, whether referring to the ritualised slaughter of animals in abattoirs or the massacre of Jews, gypsies and homosexuals in Nazi gas chambers. Derrida complicated Levinas' philosophising by showing that the "hospitality" characterising Levinas' ethical Subjectivity is available only to the individual already collectively acknowledged and recognised as a Subject; in other words, you are ethically responsible to another human Subject only if they are already acknowledged and recognised as a Subject.

### **How will the concept of the Subject be treated in this study?**

Modern understandings of the Subject can be extended by investigating the complex interrelations of poet, poem and reader in the work of the Cambridge poet J.H. Prynne. This analysis interrogates conventional arguments about the authority of the poet in deciding the meaning of a poem, and its radical undermining of the validity of a reader's interpretation and understanding. Transposing the philosophical discussion of the Subject into the study of poetry generates new insights into the construction and application of the category of the Subject as it queries traditional conceptions of this philosophical concept. Reading Prynne's poetry through the lens of philosophical Subjectivity invigorates the critical reception of the poet's work today, while also offering an example for the innovations in interpretation and understanding it hopes to generate. The poetic consideration of subjectivity is a support to rather than a replacement of philosophical work.

## **Poetry**

The following reading of the poem "For A Quiet Day" offers an example of the discussion of Subjectivity within contemporary poetry. Poetic analyses typically start with an acknowledgement of the difficulty of attributing a single, unified meaning to a linguistic construct where each word is loaded with diverse etymologies and multiple meanings. J.H. Prynne's poems can be interpreted as investing in the debate around subjectivity because they undermine the traditional role of the reader as passive receiver of the work.

Prynne's poetry challenges the understanding of the poem as holding a decipherable meaning which the reader or critic must unfold. It encourages the reader to disregard the idea that a poem should present one stable meaning, and asks instead for what Prynne calls a reading of "maximum focused intelligence and passion." This analysis counteracts the frequent condemnations of this poetry as difficult and obscure, finding instead a particular generosity and reserve.

### For a Quiet Day

There are some men that focus  
 on the true intentness, as I know  
 and wouldn't argue with: it is  
 violent, the harp — I will not do it  
 though, and the time is  
     so gentle, in the shadow  
     that any youth might  
     sleep. But I will  
     not do it, with the gilded harp  
 and of all things, its pedals, for  
 the nice touch. As the curves too  
 are sometimes gentle,

(J.H. Prynne, *Poems*, 2005)

These lines come from the opening section of “For a Quiet Day,” the eighteenth poem in Prynne’s 1969 collection *The White Stones*. On one level, this is a poem of resistance to the traditional assertion of the poet as authority on the meaning of the text and the manner in which it undermines the reader. As an ode, a poetic form of address, “For A Quiet Day” addresses those “men” who choose to “focus” on “true intentness,” or meaning of a work of art, criticising it as time spent “in the shadow” said to be “so gentle” that “any youth might/sleep”. This crude construction of art as “gilded harp” with “pedals, for/ the nice touch,” affirm the artist’s control over the dissemination, whereby form and style, like “curves” that are “sometimes gentle,” lull the reader into unwitting agreement. Prynne’s poem disrupts conventional orientations of the reader and inaugurates alternative perspectives on subjectivity in contemporary society.

Thomas Butler offers an admirable reading of this poem in his unpublished PhD dissertation “Writing at the Edge of the Person: Lyric Subjectivity in Cambridge Poetry, 1966-1993.” Butler argues that “For a Quiet Day” is the articulation of the Prynne’s stance on poetic and philosophical Subjectivity. Such poems are said to demand complex engagement by the reader in which she or he is confronted with an array of disparate rhetorics “which block an easily consumable meaning and instead require the reader to remain in the space of the poem.” Compelling the reader to occupy the poem in this way implies that the reader acknowledge and interact with others and “entertain what is discordant and other to it,” thus challenging the prejudices and preconceptions of the individual Subject. Prynne is described as rejecting the singularity of “intentness,” or meaning in poetry, comparing it to the “gilded harp” which is “always too/fine, too hopeless.” As Butler explains, “poetry marked by “intentness” is characterized by a Subject who is isolated from experience and by transparent language—or, just the kind of poetry Prynne opposes.”

It is just these kinds of digressions in language and meaning that redefine the responsibilities of the reader of Prynne’s poetry, and thus of the category of reader as subject. His poems demand that the reader engage with and decide upon the meaning of the

poem rather than uncovering a predetermined understanding. J.H. Prynne's reflections on being "rather frequently accused of having more or less altogether taken leave of discernible sense" are indicative of the particularly complex convolutions of sound and sense that characterize his poetry. The fact that he affirms these criticisms as "more or less true" demonstrates the progression of Prynne's poetry, moving away from what he says "for so long has seemed the arduous royal road into the domain of poetry ("what does it mean?")."

## Conclusion

The radical restructuring of relations between poet, poem and reader is achieved as result of the particular poems and collections, and the manner in which they are critically analysed. Transferring philosophical debate of subjectivity into the domain of the poetic invigorates understandings of authorial power and the critical production of meaning in poetry. It also extends philosophical debates through a more creative, imaginative trajectory, generating new ways of responding to old issues and debates. While discussions of the Subject continue to provoke strong reactions in philosophical circles today, the real consequences of this concept are manifested in more real and often violent ways in wider society, and it is for this reason that innovative analyses such as this are most important.

Niamh O'Mahony is a second year doctoral candidate under the supervision of Professor Graham Allen. She would like to acknowledge the support of the Irish Research Council for the Humanities and Social Sciences and the UCC William J Leen Fund.

# The Impact of the “Nakba”(Palestinian Catastrophe) on Internally Displaced Palestinian Women in Israel

Abstract of Doctoral Research  
at University College, Cork 2011



## Living between memory, war, and daily life

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My memory has betrayed me, and slowly I am losing it. I fear the black day when I find myself without any memory, just a body . . . that wanders in the streets and forests ... until a hunter finds it. I, who fought the windmills, lost my memory and turned into nothing, exactly nothing. He [the hunter] will take me to the house where I was born and hand me over to my family ... He’ll go to his family and tell them about an old man who lost his memory and pompously proclaim, “If I hadn’t intervened he would have been eaten by the hyenas.” We shall be eaten by the hyenas if we lose our memory. We shall be eaten by the hyenas.

(Natour, 2003: 19)

This paragraph written by the widely acclaimed Palestinian writer, Salman Natour, in one of his significant play about memory, as he tried to show the trauma of the Nakba for Palestinian society. His writing reflects many of the deep seated emotions embedded in Palestinian memory. I remember watching the play in Haifa in July 2004. Natour performed the role with his wonderful acts and movements. His play raised a lot of thoughts in my mind, especially when he started mentioning his granddaughter, Salma, and the stories that he told her and will tell.

These Nakba (Palestinian Catastrophe) memories and stories, especially for the first and second generations, are often underpinned with feelings of fear, loss, humiliation, and insecurity. They relate to the year 1948 as a demarcating event in their lives. Simply, their lives were turned upside down in that year. Therefore, the Nakba is a key to Palestinian collective memory and national identity from 1948 until today.

### **What is the Nakba?**

The Nakba (Palestinian Catastrophe) is the disaster that befell the Palestinian people in 1948, after the Jewish forces (subsequently Israeli) embarked on a massive operation of ethnic cleansing that aimed at ridding Palestine of its indigenous population, in order to find a nation-state for the Jews. As a result of the 1948 Arab-Israel war, many Palestinians became exiles in the surrounding Arab countries and abroad, where they remain until this day, usually as stateless, temporary residents. Estimates of the number of refugees fleeing

or expelled from Palestine in 1947-48 are around 714,000. Constantin Zureiq was the first to use the word “Nakba” in reference to the events of 1948. For him, “The defeat of the Arabs in Palestine is no simple catastrophe (Nakba), nor an insignificant, fleeting evil, but a catastrophe in the full sense of the word, an ordeal more severe than any suffered by the Arabs in their long history of ordeals and tragedies” .Why we need memory?

As a third generation Palestinian citizen of Israel, I belong to the generation that came into this world after the dismantling of military rule that the state of Israel forced upon its Palestinian citizens until 1966. This military rule prevented all citizens from leaving their villages or towns without specific permission. My generation did not really experience Israel’s wars against the Arab countries in 1950s, 1960s, and 1970s. However, the beginning of my political life and awareness began in 1982, when I was just 10 years old. That was when I participated with my grandmother in demonstrations in my hometown of Nazareth against the Lebanon war and the Sabra and Shatila massacre, and we faced Israeli police violence and harassment with our bodies. As a child I could not forget this event; until today the events of that day are indelibly etched in my memory. It seems as if they happened only yesterday.

After my grandfather passed away in 1991, my grandmother took upon herself the task of telling us, her grandchildren, about the different roles she undertook when my grandfather was in jail for his role in the resistance to the Zionist colonization of Palestine. Since I was a child, both my grandfather’s and grandmother’s stories have been the seeds of my growing political awareness. They told us what happened during the Nakba period, especially in our hometown Nazareth. Both of them lay in front of the trucks that came to take Nazareth’s citizens to the Lebanese border in the north. In this way, they and others, prevented Nazareth’s citizens from being evicted in July 1948. My grandmother told us about the time when they hosted refugees, from other villages and towns who came to Nazareth, in their small house with a garden in the middle of the city centre. Some of these refugees became Internally Displaced, while others became refugees in neighbouring Arab countries. We, their granddaughters and grandsons, were excited to hear these stories.

Therefore, I believe that memory is an important political and historical tool that secures the place, the nation’s history, and the homeland. Losing memory means losing national identity. The fact of being out of “place”, out of “time”, out of the hometown ,makes forgetting, mixing, or losing these memories easier, especially in that many of the Nakba generation are passing away, taking with them their stories and testimonies.

## **What is memory?**

Collective memory has recently become a central focus in different fields of research. This research focuses on the social, political, historical and feminist literature and its relation to collective memory. This research also concentrates on the role of remembering

and on the commemorative narratives of the Nakba's survival inside Israel in general, and on the lives of Palestinian women in specific before and after 1948. Although we are using the term "collective memory", this "collective" is constructed from the various "individual" narratives, autobiographies and testimonies that are transferred from one generation to the next. These memories differ from each other, according to the person's class, education, village origin, and village hosting shelter.

This research focuses on the personal experiences of the Internally Displaced Palestinian (IDP) women from the first generation, within the context of the social and political changes that have taken place in their lives over the last sixty three years. Furthermore, this research is trying to link these memories and reflections to the second and third generations of IDP women.

## **Memory is a battlefield**

Our memory is reflected upon and affected by different factors that erase or distort these memories. Over sixty-three years of displacement and living in a "new" place, having children and grandchildren, experiencing life's daily difficulties, worries and happiness, are all factors that reflect and affect the memories of the first generation who experienced the Nakba. Furthermore, the second and third generations were not born in their original villages. They only have "heard" their parents' and grandparents' narratives and memories. I know this from my own grandmother with her stories over the last ten to twenty years, and the missing parts or differences to these same stories when I ask her to tell me about her experiences from those days. It is not an issue of fiction, creation or lies; it is simply a reflection of the years, from the effects of losing her husband, from sickness, or sometimes simply from not talking about the past.

Conditions of exile and memories of the past have had colossal effects on the social, religious and political life of IDPs in Israel as dispersed inhabitants. What are those social consequences? To what extent have integration or assimilation policies affected those Palestinians living in shelter Palestinian villages and towns in Israel? How does the socio-political history of their village form their modern collective history? Is it "real", "invented nostalgia", or "reinvented history" that dominates their imaginations and their discourse as well?

The testimonies of IDP women in Nazareth and Akka (Acre) districts, who were interviewed over the period 2008 to 2011, taught me how these women experienced the expulsion process. They experienced the Nakba through the many roles that they played as women (mothers, wives, etc.). As women are often the emotional centre and power (source of strength) in the family, they often found themselves having to simultaneously manage their own anxiety while caring for others. They had to cope with their loss of land and tradition. Possibly the most important issue was the loss of economic resources, which impacted on their lives and their self-confidence. They were taken from their traditional

environment and lifestyle, without the aid of new knowledge or skills, or any other support to help them manage their new life, which was devastating. The re-settlement into an unfamiliar life has left many IDP women depressed and unhappy, with deep feelings of loneliness and worthlessness. Most of the women I interviewed expressed anger towards the Israeli state which deprived them of their homes.

## What we can do?

I feel it is important, especially in academic research, to investigate the past when we are studying collective memory. Here, I would like to refer back to the Palestinian writer Salman Natour. His writings help to keep our memory alive, disproving Ben Gurion (the first Israeli prime minister) when he said that “the elderly (Palestinians) will die and the youth will forget (the Nakba and their national identity)”. This is one way of constructing collective memory, especially in that many Palestinian authors and novelists chronicle these traumatic events, utilizing the names of destroyed villages and towns which were demolished during the Nakba war, depicting their inhabitants’ struggles and stories, and their “moving” to new shelters. In this way, we can remember and keep the Palestinian names for the places that were replaced by Hebrew and Jewish names. Therefore, these writings are a very important resource for our collective memory as the Palestinian minority citizens of Israel, especially for the younger generations who have grown up in a different reality, a reality of a so called “democratic” state.

The state of Israel has attempted through systematic policies, especially through the educational system, to create a new nationality of Arab Israelis, through the excision of the Palestinian narrative from the curriculum. Nevertheless, Palestinian citizens of Israel continue to commemorate the Nakba in a variety of ways, through the formation of village societies, visits to destroyed villages, and public lectures, all in order to keep the flame of Palestinian collective memory alive in spite of Israeli attempts to deny their history and their rights.

Third year PhD research student in the Department of Sociology, UCC, under the supervision of Dr. Kathy Glavanis-Grantham. I am especially grateful to my supervisor Dr. Kathy Glavanis-Grantham, Dr. Isis Nusair (Denison University — USA) and various Non-Governmental Organizations in Palestine and Israel, mainly the Association for the Defence of the Rights of the Internally Displaced (ADRID), Women Against Violence (Nazareth), and Tufula Center (Nazareth) for their critical comments and suggestions. Finally, special thanks to my partner, Jack O'Neill, and our son, Bisan, for their support.



# Using state-of-the-art DNA sequencing technology to reveal the bacteria present in Irish artisanal cheese

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## Introduction

The production of cheese is believed to have commenced over 8000 years ago during the 'Agricultural Revolution'. Today, cheese is produced and traded throughout the world, with more than 1000 cheese varieties in existence, which can be classified in a number of different ways, such as according to texture (i.e., hard, semi-hard or soft), milk type (i.e., cow, goat or sheep's milk) or level of maturity (i.e., 'fresh'/'unripened' or 'ripened'). Special categories, such as 'blue-veined' and 'smeared' cheeses, also exist. Regardless of the variety of cheese, the production is reliant on the fermentation of milk by harmless microbes such as bacteria. These microbes may be added deliberately as starter cultures or be present naturally in the milk. The bacterial composition of each cheese product is unique, and these bacteria have a major influence on the taste, colour, odour and texture of a cheese. There have thus been considerable efforts made to characterise the microbial populations of cheeses by growing (culturing) these bacteria on agar plates, in an aerobic environment (where oxygen is present), in the laboratory.

Such culture-based approaches have highlighted the frequency with which lactic acid bacteria (L.A.B., i.e., bacteria which ferment lactose to lactic acid), such as *Lactococcus*, *Lactobacillus*, *Streptococcus*, *Enterococcus*, and *Leuconostoc*, are present in cheese. While other bacteria, such as *Propionibacterium*, *Staphylococcus*, *Corynebacterium*, *Brevibacterium*, as well as yeasts and moulds, frequently occur, there also exists a large spectrum of other microorganisms which occur less frequently (including disease-causing or 'pathogenic' bacteria) or are more difficult to detect. Significantly, it is now recognised that the aforementioned traditional, culture-based techniques, introduce biases as a consequences of the fact that some bacteria do not grow well (or at all!) in laboratory agars and broths. For these reasons, it is crucial to have tools that allow monitoring of bacterial populations without cultivation.

## Modern methods

The development of new DNA-based methods which allow scientist to study bacteria without culturing them in the laboratory, i.e., culture-independent approaches, has led to a revolution in microbiology. These techniques rely on the analysis of DNA extracted from bacteria present in a particular environment and, provided DNA can be extracted efficiently, an accurate picture of the bacteria present in any environment can be developed, regardless of whether the bacteria can be grown in a laboratory or not. Different bacteria can be distinguished on the basis of differences in the DNA sequence of a particular gene, called the 16s rRNA gene, which acts as a bacterial DNA fingerprint. Thus, following the extraction and DNA sequencing of the bacterial DNA from the food matrix, bioinformatic analysis (the application of statistics and computer science) can be employed to reveal all of the bacteria that are present. The availability of new and improved DNA sequencing technologies, known as Next-Generation (Next-Gen) Sequencing technologies, and, more specifically, access to the only Next-Gen sequencer of its type (454 Genome Sequencer FLX system) in Ireland, has facilitated the present detailed investigation of the bacterial composition of Irish artisanal cheeses.

## Aim of research

The aim of my research was to apply, for the first time, state-of-the-art Next-Gen DNA sequencing technology to gain an in-depth insight into the microbial content of Irish artisanal cheese.

As mentioned above, this technology relies on culture-independent techniques. The first stage of this project was to develop a suitable DNA extraction protocol, followed by a sequencing of the 16S rRNA fingerprint of more than 100,000 bacteria. After developing a suitable DNA extraction protocol, a variety of handmade cheeses from artisanal cheese producers and farmers' markets throughout Ireland were obtained. In addition to analysing the bacterial composition of the cheeses, in many cases their associated rinds, which have been either naturally developed or smear-ripened, were also analysed.

DNA was extracted from 62 cheeses and 11 cheese rind samples, 16s rRNA gene sequences were prepared for Next-Gen sequencing and bioinformatic analysis was then carried out to identify the bacteria present.

## Outcome of study

### The microbial composition of artisanal cheeses

Sixty two handmade cheeses manufactured from unpasteurised or pasteurised cows, goats or sheep’s milk were obtained from artisanal cheese producers and farmers’ markets throughout Ireland. This collection consisted of 18 soft cheeses, 31 semi-hard cheeses and 13 hard cheeses; 49 cheeses were produced from cows milk, 10 from goats milk and 3 from sheep’s milk. Thirty four were produced from unpasteurised milk and 28 from pasteurised milk. Following Next-Gen sequencing, data analyses revealed that artisanal cheese have a diverse microflora, with the identification of 21 different bacterial genera (a classification level of bacteria). A difference in the composition of the microbes of different cheese types was noted, with the microbial diversity increasing from soft to semi-hard to hard cheese (Figure 1).

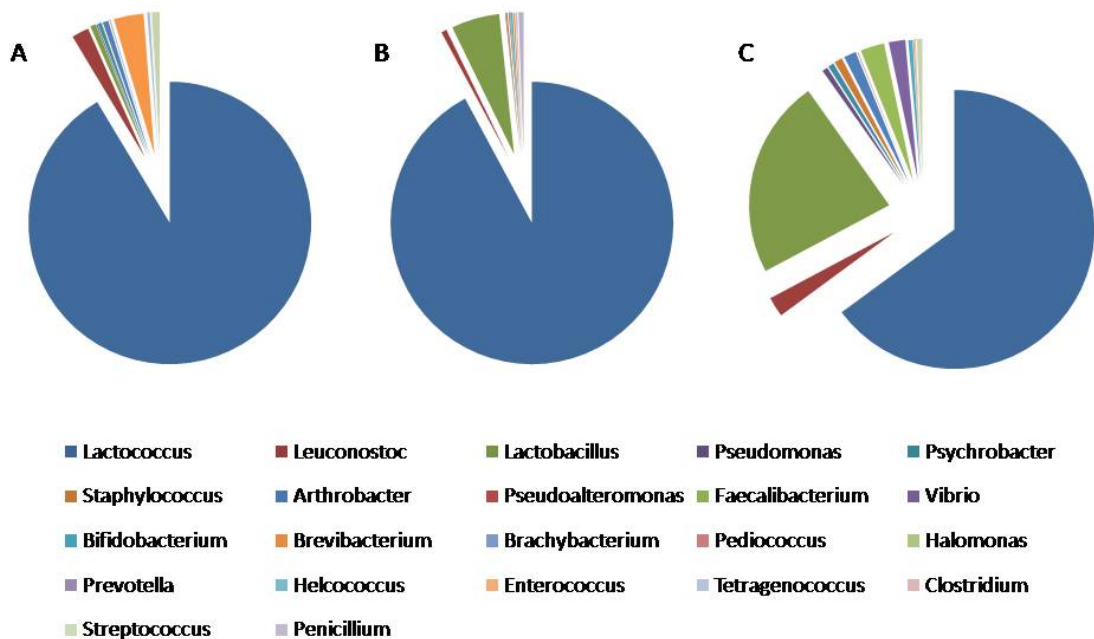


Figure 1: Microorganisms found in Irish artisanal cheeses using Next-Gen DNA sequencing technology. A = soft cheese; B = semi-hard cheese; C = hard cheese.

The dominant bacteria throughout was *Lactococcus*, a major milk microbe and a common cheese starter bacteria. When different cheese types (soft, semi-hard and hard) were compared, a total of eight genera were found in common. In addition to *Lactococcus*, these

were *Lactobacillus*, *Leuconostoc*, *Pseudomonas*, *Psychrobacter*, *Staphylococcus*, *Arthrobacter* and *Faecalibacterium*. *Vibrio* were found in soft cheese only, while *Helcococcus*, *Halomonas* and *Streptococcus* were found in the semi-hard cheeses only and *Enterococcus*, *Tetragenococcus* and *Clostridium* were found in hard cheeses only.

Three genera were shared between soft and semi-hard cheeses only. These were *Pseudoalteromonas*, *Pediococcus* and *Bifidobacterium*. Although *Pseudoalteromonas*, which is usually regarded as a marine bacterium, has been detected on the surface of smear-ripened cheese on one previous occasion, this is the first instance of its detection in cheese cores. *Brevibacterium* was the only genus shared between soft and hard cheeses, and *Prevotella* was the only genus common to semi-hard and hard cheeses.

Among these bacteria listed are three, i.e., *Prevotella*, *Faecalibacterium* and *Helcococcus*, that have never before been detected in cheese. These three types of bacteria are anaerobic, i.e., they do not grow or survive well in the presence of oxygen, which may explain why they had not previously been identified using culturing on plates under laboratory conditions. *Helcococcus* was detected in only one cheese, which was a semi-hard cheese made from unpasteurised, cows milk. This bacterium has been associated with clinical problems in humans but also in cows, sheep and horses and thus, in this instance, may reflect the sourcing of contaminated milk from an infected animal. *Prevotella* are associated with human infections, periodontal disease as well as with the rumen and hind gut of cattle and sheep. In this study, *Prevotella* was detected sporadically in semi-hard and hard cows and goats milk cheese at low levels, 0.02-0.38%.

Finally, despite not having been uncovered in cheese previously, we detected *Faecalibacterium* in soft, semi-hard and hard cheese samples made from unpasteurised and pasteurised cows milk. *Faecalibacterium* is a human gut bacterium with possible anti-inflammatory potential. Although detected at low levels (0.02-0.05%) it is notable that one of the main end-products of *Faecalibacterium* metabolism is a molecule called butyrate. While butyrate can contribute positively to cheese flavour development, in high levels this product can induce what is called the late-blowing defect in cheese, which results in undesirable cracks in the cheese, as well as abnormal aroma and flavour. The detection of these three anaerobes reveals that the microbiota of cheese is more diverse than previously appreciated, thus further highlighting the benefits of using Next-Gen sequencing to investigate these populations.

Interestingly, it was noted that cows milk cheese contained 21 different bacteria, whereas goats milk contained only 8 different bacteria. Of these eight, three, i.e., *Prevotella*, *Arthrobacter* and *Brevibacterium*, have not previously been detected in a goats milk cheese. Only two bacterial genera, *Lactococcus* and *Lactobacillus*, were detected in sheep's milk cheese.

It is also well known that pasteurisation of milk greatly influences the microbiota of resultant cheeses. However, previous studies have not employed Next-Gen sequencing tech-

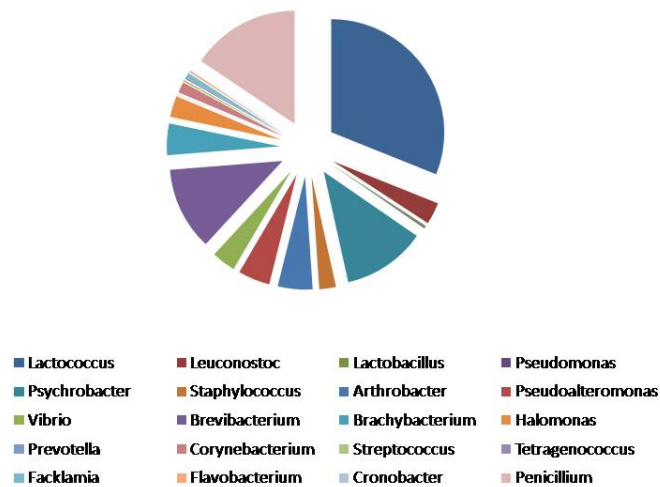


Figure 2: Microorganisms found in Irish artisanal cheeses rinds using Next-Gen DNA sequencing technology.

nologies to assess this influence in depth. Here, by comparing the bacterial genera present in artisanal cheeses manufactured from unpasteurised, relative to those made from pasteurised, milk, it is apparent that *Halomonas*, *Helcococcus*, *Streptococcus*, *Enterococcus* and *Tetragenococcus* were detected in raw milk cheeses only and that *Clostridium* and *Vibrio* were detected from pasteurised milk cheeses only.

### The microbial composition of the rind of artisanal cheeses

As a consequence of its exposure to the external environment and, in some cases, steps taken during the manufacturing process, the bacteria present in the rind of a cheese will frequently differ dramatically from that of the rest of the cheese. We again used Next-Gen sequencing to analyse the microbiota of 11 of the artisanal cheeses rinds. These included smear/wash ripened rinds, naturally developed rinds, and one mould ripened rind. Analysis of sequence data revealed the presence of 19 different genera (Figure 2).

While some of these genera, including *Lactococcus*, *Leuconostoc* and *Lactobacillus*, were the same as those detected in the cheese core, a number were identified in cheese rinds only. These included *Corynebacterium*, *Facklamia*, *Flavobacterium* and *Cronobacter*. While *Lactococcus* remained the most common genus in cheese rinds, their proportions were significantly lower in the rind than in the core. Generally, smear/wash-ripened rinds had particularly low levels of lactococci (1.91-4.82%), while naturally developed rinds had levels of lactococci of up to 98%. It was also apparent that *Psychrobacter* and *Brevibacterium* represented a considerable proportion, ~10% on average, of the total population. Other

bacteria detected include *Leuconostoc*, *Lactobacillus*, *Pseudomonas*, *Psychrobacter*, *Pseudomonas*, *Brachybacterium*, *Prevotella*, *Arthrobacter*, *Streptococcus* and *Tetragenococcus*.

While many of the genera listed above are common to cheese rinds, and indeed *Corynebacterium*, *Arthrobacter*, *Brevibacterium* and *Halomonas*, have previously been identified on the surface of Irish artisanal cheeses, we also detected two genera in the rind that had not previously been detected, i.e., *Prevotella* and *Facklamia*. The former has been referred to above and its detection in the cheese rind is surprising given its anaerobic nature. *Facklamia*, on the other hand, is an opportunistic human microbe and has also been detected in lactating cows with hematuria and urodynia and in raw cows milk (?). To our knowledge, this is the first report of this genus in cheese. It is also interesting to note that *Vibrio* were only identified in rinds of the smear/washed variety and thus it may be that the washing process contributed to the presence of these salt-water-loving marine microbes.

## Conclusion

We employed Next-Gen DNA sequencing to provide an in-depth understanding of the microbiota of Irish Farmhouse Cheeses. Here we highlighted the influence of this groundbreaking technology, identifying, for the first time, a number of bacteria previously undetected in cheese. These include the first recording of *Arthrobacter* and *Brachybacteria* in goats milk cheese. More significantly, a number of bacteria previously undetected in cheese were identified, including *Faecalibacterium*, *Prevotella*, and *Helcococcus* in cheese and *Facklamia* in cheese rind. The nature of the newly detected microbes suggests the presence of an underlying microbial population in cheese which has previously been overlooked. A thorough knowledge of the cheese microbiology is very important for cheese manufacturers as many of these microbes impact on flavour and texture of the final cheese which in return impacts on the consumer opinion of a cheese. Therefore, to meet the cheese lovers' needs, it is important for the manufacturer to understand how and where the unique tastes and textures come from and how they can impart these into their cheeses. This work highlights the significant contribution that Next-Gen sequencing technology can make to our knowledge of food microbiology.

Lisa Quigley is a student of Teagasc Food Research Centre, Moorepark and the Microbiology Department of UCC under the supervision of Dr. Paul Cotter, Dr. Orla O' Sullivan and Professor Gerald Fitzgerald. The author would like to acknowledge the Teagasc Walsh Fellowship Scheme for the funding received to carry out this research.

# Manufacturing challenges in the production of high quality modified-release tablets

**Denis Ring**

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Knowledge is the only instrument of production that is not subject to diminishing returns (John Maurice Clarke)

## Introduction

The pharmaceutical industry is obliged and regulated to ensure that manufactured medicines (i.e., tablets) meet the highest quality standards. However, no system is perfect. The European Medicines Agency (EMA) state that somewhere between 5-10% of pharmaceutical production batches must be either reworked or discarded, because they do not fully meet the stringent final quality specifications. Poor production quality, often due to inflexible manufacturing and insufficient process understanding represents an unnecessary burden in both time and expense. According to Cedar Management Consulting, the bulk of the global top 16 pharmaceutical companies' budgets are spent on manufacturing (~36%), whereas the research and development (R&D) expenses (often considered to be the major cost burden) can be less than half of this (~16%). Therefore, there is great interest in making manufacturing more effective and optimising processes in order to deliver consistent high quality.

## Research objective

The goal of this research is to facilitate greater process/production understanding and knowledge through the systematic evaluation of the manufacture of a modified-release (MR) oral tablet. The active ingredient in the MR tablet investigated in this research, along with many of the more recently developed drugs, exhibits low solubility, which provides additional challenges for consistent drug release and absorption. Pharmaceutical oral tablets remain the most popular drug delivery mechanism. MR tablets are principally used when the duration of action of a short-acting drug needs to be prolonged. Pharmaceutical companies also reinvent existing drugs by creating modified-release versions, as a legitimate means of patent extension, thus protecting their product and income integrity. The simplest method for modified-release in oral tablets is a matrix delivery system which incorporates hydrophilic polymers (hypromellose) that swells in the presence of water to

Table 1: Table 1 Typical ingredients used in a modified-release tablet, showing the % composition and function

Typical Ingredients In a MR Tablet	Typical Composition	Function of Materials (API & Excipients)
Active Pharmaceutical Ingredient (API)	~18%	Active Medicine (Drug Ingredient)
Calcium hydrogen phosphate dihydrate	~53%	Diluent (To bulk up the tablet)
Hypromellose (100 & 4000 cP)	~21%	Matrix agent (To control drug release)
Magnesium stearate	~0.05%	Lubricant (To ensure that tablet ejects efficiently from the tablet press)
Maltodextrin	~7%	Binder (To hold the different ingredients together)
Silica, colloidal anhydrous	~0.2%	Flow agent (To ensure good powder and granule flowability)
Water	<1%	Granulation liquid

form a gel layer around the tablet to control the release of the active components from the tablet.

## Pharmaceutical manufacturing

Pharmaceutical processes use batch recipes which are established during R&D and subsequently scaled up for full production. Product development combines the active drug with a variety of other ingredients, Table 1 shows some typical ingredients used in the manufacture of a MR tablet. The full scale batch manufacturing regime is fixed early in the lifecycle of the product, following the process validation of three production runs generating an acceptable (though perhaps not optimal!) product quality.

The pharmaceutical industry defines validation as the documented act of demonstrating that procedures, processes, and production activity will consistently lead to the expected results. Validation includes the qualification of systems and equipment and is a requirement for Good Manufacturing Practices (GMP) and other regulatory controls. Modified-release tablets containing poor solubility drugs are particularly susceptible to process variability; dissolution is a critical quality attribute for tablets. Figure 1 illustrates how observed dissolutions can deviate from a normal distribution.

Previous studies into the production of oral tablet drugs have shown that a large number of factors including the physicochemical (physical & chemical) properties of the raw materials and the manufacturing processes used, can influence drug release behaviour from the final product i.e., dissolution. More recently, the focus of regulatory bodies such



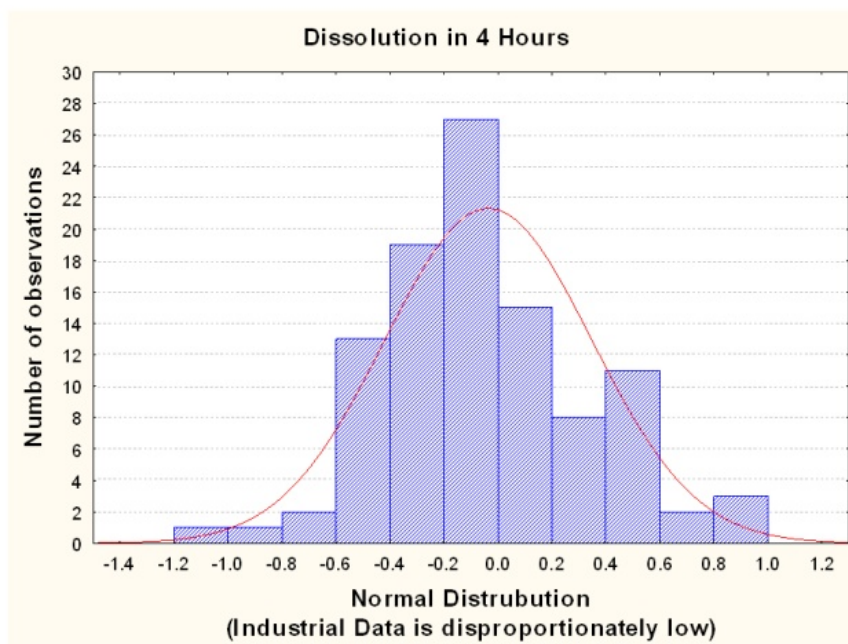


Figure 1: The industrial data analysed showed how real measured dissolution values (the bars) deviated from normal distribution (the line) expected by commercial specification.

as the Irish Medicines Board (IMB) and the U.S. Food and Drugs Authority (FDA) on operating validated inflexible processes has shifted. Pharmaceutical companies are now required to demonstrate an in-depth understanding of the dynamic behaviour of ingredients/production and the impact of this on the finished product performance.

Quality by Design (QbD) is the mechanism used to provide an increased understanding and assurance of product quality. QbD is a systematic concept to product development as opposed to the traditional, more empirical method. Under the QbD framework, Process Analytical Technology (PAT) employs technology to understand and control the manufacturing process.

## Methods of research

The research was divided into four distinct phases, as seen in Figure 2, with the optimum dissolution specification being the ultimate quality goal.

### Industrial data

Industrial data from the production of a commercial MR tablet was compiled using 105 manufacturing batch records. Analysis of real industrial data was valuable as it indicated the actual quality situation pertaining to production. However, it was also constrained, as many factors recorded in a controlled process do not possess sufficient inherent variability

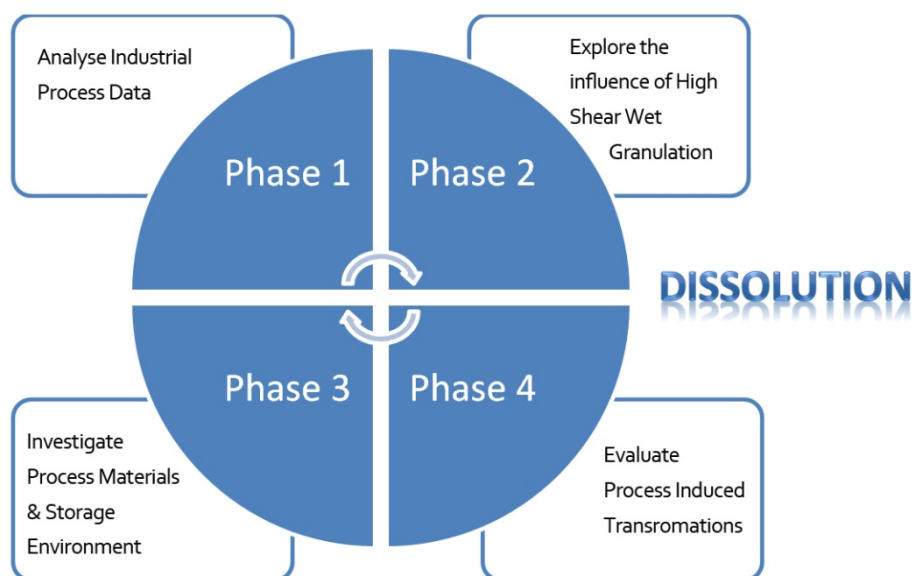


Figure 2: Research phases

to be useful. A coefficient of variance greater than 10% was used as the acceptance criteria to indicate useful data. I investigated the effect of various process factors using a Pareto analysis (a statistical technique which prioritises effects) using software (Statistica 7.0). I was able to correlate process input factor changes to improved dissolution using Microsoft Excel.

### High shear wet granulation

Granulation is a size enlargement (powder) process designed to assist with drug uniformity, enhance powder flowability and reduce dustiness. High shear wet granulation combines the ingredients of the drug formulation using a high speed mixing blade and chopper, a liquid binder is used to agglomerate the powder particles into granules. This technique is common in the pharmaceutical industry due to its ability to reduce processing time and produce granules with high strength and density. I examined the relationship between the high shear wet granulation operation and products formed to facilitate greater process understanding, thus expediting the application of QbD and PAT to the tableting process. I used a special (L9 Taguchi) structured design of experiments (DOE) which was excellent at minimising the number of experiments needed to be able to reliably predict whether certain processing parameters are better than others. I used the original industrial data as a guide to select various energy inputs (mixing / milling) and material changes (wetting) for analysis.

## **Process materials and storage environment**

Quality by design (QbD) relies on process understanding and therefore acquiring information regarding the processes applied, material used or general environment is vital. The QbD approach to product development requires a systematic evaluation and understanding of the formulation and manufacturing process. In this phase of the research a range of different studies were carried out to assess the influence of a variety of process parameters and critical quality attributes of materials on the target product performance of controlled release tablets, i.e., the drug dissolution.

I studied the impact of varying the granulation endpoint criteria, the influence of granule particle size along with excipient (raw ingredients) variability; batch to batch and supplier to supplier. I also investigated the influence of temperature, time and relative humidity during the storage of granules prior to blending and eventual tableting.

## **Process Induced Transformations (PITs)**

The thermal and mechanical processes involved in the production of pharmaceutical tablets can be very vigorous, involving heating, high shear mixing, wetting, milling, blending, storage and finally compression to form tablets. It is possible that process stresses may cause changes in the materials involved. The general term for these changes is process induced transformations (PITs)

Many drug substances can exist in different crystal arrangements. This phenomenon is called polymorphism. Different polymorphs of the same pharmaceutical solid can have different chemical and physical properties which can alter apparent solubility and the dissolution rate. Solvent molecules can also be incorporated in the crystal lattice called solvates or pseudopolymorphs. If the solvent is water, the polymorph formed is called a hydrate. My research work focused on hydrates, as water was the solvent used in the high shear wet granulation process. I investigated PITs using a range of instrumentation, such as Scanning Differential Calorimetry (DSC) Scanning Electron Microscopy (SEM), Hot Stage Microscopy.

## **Research findings**

The industrial data analysed indicated the presence of product variability and the importance of the high shear wet granulation step in the overall tablet manufacturing process. Using experimentation, I developed an understanding of how the granulation process affects intermediate materials. Figure 4 illustrates the various significant process interactions identified.

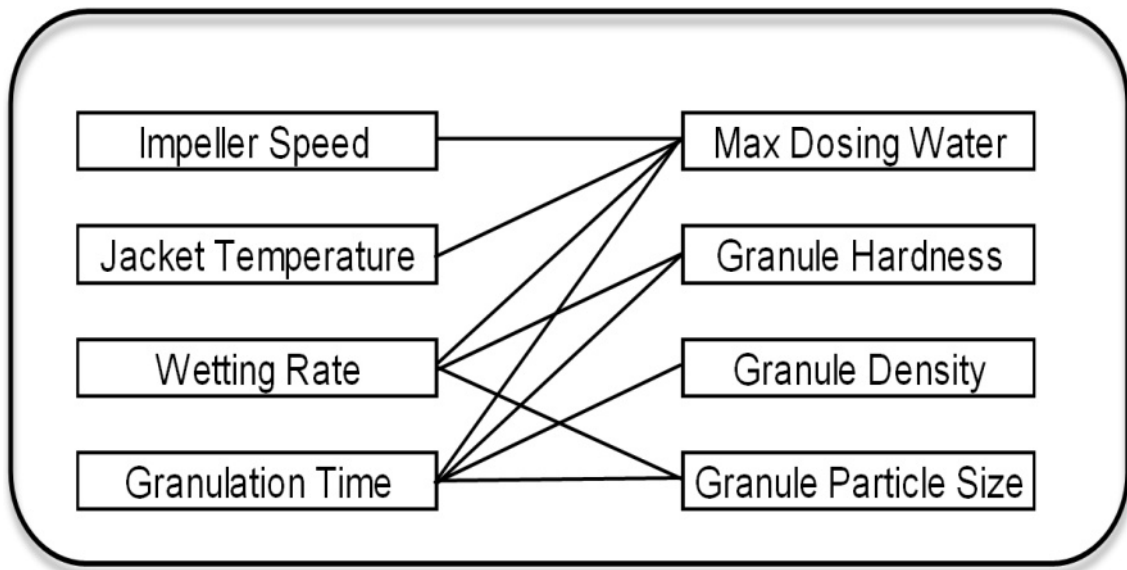


Figure 3: How Process parameters influence the intermediate (granules) material produced

I determined that changes both in supplier and material batch used; resulted in dissolution variability. The same United States Pharmacopeia (USP) grade of hypromellose (a critical component in the controlled release of the drug substance) was used in all cases but different dissolution release profiles were observed shown in Figure 4.

I analysed Intermediate products such as granules using a range of sophisticated techniques to identify if any PITs had occurred. A DSC analysis was carried out on nine granu-

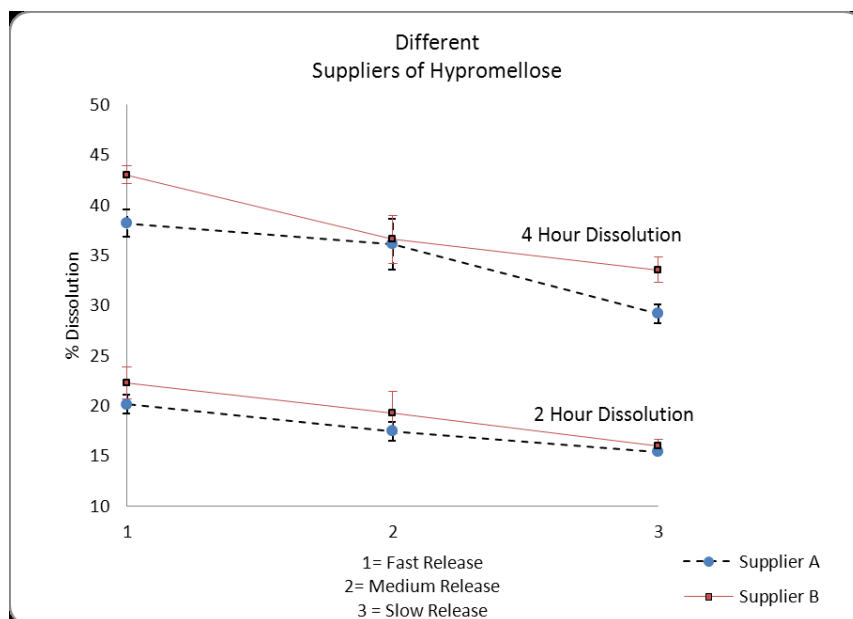


Figure 4: Changes in dissolution were observed when the manufacturer (A/B) of the same raw ingredient was changed

lations containing the same ingredients but processed using different granulator settings. The DSC measured the amount of heat required to increase the temperature of a sample as a function of temperature. The scans were not identical; some samples indicated that the intense processing regime used for the high shear wet granulation may have produced hydrates under certain conditions. The presences of hydrates can influence subsequent dissolution profiles.

## Conclusion

This research comprehensively examined the challenges faced in the pharmaceutical production of a MR tablet containing a low solubility active ingredient. Quality issues related to drug manufacturing continues to be highly relevant, in 2010 the U.S. Food and Drug Administration reported more than 1,742 drug recalls, skyrocketing from 426 in 2008.

Utilising industrial data, key process variables and materials properties which can influence quality were identified. Laboratory testing based on the industrial data results built up a more comprehensive understanding of the overall production. Dissolution release profiles were modelled and the consistency of batch production techniques was examined.

This work contributes towards the goal of increased process understanding and thus facilitates the integration of quality by design as a process/product optimisation technique. The research is of relevance to anyone involved in the production of medicines, in particular tablets. According to the Irish Pharmaceutical Healthcare Association (IPHA), Ireland currently manufactures 5 of the world's top 12 medicines and is the **second largest net exporter of medicines in the world.**

I wish to acknowledge help and support of all the staff of the Department of Process & Chemical Engineering. I would like to especially thank my supervisors, Dr. Jorge Oliveira & Dr. Abina Crean (School of Pharmacy)

# The coldest place in Ireland

**Laura Russell**

Physics Department, UCC

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## Introduction

Did you know that the Quantum Optics Laboratory in Tyndall National Institute is the coldest place in Ireland? The physicists in this laboratory use lasers to push atoms in such a way as to slow them down. When an atom gets slowed down, its temperature also decreases. This technique is called laser cooling and was first demonstrated in 1978 by Wineland, Drullinger and Walls.

Physicists use the Kelvin (K) scale to measure temperatures which is an extension of the degree Celsius scale down to *absolute zero*, the lowest temperature that can theoretically be reached. Absolute zero Kelvin represents a complete absence of heat energy. While we may have thought our weather couldn't get much colder last winter here in Ireland, cold atoms are unimaginably chilled, at nearly absolute zero Kelvin, or  $-273^{\circ}\text{Celsius}$ .

## Laser cooling and magnetic trapping

The temperature of an atom is related to how fast it's moving. The air we are breathing is comprised of atoms moving around at 600 miles per hour; they are full of energy and have a temperature of 300 K or, what we term "room temperature." A cold atom moves around very slowly. If we can slow the atom down, its temperature will be reduced. To laser cool an atom which is moving left to right, we shine a laser beam against it from right to left. When the laser beam is just the right colour or wavelength, the beam will bounce off the atom with more energy than it hit the atom with. This extra portion of energy has been taken away from the atom and therefore the atom is just a little colder than before it encountered the laser beam. If the laser beam is the wrong wavelength, it will pass straight through the atom and have no effect. The science of keeping lasers at precisely one colour or *wavelength* is a fascinating and challenging research area.

As we live in a 3-dimensional world, we need to slow the atom in all three directions. Therefore we send *six* laser beams towards it — top and bottom, left and right, front and back. While the six lasers push the cold atoms to the intersection point of the beams, we must also use a *magnetic field* to keep the atoms in a tightly confined position. The magnetic field we use would look like an egg-cup if we could see it with our eyes. Our

laser-cooled atoms fall into the bottom of the magnetic “cup”. Combined, the six laser beams and the magnetic field are known as a *magneto-optical trap*, or MOT — see figure 1.

The MOT is arranged inside an ultra-high vacuum chamber. This is a large stainless steel compartment that has as much air pumped out from it as possible. This means that very few non-laser-cooled atoms will interfere with the laser-cooled ones at the centre of the MOT. Inside the vacuum chamber, the pressure is  $10^{-10}$  mbar, similar to that in Deep Space. When the MOT is switched on, a small cloud, measuring 1 millimetre in width and containing 10 million atoms with a temperature of approximately 100 micro-Kelvin forms at the centre. The photograph in figure 2 is taken with a CCD camera pointing through a glass window in the vacuum chamber. The laser beam intersection point is clearly visible, and at its centre is a cloud of cold atoms.

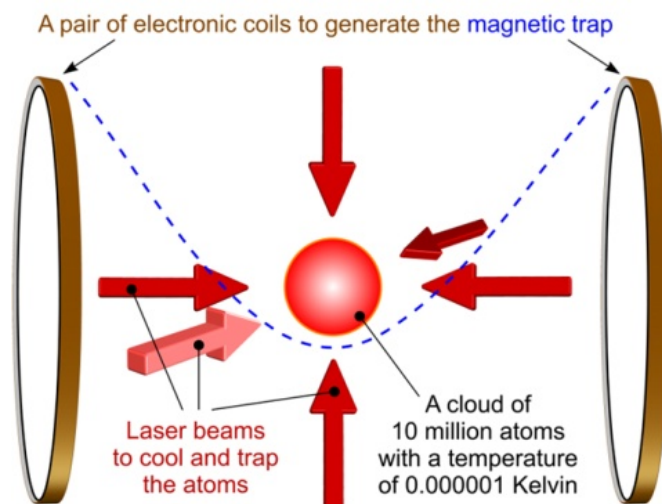


Figure 1: Schematic illustration of a magneto-optical trap (MOT). The six laser beams cool the atoms and push them to the intersection point while the magnetic trap (generated with a pair of electronic coils) confines the atoms in a small volume approximately 1 m

## My Research

My own research is a step along the way towards a quantum computer. In the Quantum Optics Group laboratory, I investigate what happens when you move the cloud of cold rubidium atoms near a glass surface. Rubidium is a silvery metal that looks a lot like aluminium. It is released as a gas into the vacuum chamber and laser cooled with infrared laser light. This means the laser beam is invisible to the naked eye but can be viewed with a CCD camera.

To test the atoms near a glass surface, a very narrow glass rod called an optical nanofibre is placed inside the vacuum chamber and the cold rubidium atoms are positioned around

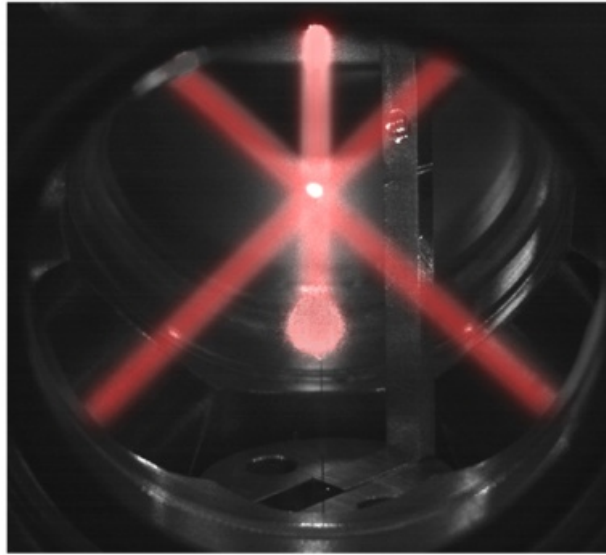


Figure 2: A CCD image of a cold cloud of rubidium atoms which have been laser cooled by the red laser beams to temperatures of a millionth of a Kelvin. The white fluorescent cloud forms at the intersection of the beams.

it. The nanofibre is 100 times smaller than a human hair and is fabricated from what is now an everyday tool in connectivity — optical fibre. To make this tiny device, a section of optical fibre is heated and stretched apart until it is only 600 nanometres in diameter. Figure 3 shows a CCD image of the rubidium cloud surrounding the nanofibre — the nanofibre appears larger than it actually is because of the laser light reflecting off it. The cloud of atoms, which is fluorescing while being laser cooled, is slightly elongated because gravity is pulling it downwards. The right hand image (figure 4) models what the system looks like in greater detail. The cloud of rubidium atoms fluoresces and a portion of this light leaks into the nanofibre and travels towards a detector.

As the atoms are so small, they will see the nanofibre as a large glass surface. In fact, each atom can see an image of itself in the glass. An atom is made up of positive and negative

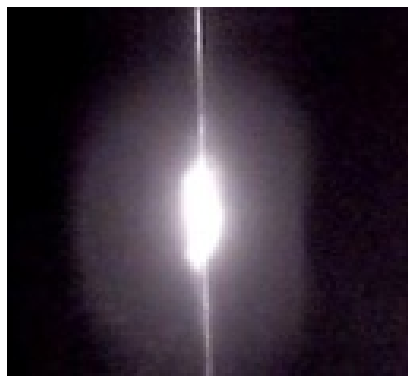


Figure 3: A CCD image of the cold cloud of rubidium atoms surrounding an optical nanofibre. The cloud is elongated because of gravity and the nanofibre appears larger than it actually is due to the intensity of the light reflecting off it.



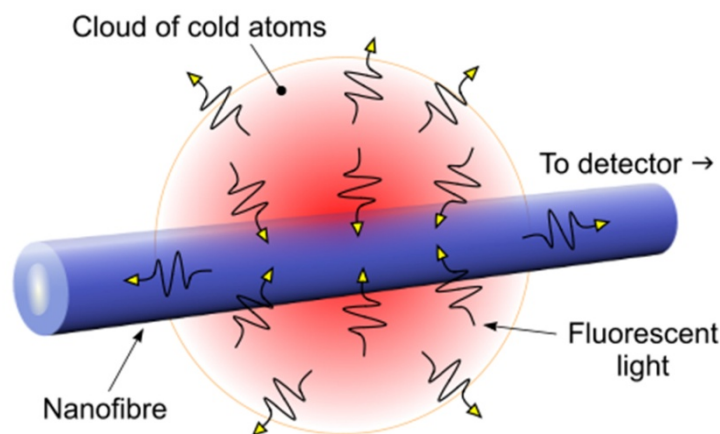


Figure 4: A schematic illustration of the rubidium cloud and nanofibre system. The fluorescent light escapes from the cloud in all directions but a portion of it can enter the nanofibre and travel towards a detector.

charges that are moving around constantly. Every now and again, there will be mostly positive charges on one side of the atom and negative charges on the other side. In the mirror image of the atom in the glass, these charges are reversed and, as the old saying goes: opposites attract! The positive charges on the atom will be attracted to the negative charges on its reflection and vice versa. It's almost as if the atom is attracted to its own reflection. This is called the *van der Waals* effect — which is the mechanism responsible for geckos sticking to walls. While useful for geckos, this is a major concern for quantum devices of the future where cold atoms will be positioned near surfaces in order to be probed. If many atoms stick to the surface the efficiency of the device will be destroyed. With my experiment, the nanofibre also acts as a detector for the atoms so that we can learn how close an atom is to surface and even control this distance.

### Using the nanofibre as a detector

Figure 5 displays a fundamental result from my research. The magnetic trap is switched on and off to allow the cold atoms to gather around the nanofibre and then disperse, respectively. The sudden increase in the signal is from the light from the cold atoms entering the nanofibre and travelling towards a detector *via* the normal sections of unstretched optical fibre.

### Spectroscopy with cold atoms and nanofibres

The optical nanofibre is created from standard optical fibre which, for example, is used to carry light signals for broadband connectivity — this means that we can launch light through one end of the fibre and it will travel all the way to the other end even through the narrow section of nanofibre. Figure 6 shows a schematic image similar to that in

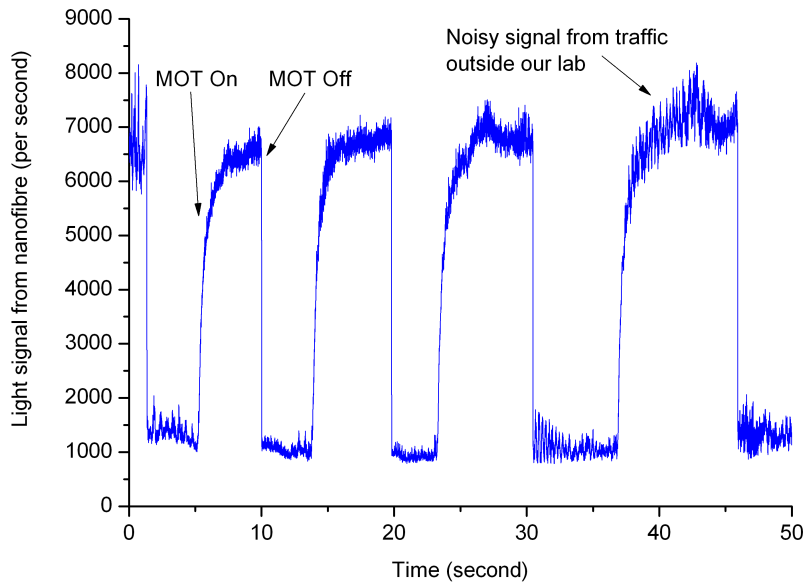


Figure 5: Each time the MOT is switched on the cloud of atoms gathers around the nanofibre and fluoresces into it. This plot shows what the detector observes at one end of the nanofibre — a large increase in light coming from the nanofibre each time the MOT is activated. The rubidium cloud is extremely sensitive to external fluctuations. If there is heavy traffic on the road outside our laboratory, we observe a fluctuating signal as shown in the last peak in the figure.

figure 4 with the addition of a probe beam sent through the nanofibre. This probe beam leaks out of the nanofibre and is absorbed by the atoms provided the beam is the correct wavelength. This means that the amount of light after the cloud will have decreased and we can examine this decrease or absorbance with a detector. This type of experiment is called spectroscopy and is used by scientists all over the world to gain characteristic information about samples of material, whether it is gas, liquid or solid.

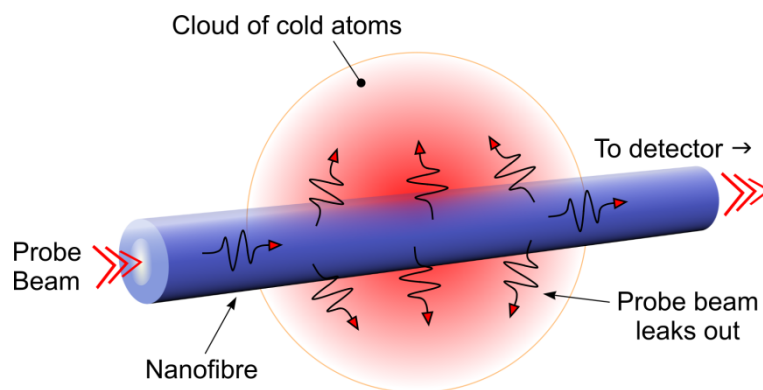


Figure 6: By sending a probe beam through the nanofibre, it leaks out and interacts with the surrounding cold atoms. This system allows us to perform spectroscopy on the cold cloud of rubidium.

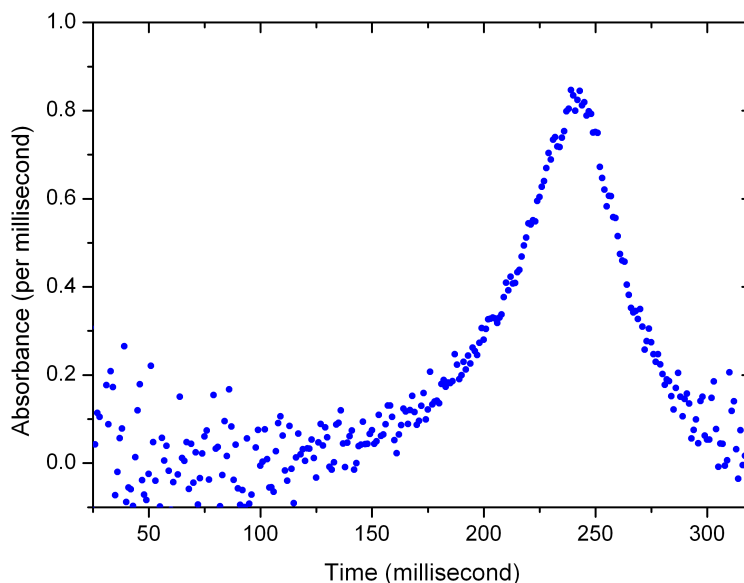


Figure 7: An absorbance profile for rubidium in a MOT. During these 300 milliseconds, the probe beam wavelength (colour) is scanned over a very small range. When it is the correct wavelength, the rubidium atoms in the MOT absorb as much of it as possible — this corresponds to the highest point in the graph where almost 0.9 absorbance is reached. The absorbance is much lower further away from this point because the atoms do not absorb the beam if it is the wrong wavelength.

Figure 7 displays a typical absorbance profile for cold rubidium atoms in a MOT. During this 300 millisecond timeframe, the wavelength of the probe beam is scanned over a very small range. When the wavelength of the beam is correct, the atoms will absorb as much of it as possible — this is the point on the graph where it reaches almost 0.9, or 90%, of the full absorbance. Away from this point, the beam is not absorbed as much.

## Outlook

Despite sounding quite alien, cold atoms have many uses in some of today's essential technologies. For example, the world's most precise atomic clock, which uses cold strontium atoms, neither gains nor loses a second in more than 200 million years. In each of the 24 GPS satellites orbiting our Earth, there are four atomic clocks. These satellites are used by everyone from the military to the taxi driver. An error of just one nanosecond (or billionth of a second) in the GPS clock translates to an error of one foot on Earth. This may not seem like much, but is critical if you are relying on a GPS to land on an aircraft carrier, or synchronise signals from radio telescopes in astrophysics.

In the future, quantum computing devices will rely on scientists harnessing quantum behaviour to create systems that can far exceed the speed and processing capabilities of

current silicon-based computers. Cold atoms will play a central role in this because quantum computers will require us to individually probe single cold atoms in order to encode them with a “0” or a “1” to create a binary system which is what modern computers use to perform computational tasks. With this research and the efforts of other research groups worldwide, the iQuantumPhone is not far away!

I wish to thank my supervisor, Dr. Síle Nic Chormaic and my colleagues from the Quantum Optics Group. This work is partially supported by Science Foundation Ireland under Grant Nos. 07/RFP/PHYF518 and 08/ERA/I1761 through the NanoSci-E+ Project NOIs, and the Higher Education Authority *via* the INSPIRE programme. I acknowledge support from IRCSET under the Embark Initiative.

# Hedging your bets in a volatile world: an introduction to the use and pricing of European call options.

**Gearóid Ryan**

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## Introduction

In recent years, our economy and livelihoods have been affected by the volatility of financial markets. We have seen how banks and investors have failed to control and understand their risks. In this article, I outline one of the fundamental tools used to control exposure to risk in financial markets. In doing so, I explore some of the underlying assumptions of mathematical models used in the financial industry today and show how my research attempts to make these assumptions more realistic while keeping the model simple.

As well as the trading of stocks and shares, many of the transactions in financial markets consist of the trading of contracts. Such a contract may be an agreement between two parties on the price of a stock, the quantity and time of delivery of some commodity, or contracts that provide insurance for investors. My research is concerned with determining the value of one of the simplest kinds of financial contracts. The name of the contract is a 'European Call Option'. This is, very simply, a contract between two parties to trade some product in the future. The date of the transaction and the price of the product are agreed in the contract. It is important to note that the buyer of the product, i.e., the person who owns the contract, has no obligation to go ahead with the transaction if he feels he can do better elsewhere. In other words, with this contract, he has the option of buying the product for the specified price, at the specified time.

We study this simple contract because understanding it will pave the way towards an understanding of more complicated contracts. We will see how a European Call Option can be used to hedge exposure to volatility, and how to assign a value to this contract.

## Background information

Before discussing financial contracts, it is necessary to explain how financial mathematicians understand stock prices. The most basic mathematical models for stock prices assume that the price grows naturally over time but is subject to random fluctuations. The

technical name for this is Geometric Brownian Motion. This model was first introduced in 1900 by Louis Bachelier, a French mathematician.

For example, imagine we have a bank account whose value at the end of the year is €100. Our friendly bank manager adds €5 to our account as interest. During the year our bank balance has fluctuated due to random bills and lodgements, the size of which can't be predicted beforehand. The price of a stock, according to Bachelier's model, behaves in a similar way to our bank balance; it has a predetermined growth rate (the interest added), and is subject to random fluctuations. The model goes slightly further in that it assumes, using the above analogy, that the chances of having of a large change in our bank balance is much more unlikely than having a smaller one. You may think of a small change as day to day purchases on your laser card such as buying a cup of coffee, paying for petrol etc., and a large change as the bimonthly electricity bill.

The word volatility refers to the size of the random fluctuations of the stock price. A highly volatile stock will have large fluctuations in its price, making the future price more unpredictable. In a mathematical sense, one measure of the volatility could be the variance of the stock price. The biggest assumption in Bachelier's model is that the volatility of the stock price is constant. We can think of this in terms of coin tossing. In a coin toss the chances of getting tails is always 50%. This is obvious, but the mechanics of financial markets is much more complicated than a simple coin toss and it has been shown that the chances of certain events happening, such as the price of a stock going up or down, changes regularly. The market is like a coin, whose chances of getting tails changes every time it is tossed, and may even depend on previous tosses.

## My research

As mentioned above, the goal of my research is to find the value of European Call Options. The most important aspect of this research is having a very good stock price model. After that, finding the value of simple financial contracts is relatively straightforward.

One large area of current research in mathematical finance is in relaxing the assumption of constant volatility in stock price models, and this is the area in which I work. We can see from Figure 1 that this assumption is unrealistic. Building on previous research I assume that the stock obeys the same equations as Geometric Brownian Motion except that the parameter in my model that represents the volatility is constantly changing. In fact, I assume that the volatility of the stock price also behaves according to Geometric Brownian Motion. This is called a 'stochastic volatility model'.

Figure 1 Price in USD of AIB shares from 2003 to 2008. We see that the size of the fluctuations in the share price is increasing with time i.e., the volatility is increasing. This data suggests that stock price models should not assume constant volatility. (<sup>1</sup>Source:

Yahoo Finance)The next important point to note is that I assume the underlying source of randomness in both the stock price and the stock price's volatility is the same. For example, changes in the price of petrol and the price of diesel are for the most part subject to changes in the price of oil, i.e., they are subject to the same underlying source of randomness.

My model also takes into account historic information. It assumes that the volatility in stock price depends on previous price fluctuations and previous volatility. This information comes from existing market data. The model puts more importance on more recent data, as it is obvious for instance that the stock price yesterday is far more relevant than the price one year ago.

My research is on improving existing models by looking at the historic information in new ways and by looking at how to best weigh the importance of this information.

With this new model, I hope to provide better predictions of the values of financial contracts. This research is both numerical and theoretical. The numerical part is where computer algorithms are used to refine the parameters of our model. The algorithms use existing market data to do this. The theoretical part is in the designing of the model and in devising methods to calibrate its parameters.

## **Hedging your risk**

As an example of how European Call Options are used we imagine a manufacturer who, in planning for the year ahead knows he can afford to buy some raw material for, at the most, €100 in 6 months time. If the price is higher than this the manufacturer will go broke. The manufacturer knows that the price of the raw material is subject to large fluctuations/high volatility and needs to find a way of protecting himself against this.

The manufacturer may buy a European Call Option contract from one supplier that guarantees them a price of €100 for the raw material in 6 months time. The manufacturer pays the supplier a small fee for this contract. Now if in 6 months time, the price of the raw material on the market is greater than €100, the manufacturer will use the contract and buy the material from the supplier for €100. If the value of the raw material is less than €100, then the Call Option is worthless as the raw material can be bought from the market at the lower price. In this way, the contract has allowed the manufacturer to hedge against future volatility and eliminates a source of risk.

Now imagine that we are the supplier. As the value of the raw material stored in our warehouse goes up, the value of our company goes up. The raw material is an asset. On the other hand, as the value of our raw material goes up, the more likely the contract we have written will be used, forcing us to sell for a lower than market price. The contract is a liability.

Of course, the changes in price of our raw material and the change in value of these contracts are linked. In fact, one can determine the best ratio of raw material and contracts to own such that the price movements of each perfectly cancel out each other. No matter what the change in price of the raw material, the net value of the suppliers company will always stay the same. This perfect ratio needs to be recalculated as frequently as possible.

The big question here is what fee should the supplier charge the manufacturer, i.e., what is the value of the contract. Finding a fair value is the goal of my research.

## Conclusions

This research area aims to model the uncertainty of financial markets and in doing so provide tools that help manage or eliminate sources of risk. The work on pricing the European Call Option is a starting point to understanding more complicated contracts. The tools developed here may be useful to many businesses that are exposed to uncertainty. The current economic situation highlights the importance of this area of research and indicates how much we have yet to learn.

I would like to thank my supervisor Dr. Tom Carroll and Dr. Gregory Temnov for helping me in the preparation of this article and to acknowledge the Edgeworth Center for Financial Mathematics and Science Foundation Ireland for funding my research.



# How can bacteria benefit plants?

**Siva Linga Sasanka Velivelli**

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## Introduction

Bacteria are microscopic, single-celled organisms found almost everywhere on earth in vast numbers. They are extremely diverse and play a major role in nature, contributing to plant growth and health. Agriculture provides a major share of the national income in many developing countries. However, diseases cause significant yield and economic losses in many important agricultural crops. Farmers have adopted a strategy to increase crop yields by applying large quantities of chemical fertilizers and pesticides. The use of chemical-based fertilizers offers some protection against plant pathogens and provides immediate relief, but cannot provide a long-term sustainable solution.

The excessive use of chemical-based fertilizers also causes severe environmental problems. Many countries have banned the use of certain hazardous chemicals, including some pesticides that are used to control plant diseases. For example, methyl bromide, used in the control of pests, has been banned internationally because of its adverse effects on human health and the environment. It is very difficult for farmers to produce a good quality and a high yield in economically important agricultural crops with limited control measures. Due to current public concerns about the adverse effects of agrochemicals, new technologies that can improve the economic viability of agricultural systems, with little reliance on the use of chemical fertilizers and pesticides, are urgently needed and should be a high priority for agricultural research, both now and in the immediate future.

An ideal agricultural system is sustainable if it maintains and improves human health, benefits producers and consumers, produces enough food for an increasing world population, while maintaining or enhancing the environmental quality and conserving natural resources such as soil and water, both now and in the immediate future.

Biological control appears to be a potential alternative to chemical fertilizers and pesticides and offers an environmentally friendly approach to the management of plant diseases. Biological control of plant disease is defined as “the involvement of the use of beneficial micro-organisms, such as bacteria to attack, and control the plant pathogens”. Plant roots support a wide range of micro-organisms that can have either a deleterious or beneficial impact on plant health and growth. The use of beneficial micro-organisms to control or reduce plant diseases are known as plant-growth-promoting rhizobacteria (PGPRs) (‘rhizo’ means ‘root’). PGPRs have gained worldwide importance over the last

few years and have attracted much attention in their role in reducing plant diseases, thus playing an important role in crop production. The use of PGPRs to promote plant growth and to control plant diseases continues to be an area of rapidly expanding research.

Scientists have been interested in the use of potential and efficient PGPRs in a way that can enhance soil quality and crop productivity. PGPRs have the capacity to promote plant growth directly or indirectly and play an important role in sustainable agricultural production. There are various mechanisms by which PGPRs affect plant growth directly or indirectly. The direct promotion of plant growth by PGPRs can be through a number of methods.

1. Some plants cannot use atmospheric nitrogen for their growth. PGPRs may fix atmospheric nitrogen into ammonia and supply it to plants for better growth.
2. They also synthesize phytohormones such as indole acetic acid (IAA), gibberellic acid (GA) and cytokinin, which can act to improve the different stages of plant growth.
3. Phosphorus, which is an essential nutrient, can often be a limiting factor for plant growth; however, some PGPRs solubilize insoluble phosphate into soluble forms and make them more accessible for plant growth under poor phosphorus availability.
4. Ethylene is important for plant growth and development and it is required by many plant species for seed germination. High levels of ethylene can lead to inhibition of root elongation. Some PGPRs synthesize an enzyme 1, which can lower plant ethylene levels, thereby increasing root length and growth.
5. Iron deficiency is a limiting factor of plant growth. Some plant-growth-promoting rhizobacteria also play an important role in the production of siderophores (iron carrier molecules, which solubilize and transport iron) that enhance iron availability to plants.

The indirect promotion of plant growth occurs through the suppression of plant pathogens and involves a variety of mechanisms including the production of antagonistic substances such as antibiotics, fungal cell wall lysing enzymes ('lysis' means 'breakdown' or 'to separate'), or hydrogen cyanide, which suppress the growth of fungal pathogens and the production of siderophores that chelate (solubilize or capture) iron, making it unavailable to pathogens. PGPRs with antifungal properties have been identified as a biological control alternative to pesticides for disease suppression.

## **My methodology**

My research project aims to explore the existing large biodiversity of soil micro-organisms of Andean countries to improve the sustainability, food security, environmental protection and productivity of Andean cropping systems, benefiting rural farming households.

Commercial rhizobacterial strains were used as a model to develop the system at the laboratory level for the early detection and selection of potential PGPRs which have potential as biocontrol agents in crop production.

A laboratory study was conducted to characterize the beneficial properties of commercial two rhizobacterial (PGPRs) strains of *Bacillus subtilis* and *Pseudomonas fluorescens* for their multiple plant growth promoting activities (Fig. 1). The two commercial bacterial strains were tested for their ability to inhibit plant diseases using plate tests. The effects of the PGPR isolates on plant growth promotion and suppression of potato disease in potato microplants were also examined. These commercial rhizobacteria were also tested for various activities which can promote plant growth, including the production of plant growth hormones.

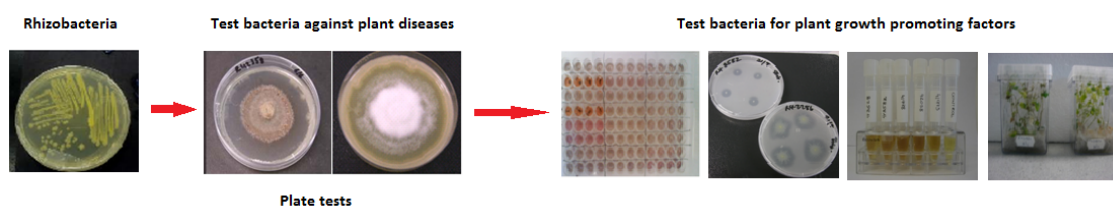


Figure 1: Screening of commercial rhizobacterial (PGPR) strains for their multiple plant growth promoting activities

## What did I find?

This research examines the effect of commercial rhizobacterial (PGPR) strains for their ability to inhibit plant diseases using plate tests and also plant growth promotion and suppression of potato disease in potato microplants. These commercial rhizobacteria influenced plant growth and plant health positively and the inhibition of plant disease could be due to the production of various chemical compounds. They also act as plant growth promoters due to their ability to produce various plant growth hormones. The two commercial rhizobacterial (PGPR) strains inhibited plant disease by 21.32% and 19.28%. These two rhizobacteria also increased plant growth by 20% and 12% and the disease suppression activity was also evaluated in terms of percentage under disease pressure by 15% and 12% [Table.1].

## Conclusion

These two commercial rhizobacterial strains inhibit plant disease and also have significant effects on plant growth and disease suppression in laboratory tests. Rhizobacteria that

Table 1: Plant growth promoting attributes of the commercial PGPR Strains

Strain	Effect on plant disease %	Plant growth promotion %	Plant disease suppression %
<i>Bacillus subtilis</i> FZB 24	21	20	15
<i>Pseudomonas fluorescens</i> CHAO	19	12	12

control plant diseases have gained worldwide importance and are potential tools for sustainable agriculture. Promotion of plant growth by rhizobacteria offers an attractive way to reduce or replace chemical fertilizers and pesticides and also decrease adverse environmental effects. These results indicate the beneficial properties of the rhizobacteria which could be used as a tool for selecting new/potential PGPRs.

Siva Linga Sasanka.Velivelli is a PhD student in the School of Biological, Earth and Environmental Sciences, under the supervision of Dr. Barbara Doyle Prestwich. The author would like to take this opportunity to thank the senior postdoctoral researcher in the lab Dr. Eileen O' Herlihy. The author would also like to acknowledge contributions to this research from Dr. Bogumila Janczura and funding from European Community's Seventh Framework Programme FP7/2007-2013 (Grant No: 227522, 01/02/2009-31/01/2014). The author would also like to thank Ms. Eileen Crowley for proof-reading. More information can be found on VALORAM website: <http://valoram.ucc.ie>

# Whispering-gallery-mode microbubble resonators: fabrication and characterization

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## Introduction

Whispering is not an effective means of communication when a considerable distance separates the two conversationalists. In spite of this, a soft whisper can travel a very long way in the right environment — a whispering gallery. In 1910, the scientist Sir John William Strutt (Lord Rayleigh) witnessed this acoustic phenomenon in the Dome of St. Paul's Cathedral in London (see Fig. 1). Here, two people on opposite sides of the dome, up to 40 metres apart, can talk to each other by simply whispering against the curved wall.

Inevitably, Lord Rayleigh — a true mathematician at heart — solved what he described as “The problem of the Whispering Gallery”. He realised that, as the whisper travels along the curved surface, it loses very little energy and so can be heard after a great distance. Conversely, when the speaker talks at normal volume, the message possesses enough energy to complete several laps of the Dome. In this case, the sound waves overlap and the listener is unable to decipher the statement. If you have yet to visit such a gallery, I highly recommend it. A few other examples of this gallery include:

- The Echo Wall in the Temple of Heaven, Beijing;
- The Statuary Hall in the United States Capitol, Washington D.C.;
- The Gol Gumbaz in Bijapur, Karnataka State, India (see Fig. 1).

## Traditional microresonators

Imagine shrinking the Whispering Gallery down to one-fifth of the size of the full-stop at the end of this sentence. Now, replace the sound waves with light and you have an optical microresonator. Traditionally, these microresonators take the form of solid glass disks, toroids (doughnut-shape) or spheres (see Fig. 2). For a good quality resonator, there are two specific criteria that need to be satisfied:

- No defects, i.e., smooth surface;
- Low ellipticity, i.e., as circular or spherical as possible.



Figure 1: Examples of a Whispering Gallery. The Dome of St. Peter's Cathedral in (left) and the Gol Gumbaz in Bijapur (right).

The confinement of light in such a small volume leads to very high circulating intensities. The light completes several laps in precisely the same way as the normal volume sound waves in the Whispering Gallery. The exact number of laps depends on the quality of the resonator. In a *good* resonator, the light can easily complete tens of thousands of laps or reflections in real time.

My research involves the investigation of these novel optics devices to study the fundamental interactions of light and nanoparticles, e.g., atoms. Naturally, this work also extends to studying the sensing applications of these resonators.

## Coupling light into a microresonator

The most effective process of inserting light into a microresonator is to place it in very close proximity to a tapered optical fibre, i.e., coupling. A tapered optical fibre is fabricated from standard optical fibre. In the modern world, standard fibre is widely used in a diverse range of applications from broadband connections used in telecommunications to

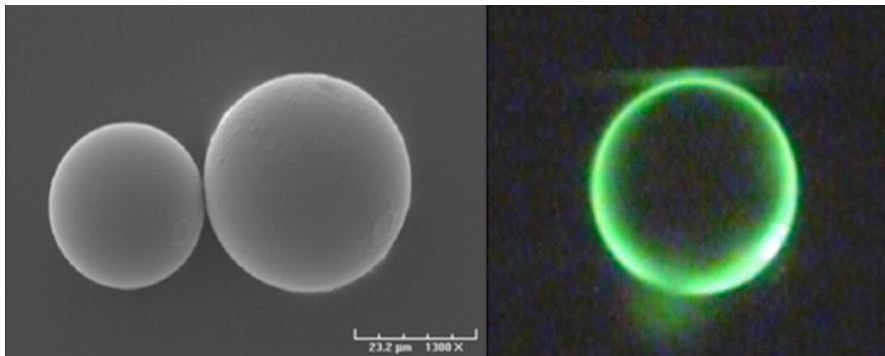


Figure 2: Example of a traditional resonator — solid glass microspheres (left) and light travelling inside a sphere (right).

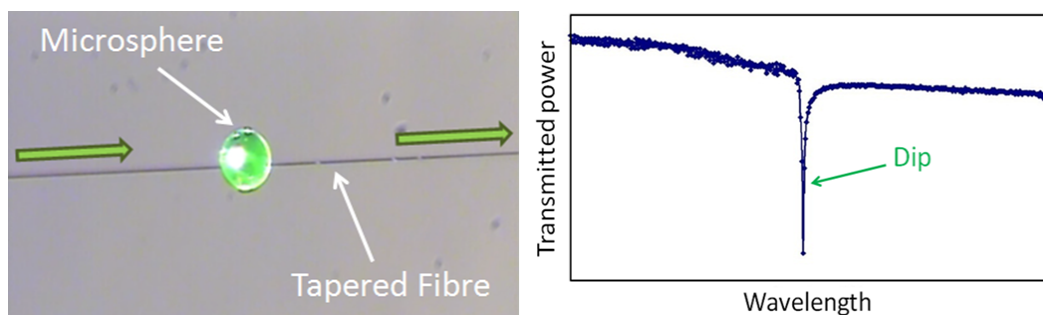


Figure 3: Microsphere and tapered optical fibre system (left) and whispering-gallery-mode (WGM) spectrum (right).

endoscopes in medical imaging and novelty Christmas decorations, to name but a few. In all of these examples, the light is confined to travelling inside the optical fibre.

For coupling into a microresonator, it is essential for the light to travel outside the fibre. This is achieved by placing the standard fibre into an oxygen-butane flame, where two translation stages (i.e., micro-positioning tables) pull it in opposite directions, thereby reducing the diameter of the fibre. This process is called tapering. After tapering, the midsection of the fibre is reduced in size until it becomes too small to contain the light. At this section, called the waist, the fibre now resembles spiders' silk in diameter. Here, the light travels briefly outside the fibre in the surrounding medium. This external light is called an evanescent field. It is *via* this field that effortless coupling of light into a resonator is facilitated. The waist is still connected to standard fibre at each end. After the waist, the light is directed to travel inside the standard fibre again, where it can be easily detected at the fibre end.

The sphere is placed in contact with the waist of a tapered fibre (see Fig. 3) and light from a laser is launched into the fibre. When the light reaches the waist, under very certain conditions, it couples into the sphere whereupon it completes several reflections, and then couples back out into the fibre. The condition where this coupling occurs is called “resonance” and is achieved by varying the wavelength (i.e., the colour) of the laser light. When the wavelength matches the size of the sphere, a dip is observed in the transmitted power of the light at the fibre end (see Fig. 3). These dips are also known as whispering-gallery-modes (WGM), which take their name from their acoustic analogue.

WGM resonators have been used comprehensively in a wide range of applications from the applied, i.e., biological or chemical sensing or laser engineering, to fundamental physics, in cavity-quantum electrodynamics experiments and cavity optomechanics. Primarily, these resonators can be exploited as extremely efficient lasers because a significantly larger amount of light is detected out of the resonator than is coupled in to it. This is a consequence of the unique characteristic that the light undergoes several reflections in such a small volume.

WGM resonators can also be used as extremely efficient sensors for a number of different

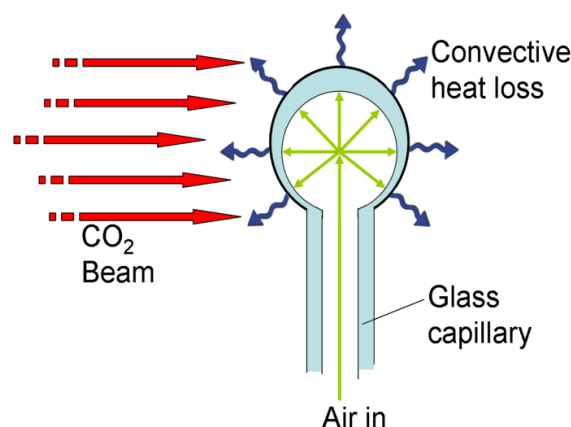


Figure 4: Diagram of optical microbubble resonator formation.

parameters, e.g., changes in pressure and temperature, a measure of mechanical vibrations, and the detection of biochemical samples, atoms or vapours. In biochemical sensing, even the presence of a single nanoparticle, such as an influenza particle, will disturb the light travelling inside the sphere. This disturbance is significantly magnified due to the number of reflections in the sphere. As a result, a change in the WGM spectrum is easily detected at the fibre end in the form of a shift in the position of the WGMs.

## My research

As a sensing appliance, with the solid microsphere and tapered fibre system, the sample under investigation is required to reside outside the sphere. This can be challenging as the sample can substantially affect the coupling efficiency of the resonator with the tapered fibre. However, we can fabricate a new hollow glass microresonator, a microbubble, which has the distinct advantage that the sample can now be placed inside the cavity. This is a recent concept, of which there are only a few examples of analogous work, to our knowledge. The main aims of this work are to fabricate and characterize microbubbles in terms of their optical properties using methods comparable to that of the already well-developed solid microspheres.

## Microbubble Fabrication

The microbubble fabrication process is similar to glass-blowing but on the microscopic scale with a laser as the heat source. A hollow glass capillary tube is tapered in the flame until it breaks. The tapered tip is gently heated using a CO<sub>2</sub> laser to close it. The other end of the capillary is connected to an air pump which pressurizes the tube as the tip closes. When the tip is closed, the air pressure forces the soft glass tip to expand and blow out a bubble (see Fig. 4).



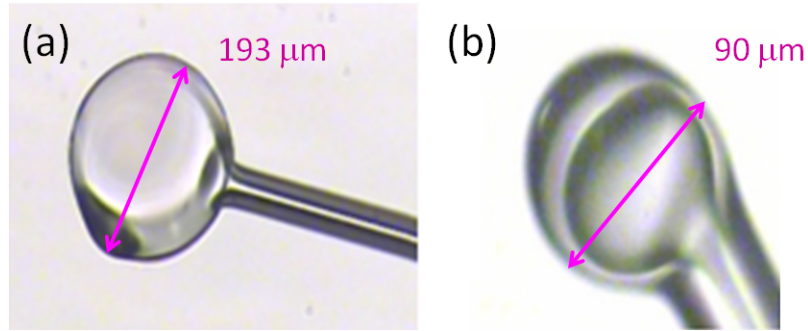


Figure 5: Images of microbubbles (a) when expansion is uncontrolled and (b) when expansion is controlled. The size of the bubble in (b) is similar to that of the microspheres.

If there is sufficient heating, the expansion of the bubble speeds up as the glass wall becomes thinner. The expansion then stops suddenly because the rate of heat losses at the bubble surface exceeds the heating rate from the laser. The resulting bubble (see Fig. 5a) will tend to have excess material on the surface which adds a distortion to the shape.

In order to make a more symmetrical bubble with a thicker wall, the heating of the bubble is stopped before the period of rapid expansion. During this process, the inside of the sphere filling with air is carefully monitored and the laser is manually controlled so that the expansion does not accelerate. This bubble (see Fig. 5b) is placed in contact with a tapered fibre using the same technique as for the sphere and corresponding WGMs are detected out the end of the fibre. The diameter of this bubble is similar in size to that of the microspheres.

### Microbubble Characterization

To test if the light is penetrating into the hollow cavity of the bubble, it is filled with water. Initially, the WGM spectrum is recorded when the bubble is empty. The end of the capillary tube is connected to a syringe and a computer-controlled syringe pump. The air is pulled out of the bubble, to avoid a build-up of pressure, before water is pushed up the capillary tube into the cavity. The WGM spectrum is recorded again when the bubble is full of water. A shift in the position of the modes is observed (see Fig. 6). This is due to a difference in the refractive index between air and water, i.e., the light travels at a slightly different speed in each of the two media, which results in the position shift. When the bubble is emptied, the modes return to their original positions and this is a strong confirmation that these resonators are reusable. The resultant WGM shift is unique which can be used to identify the particular species under investigation, using a technique called refractive index sensing.

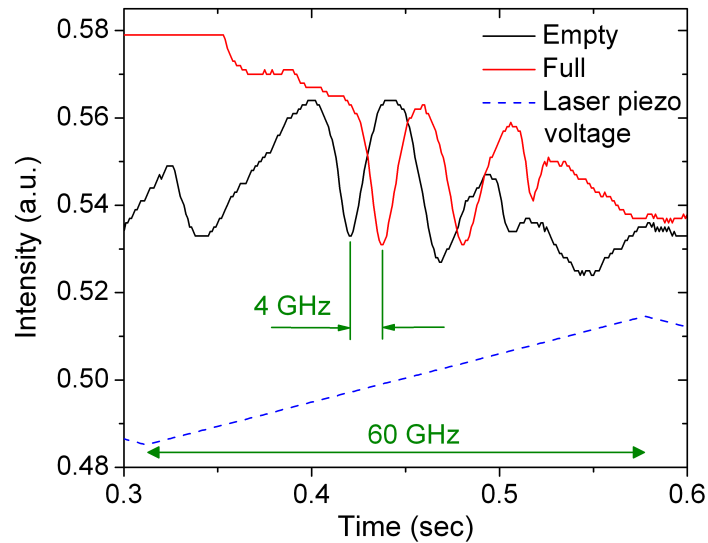


Figure 6: WGM spectra when bubble is empty (black trace) and full with water (red trace).

## Conclusion

The fabrication and characterization of a new optical microresonator are described. These promising new resonators could find as many applications as their solid counterparts, especially in biochemical sensing. It is suggested that single nanoparticles smaller than an influenza particle can be detected using these novel devices. In context, well-developed optical microbubbles could provide the rapid detection of viral particles responsible for highly-infectious diseases, e.g., Anthrax, Ebola fever and Severe Acute Respiratory Syndrome (SARS), to suggest but a few. The early diagnosis of such potentially lethal infections is vital for successful treatment and prevention. Future work will involve further testing of the sensing capabilities of microbubbles.

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# Decision support for building renovation strategies

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## Introduction

In Europe, buildings account for 40% of energy consumption and 36% of EU CO<sub>2</sub> emissions. The energy usage of old structures built or rehabilitated before 1980 is as high as 300 kWh/m<sup>2</sup>/yr, which is greater than the figure for modern structures and passive houses. Obviously, old buildings are the major users of energy, as they use more than twice as much as the modern building.

There are numerous published studies showing that energy savings of 40 to 74% can be achieved in commercial buildings through renovation. Implementing rational renovation, which results in efficient operation and maintenance and facilitates low energy consumption, creates a triple-win situation: it provides a much needed impetus to the European economy, it contributes to the achievements of energy and climate targets and it decreases energy costs for citizens, businesses and public bodies.

Normally, the renovation of existing buildings usually involves decision-making processes. The challenge is that there are too many alternatives to be considered and to be chosen. It is difficult to determine which low-energy technique has the best results for energy consumption and CO<sub>2</sub> emissions. Therefore, it is necessary to analyse building performance and develop a decision support process for renovation strategies. This will be achieved through:

- Developing the Decision Support Framework (DSF) for building renovation strategies. The DSF proposes methodologies for the analysis of building performance and a Decision Support Model (DSM) for the process of decision-making.
- Developing methodologies for the analysis of building performance that is the integration of 'model-driven' and 'data-driven' in the framework.
- Developing the DSM for the process of decision-making, which is the decision component of the framework.
- Implementing the DSM as a prototypical Decision Support Tool (DST), which is a basic for further development of a Decision Support System (DSS).

This article firstly introduces the term of Decision Support (DS) and DSF. Then it presents building performance and renovation solutions. Thirdly, it describes the development of the DSF. Finally, it concludes with the implementations of the DSF.

## Terms introduction

### Decision support and decision support framework

DS is a broad field concerned with supporting people in making decisions. Unfortunately, it is in fact very loosely defined. Initially, there was a close link between Decision Support and Operations Research and Decision Analysis. Subsequently, DS was coupled with the development of DSS. Nowadays, DS is probably most often associated with integrated usage of Data Warehouses and OLAP (On-Line Analytical Processing) or Modelling and Simulation. DSS is a computer-based tool that supports business or organizational decision-making activities. The DSS is differentiated into communication-driven DSS, data-driven DSS, document-driven DSS, knowledge-driven DSS and model-driven DSS. Decision support framework is a model for development of a decision support system. A DSS requires a structured support, with the DS framework includes people, technology, and the development approach.

### Building performance

Building performance is a comprehensive whole building approach aimed at identifying and fixing comfort and energy efficiency problems in a building. Building performance addresses the following parameters in this research: energy performance, thermal performance and maintenance activities.

- Energy performance – Energy performance of a building means the amount of energy actually consumed or estimated to meet the energy demand associated with typical usage of a building, which may include heating, cooling, ventilation, hot water and lighting.
- Thermal performance is the extent to which a material or building element reduces heat loss. The thermal performance of a building element is described by its U-value ( $\text{W}/\text{m}^2\text{K}$ ). Thermal transmittance values (U-values) of envelop materials are used to predict the fuel consumption of buildings. U-value is the measure of the amount of heat loss through an element of construction, such as roof, wall or windows. The lower the U-value, the less energy lost, the better are its insulation characteristics and indoor/thermal performance.

- Maintenance is a major activity in a building's life cycle. In maintaining a building, there are usually several strategic options available to management and many alternative decisions to be considered. In general, maintenance activities can be classified into six types: routine maintenance, emergency maintenance, corrective maintenance, predictive maintenance (also known as Performance-based Maintenance (PBM)), testing or failure-finding and preventive maintenance.

## Renovation solutions

'Core and shell' covers base building elements, such as structure and envelope. Renovation solutions for 'core and shell' of buildings contain thermal insulation (wall insulation, roof insulation and floor insulation), window renewal, air tightness and shading devices. Building service systems are installed to support the required business functions of the building and the needs of the occupiers. Renovation solutions for service systems of buildings contains component insulation (e.g., pipe work/ductwork insulation, boiler insulation, etc.), component replacement (replace the component before it exceeds its technical life span), system improvement (e.g., upgrade fluorescent lamps to T5— a new version of fluorescent lamps designed to optimize energy consumption), Building Management System (install it to monitor/control building performance) and using renewable energy sources (e.g., solar, geothermal, biomass, hydro and wind).

## Development of decision support framework

In this research, a DSF was developed (see Figure 1), which contains two main components: a building performance analysis component and a decision-making component. 'Model-driven' and 'data-driven' are included in the building performance analysis component and a DSM is the decision-making component. Decision support models can condense a lot of information into simple charts that can be used for project implementation and control and enable easier explanations of decision-making procedures, which sketch the strategy drafting process.

The DSF proposes methodologies for the analysis of building performance and a DSM for the process of decision-making. The building performance factors addressed in this research are energy performance (technical parameter), thermal performance (technical parameter) and maintenance activities. Energy performance and thermal performance analyses are based on modelling and simulation methods. Maintenance activities analysis is based on data warehousing and web application methods. A DSM with six sections is developed, including an initial survey of the area conditions, analysis of building performance, consideration of all possible solutions, specification of feasible options, evaluation of the options and selection of the best option. The DSM is implemented as a prototyp-

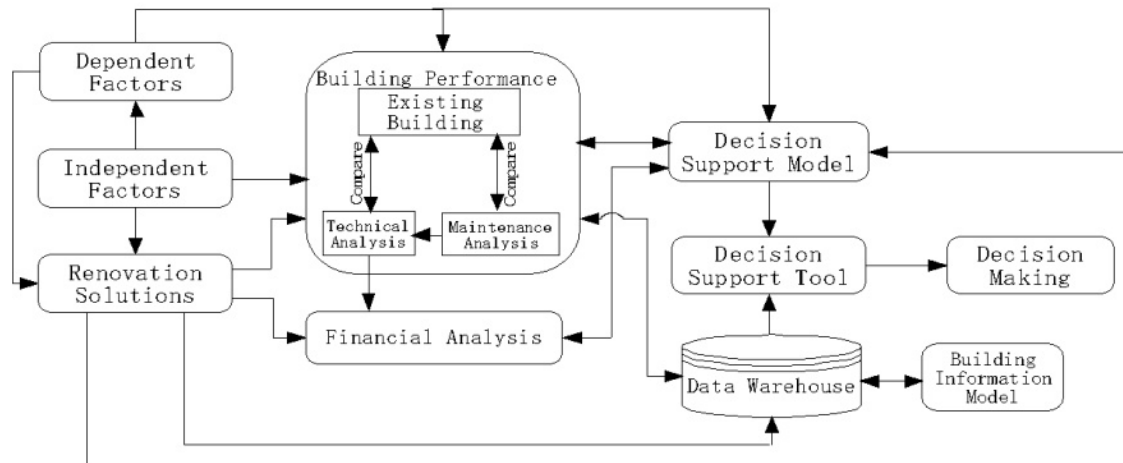


Figure 1: Simplified diagram of the Decision Support Framework (DSF)

ical DST. The DST supports users to make final decisions. Building information model can be used to facilitate accessing, storing and processing all information and linked to a Data Warehouse (DW), which can be available to be used by different stakeholders. The development of the DSF was published in the ASCE Workshop of Computing in Civil Engineering.

## Implementations

In this research, implementation of the DSF proves that the proposed research methodologies for the analysis of building performance and decision support for renovation of a particular building do work. Two case studies are performed for six distinct buildings at UCC and the CEE building located in main campus of UCC.

- Case study I (six distinct buildings at UCC) – focuses on maintenance activities analysis
- Case study II (the CEE building at UCC) – focuses on technical parameters analyses

The goal of the first case study is to prioritize what components/systems need to be replaced/renovated. It focuses on renovation strategies from the maintenance density and energy consumption point of view. This case study used six distinct buildings at UCC for analysis of maintenance activities. The six distinct buildings include Kane Building, Boole Library Building, O’Rahilly (O’R) Building, Civil Environmental Engineering (CEE) Building, Electrical Engineering (EE) Building and Environmental Research Institute (ERI) Building. Three of these six buildings are with areas more than 10000 m<sup>2</sup> and the other three buildings have smaller areas. Their construction dates vary from 1910 to 2004. By application of the DSF, five suggestions were proposed: optimize the maintenance sched-

ule of plumbing systems for Boole Building, Kane Building and O'R Building; improve settings of existing Building Management System (BMS) i.e., recalibrate the temperature point for sensors of existing BMS for Boole Building (a BMS is a computer-based control system installed in buildings that controls and monitors the building's performance and energy consumption); upgrade lighting systems for Boole Building, Kane Building, CEE Building and EE Building; improve existing mechanical ventilation systems for Kane Building and CEE Building and improve existing 'core and shell' for CEE Building and EE Building. A Web application was developed to display the frequency of faults and density of maintenance of each building. Future research work is to develop a decision support system based on the DSF that will help engineers easily select a building's components/systems in renovation strategies. This case study was published in the ASCE Workshop of Computing in Civil Engineering in detail.

The purpose of the second case study is to report about the development of an energy simulation model for an existing university building in order to simulate its energy consumption and thermal comfort. This case study presents a 100-year-old building – the CEE building. It is a traditional structure built in 1910 and in need of substantial renovation. By application of the DSF, there were six renovation solutions initially, but only four renovation solutions were selected because of the limited budget. This case study was published in the International Conference on Building Science and Engineering (ICBSE) in detail.

## Conclusions

There are only few specific guidelines for decision support in building renovation strategies. This research developed a holistic, methodological DSF, which is a guide for the user to analyse building performance for comparison of various renovation solutions in order to make decisions.

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