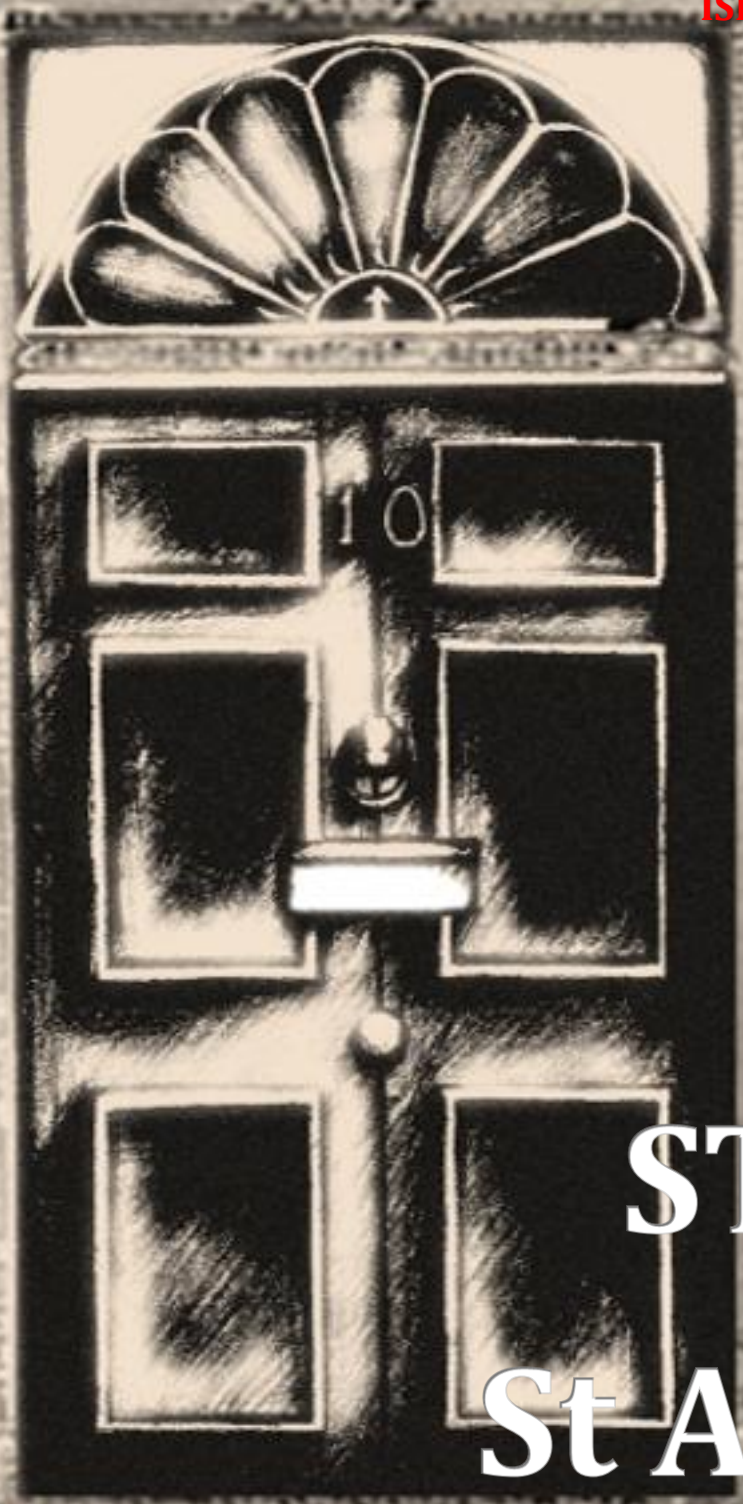
Volume 3
Autumn 2011

STAAR
ST. ANNE'S ACADEMIC REVIEW

ISBN 2048-2566



STAAR: St Anne's Academic Review

ISSN 2048-2566

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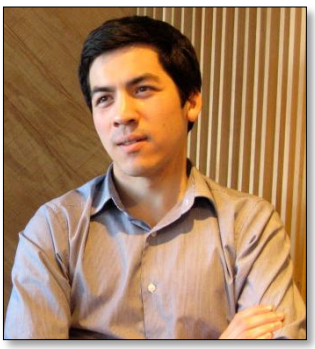
About the Contributors

Gregory Ross is in the 3rd year of his DPhil and is based in the Department of Biochemistry. He graduated from the University of Warwick with an undergraduate Masters in physics and was interested in applying what he learnt to addressing questions in biology. As a result, he joined an industrial programme designed for interdisciplinary research at the Doctoral Training Centre. He research is focused on developing computational techniques to investigate how drugs interact with proteins at the atomistic level. After his DPhil, he aims to continue scientific research at the academic and industrial interface.

Munish Sikka did his Undergraduate in Computer Engineering and MBA in Forestry Management from India. He was awarded the Chairman's gold-medal for academic excellence for the work he did in the MBA program. He has workedin the area of Forest and Environmental Policy in India before coming to Oxford to do his MSc in Environmental Change and Management. The present paper is out of his dissertation work done in Southeast Alaska supported by generous grants from Climate and Development Knowledge Network,UK and St. Anne's College. His broader research interests include Climate: Science, Policy and Modelling, Natural Resource Management through Community Participation, and Renewable Energy. He is further interested in doing a PhD and consultancy work in the Environment Sector. Munish has recently joined the Jet Propulsion Lab, NASA as Environmental Scientist.



Robert Seddon completed his PGCE in Physics earlier this year. He previously completed a BA in Physics at St Anne's before returning to train as a secondary school Physics teacher at the University's Department of Education and in Oxfordshire comprehensive schools. He is spending this year in Japan on the St Anne's Year in Japan Scholarship.

Naomi Walker did her undergraduate degree in Spanish and Master's in European Literature at Exeter College, Oxford. She is now in the final stages of her DPhil in Golden Age Spanish Literature, producing a critical edition of a seventeenth-century play by Lope de Vega. Naomi is one of the three Assistant Deans at St Anne's College, with responsibilities for welfare among both undergraduate and graduate students.

Mark Uttley is midway through an MPhil in Economic and Social History at Oxford and is a Domus Scholar of St Anne's College. He also holds a BA (Hons) in History from the University of Manchester. He has a diverse mix of research interests; his current work is on English seventeenth and eighteenth century trade, but his undergraduate dissertation was on the British General Election of 1945. He is also interested the political, economic, and social history of twentieth century Britain.

Niluka Satharasinghe did an Undergraduate Degree in Computer Science at the University of Leicester and is currently doing an MSc in Computer Science. His has a mix of interests, however his primary area of research interest is focused around Machine Learning. He served on the St Anne's MCR Committee from 2010 to 2011 as the IT Representative. He is also interested in functional programming, primarily around Clojure and Haskell.

The Editors

Editor-in-Chief: Himanshu Kaul

Himanshu is currently a third year DPhil candidate in Engineering Science. His research lies at the intersection of *Regenerative Medicine*, *Tissue Engineering* and *Computational Biology*. He is working on developing a software platform that could be used to simulate biological phenomena and validating it using an *in vitro* model that aims to capture the complexity of biological processes such as cellular differentiation and cell expansion. In his spare time Himanshu is an amateur Cricketer and Thespian.

Humanities Editor: Helena Taylor

Helena is currently in the second year of her DPhil in French at St Anne's, writing a thesis with the provisional title: 'Lives of Ovid in French writing 1666-1713'. She read Classics and French at Worcester College (2003-2007), and completed an Mst in European Literature (French) the following year. As part of her DPhil, she spent 2010-2011 in Paris working as a *Lectrice* at *Université Paris-Sorbonne* (Paris-IV).

Science Editor: Olga Kciuk

Olga came to St. Anne's College after receiving her Hon. BSc from the University of Toronto. She completed an MSc in Neuroscience and was the Academic Affairs Officer for the MCR in 2010-2011. She is currently working at the John Radcliffe Hospital, researching the development of chronic post-operative pain.

General Editor: Rani Preatarshini Subassandran

Rani completed LL.B in King's College London and soon after pursued the Bar Vocational Course. She was called to the English Bar the Autumn that she joined Oxford, i.e. October 2010. She successfully completed Masters in Law in Oxford, which is the Bachelor of Civil Law (BCL) Course, in the Summer of 2011. Rani is currently working in the Legal Department of the Malaysian Government's Foreign Direct Investment Sector.

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Word from the Editors

Daria Luchinskaya, Editor-in-Chief '09-10

Hello new academic year and hello new issue of St Anne's Academic Review. It is with great pleasure that I see STAAR carry on under Himanshu's direction, he's done a fantastic job as editor-in-chief, and I would like to thank him and the editors for their work in bringing this third volume to light.

STAAR was set up three years ago, building on the successes of the then-recently-established Arts and Humanities and Sciences Discussion Groups, now a vibrant and unique part of our College community, and the esteemed Subject Family Events. Underpinning these initiatives was a sense of sharing the achievements of academic work and in making it accessible and interesting to people in different fields of study, which we hoped to put across from the very first issue of STAAR. I should also acknowledge the role of the New Collection, the peer-reviewed journal run by the New College MCR, as a substantial source of inspiration.

When STAAR was established in 2009 I had little idea of the kind of reception that it would have, and I have been so happy to hear from many different people how much they enjoy it. It's mentioned in all sorts of fascinating and unexpected places, amongst which Onlinedegrees.org, an online education portal, picked up on an article by Dr. Nina Alphey and Christina Mayer from STAAR 2009 on obtaining funding for conferences. I have also been overwhelmed by the support for STAAR - from the extremely helpful and on-the-ball editorial teams, the interest and anticipation in the MCR community, the encouragement from STAAR's successful reception by the JCR and the SCR, and the invaluable help and advice from St Anne's college in STAAR's evolution.

Having been the chief editor of STAAR for its first two issues, while doing my MPhil in Russian and East European Studies at St Anne's, I could not be happier to see it thrive under a new editorial team, indicating that it has become a part of College life. As for me, I teach introductory maths to first-year St Anne's students reading Economics in various subject combinations, and doing a PhD in Employment Research at the University of Warwick. I would very much like to publish an article in STAAR when I have some findings!

I really hope that STAAR will carry on from strength to strength to celebrate our interests, curiosity and perseverance in doing what we do, across different disciplines and at different stages of our lives. Thanks to everyone who is and has been involved in STAAR, from making it to reading it.

Himanshu Kaul, Editor-in-Chief '11

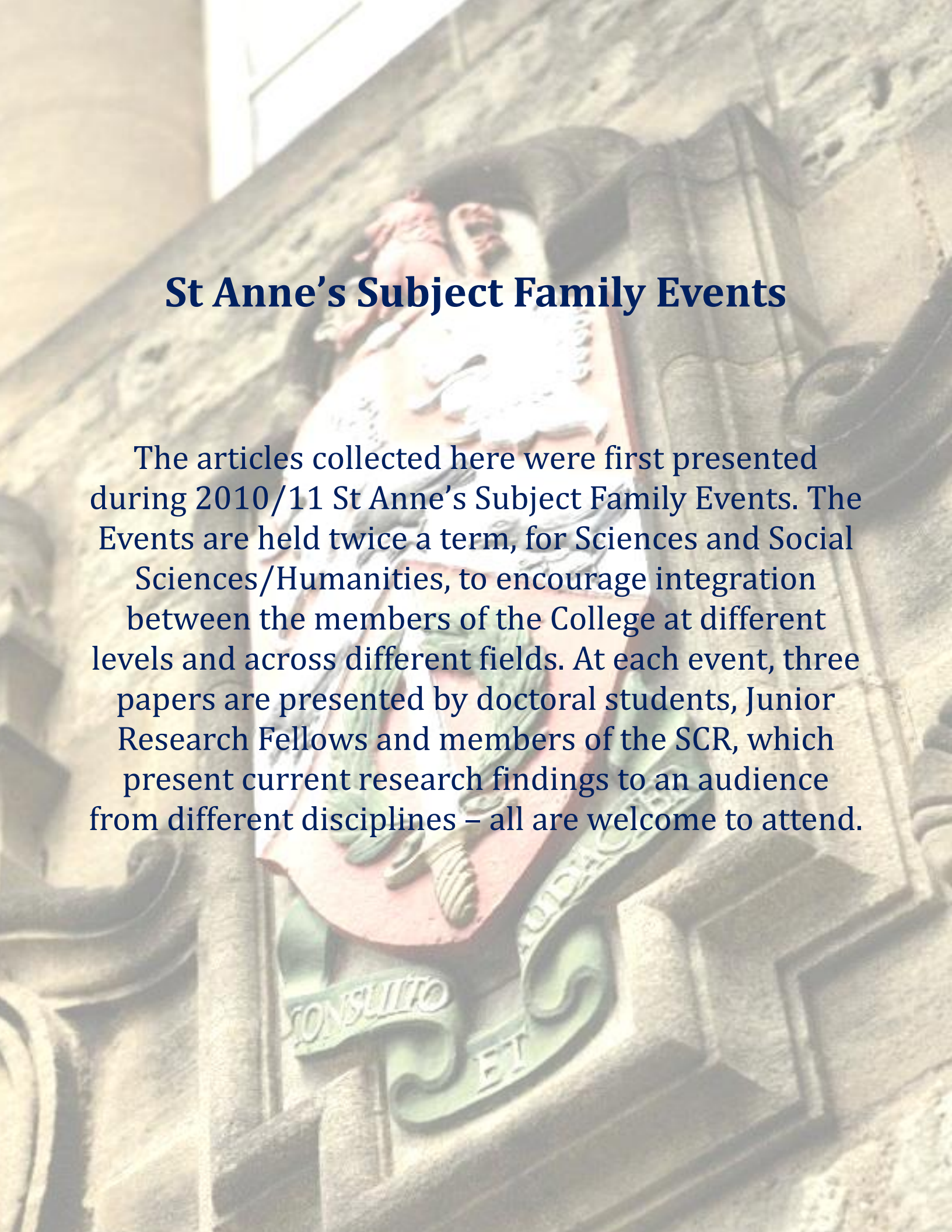
It is with great enthusiasm that I present to you the third volume of St Anne's Academic Review. The current volume consists of articles that were submitted by St Anne's MCR members from the academic year 2010-11. With the current volume, STAAR – an online initiative in its first two years – takes its first steps in print; a move that I believe will increase its visibility amongst the St Anne's community at large. Contributions from the MCR and guidance and support from the SCR, including Dr Anne Mullen and Principal Tim Gardam, has since STAAR's inception played a key role in this advancement.

The most important feature of STAAR is the journal's requirement that the work presented be in non-technical language so that the articles are accessible to one and all. The journal therefore serves as a wonderful medium to hone one's writing skills and, more importantly, increase awareness of the diversity of projects JCR/MCR/SCR members at St Anne's undertake each year. With this in mind I would like to point the reader to an elegantly written article by **Robert Seddon**, a PGCE graduate, on a very important problem that pervades our education sector and a feature by **Nilu Satharasinghe**, currently a post-graduate in the Computer Science department, in which he shares his work that earned him and his team a visit to *10 Downing Street*. I hope that with the volume coming out in print the St Anne's community, when headed for their evening cup of tea or taking a break, will take a moment to note the achievements of their colleagues and extend a thought to the diverse range of perspectives on offer.

Along with the Science and Humanities Discussion groups, STAAR, I believe, is the soul of St Anne's MCR and one of the key ingredients that makes St Anne's student culture unique. In a gathering of twenty colleges summoned by the Vice-Chancellor Lord Hamilton it was a mention of STAAR that made St Anne's college standout compared to the others. Of course, credit goes to Dr Mullen and Principal Gardam for being supportive of the various student initiatives, especially STAAR, but the fact remains that it is the contributors – the JCR, MCR and SCR – that give the journal its real value.

STAAR has a lot to offer, and I strongly believe that print version of the journal will increase its outreach. I look forward to more submissions from my colleagues and publishing the fourth volume of the journal next year. I have little doubt that with continued support from the College and the SCR, STAAR will advance strongly and, along with its contributors, charter new frontiers. I look forward to contributions for STAAR's fourth volume.

Thank you.



St Anne's Subject Family Events

The articles collected here were first presented during 2010/11 St Anne's Subject Family Events. The Events are held twice a term, for Sciences and Social Sciences/Humanities, to encourage integration between the members of the College at different levels and across different fields. At each event, three papers are presented by doctoral students, Junior Research Fellows and members of the SCR, which present current research findings to an audience from different disciplines – all are welcome to attend.

Water: The Most Important Molecule in Drug Discovery

Gregory Ross

Abstract: *Diseases can often be attributed to the malfunctioning of proteins, the molecules that constitute the vast majority of the machinery and scaffolding within our bodies. As a result, we take medicinal drugs to bind to and modulate the functionality of faulty proteins. However, because the body is mostly an aqueous environment, water effects are an important consideration in the development of all new drugs. In particular, when a small molecule binds to a protein, water within the protein's binding site can be expelled or rearranged so as to facilitate or hinder binding. Knowledge of this process can help medicinal chemists design selective and stronger binding drugs to combat diseases.*

Water is a substance that is utterly fundamental to life. It is well known that water constitutes up to 70% of an adult's body weight, so it is hardly surprising that water plays a key role in almost all biological functions. Water is the fluid through which molecular machinery is transported within cells and around the body, and its unique properties facilitate chemical reactions. Importantly, as this article will discuss, water plays a critical role in molecular binding and informs the creation of new drugs to combat diseases.

Proteins are biology's molecular machines that carry out all of the functions necessary for life. Endogenous diseases occur due to the malfunctioning of one or more of our proteins. We use drugs (medicinal or recreational) to inhibit, activate or modulate the working of particular proteins. For instance, ibuprofen and aspirin are believed to inhibit cyclooxygenase,[1] a protein that is associated with inflammation. In the case of bacteria and viruses, drugs are designed to target microbial proteins and hinder their functions so they cannot proliferate or produce harmful substances in the body. Proteins catalyse reactions, relay signals, and carry out all their functions through binding events. These take place in grooves or pockets on the proteins' surfaces or in the proteins' interiors, which are known as binding sites. Drugs can interfere with a protein's functionality by fastening onto its binding site and preventing other binding events. Small molecules that bind to proteins are known as ligands.

Once a protein has been identified as being integral for a disease, it is typical for a pharmaceutical company to virtually screen hundreds of thousands to many millions of compounds against it, with the aim of finding compounds which bind strongly to the protein's binding site, and thereby identifying the most promising candidates for inhibiting the protein. This is an important initial step in drug discovery as subsequent chemical screens run on the candidates are time-consuming and very expensive, so by screening ligands virtually, both time and money can be saved. Despite decades of research, however, accurately predicting the binding affinity of a ligand is still very difficult, even once the 3D structure of the complex is known. It is harder still to predict a ligand's binding strength at the rapid speed required by virtual screens.[2] This shortcoming can be partly attributed to the misrepresentation of water in existing binding models. Rather than being a passive medium through which binding processes take place, water

plays an important part of the recognition process and in the affinity of the binding pair. One of the most important factors that drive a ligand to bind with a protein is the tendency of non-polar substances to cluster together in an aqueous (water-based) solution. It is called the hydrophobic effect and is a process that merits an entire article of its own.[3] Water, however impacts the binding process in subtler ways as well, such as through the rearrangement of water molecules in the binding site when a ligand binds.

A classic example is the bacterial oligopeptide binding protein (OppA). This protein is responsible for transporting small peptides, or chains of amino acids (Figure 1a) from outside a bacterial cell to its interior. Due to the nature of its task, OppA must exhibit binding plasticity, or be able to accommodate a large variety of ligand shapes and chemical types. It does this partly by changing the number and distribution of water molecules in its binding site. When a ligand is too small to bond directly with the protein, as in Figure 1b, four water molecules surround the ligand, bind to the polar group and bridge the interaction between the peptide and the protein. In Figure 1c, where the peptide side chain is large and hydrophobic, the opposite is true: to accommodate the ligand, all but one of the water molecules are expelled from the binding site. Water molecules acting like those in Figure 1b are very common; it has been reported that 85% of protein-ligand complexes have at least one water molecule bridging the interaction between the ligand and the protein.[4]

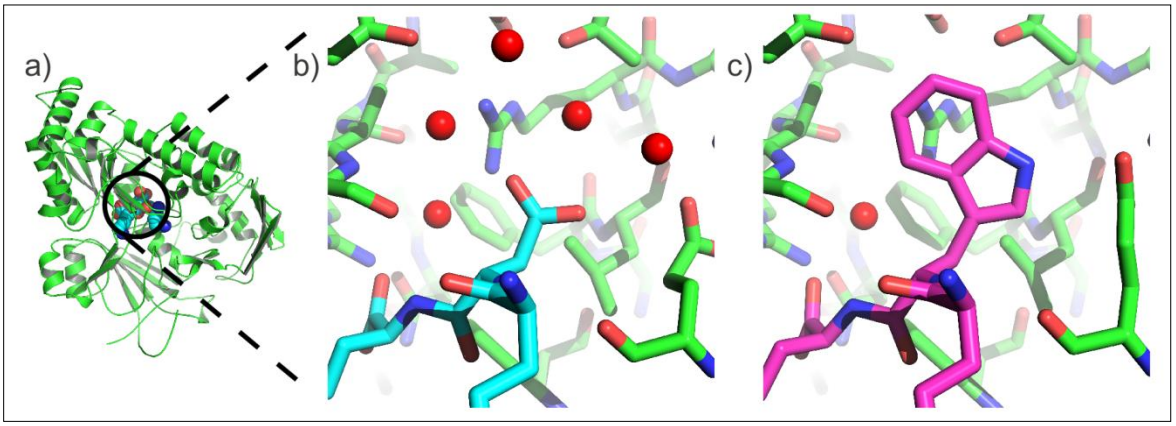


Figure 1. a) The bacterial peptide transporter OppA binds to a myriad of small peptides. b) As the peptide (in blue) is too small, four water molecules (red spheres) are able to bridge the interaction to the protein (green sticks). c) All but one of the water molecules has been expelled to accommodate the larger peptide side chain (purple sticks).

Whether or not a ligand will displace a water molecule is of particular interest to medicinal chemists, as water displacement is seen as a route to improve the affinity of a drug. A classic example of this can be seen with HIV protease, a protein necessary for replication of the HIV virus (Figure 2a). X-ray crystal structures of HIV protease revealed that a water molecule bridged the interaction between the ligand and the protein (Figure 2b). As a result, a new class of potent drugs were created to displace that same water molecule (Figure 2c).[5] In fact, this was the first example of the targeted displacement of a water molecule.

We expect the affinity of a ligand to increase when it displaces a water molecule because the process increases the *entropy* of the system. Entropy, a measure of disorder, is one of two constituents that determine the binding strength of a reaction. If a water molecule is displaced

from a protein's binding site, it is more able to freely rotate and explore its surroundings, thus making the system more disordered. The other factor determining binding strength is *enthalpy*, a measure of the intermolecular energies of the protein-ligand complex. To understand the respective roles of entropy and enthalpy in a binding event, we can imagine two ligands which are identical, except that one has a chemical group which displaces a water molecule upon binding with the protein. If this ligand can fully replace the bonds between the protein and the dislodged water molecule, then the change in enthalpy caused by its binding will be roughly the same as that of the other ligand; but in terms of entropy, the water-displacing ligand is the stronger binder because of the increase in disorder provided by freeing the water molecule. However, the targeted displacement of a water molecule may not always result in stronger binding, especially if the ligand cannot compensate fully for the stabilising role played by the water molecule within the protein.[6]

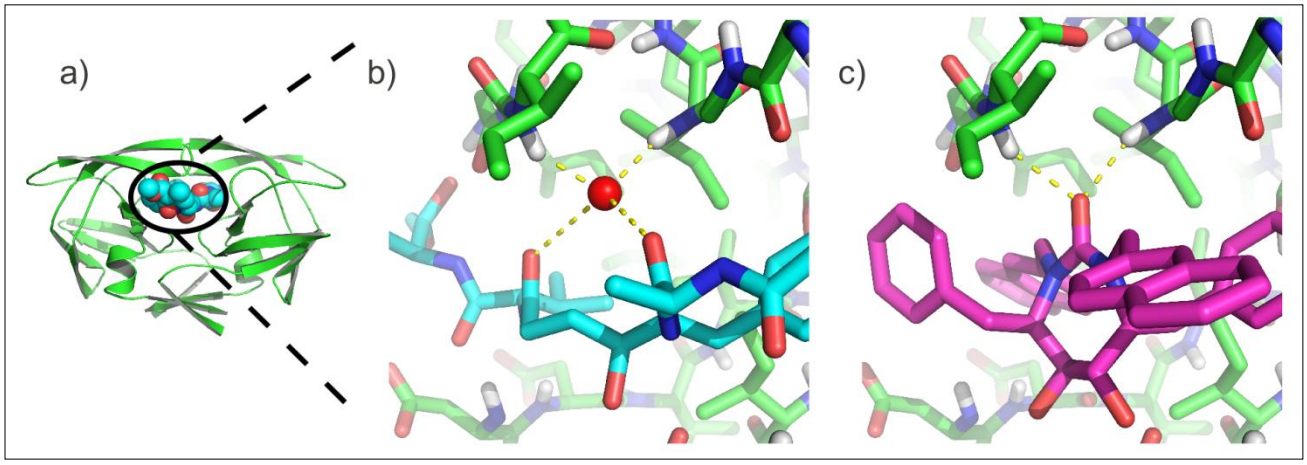


Figure 2. a) The protein HIV protease is required by the virus to help create a complete viron. b) An X-ray crystal structure of HIV protease with an inhibitor reveals that a water molecule is bonded to both the protein (green sticks) and the inhibitor (blue sticks). c) As the first example of its kind, a new inhibitor was designed to displace the same water molecule to improve its binding affinity.

We have seen with OppA that water molecules in protein binding sites can help ligands bind to proteins either by bridging the interaction or by being dislocated to make room in the binding pocket. Further, with HIV protease we have seen that the accommodating nature of water can be exploited to create more selective and strongly-binding drugs. Hence, our ability to predict the role of water in a protein binding site may hold vital importance for a drug discovery program. Before this can be done, however, we must be able to accurately determine the locations of water molecules; after all, we cannot possibly predict what role the molecules play if we have not first identified them.

My work focuses on developing methodologies to elucidate the role of water in protein-ligand binding. The end goal of my research is to inform better ways to calculate the binding strength of a compound accurately and within the time constraints demanded by virtual screening. As a starting point for my approach, which combines molecular simulations and empirical analysis, I use 3D structures of many different proteins that have been determined with X-ray crystallography. Thus far I have established a method for predicting water locations accurately and rapidly (Figure 3). Furthermore, I have used this new, rapid method to study a

large range of protein-ligand X-ray crystal structures, and have established empirical ways to predict whether a water molecule will be displaced by a chemical group on a ligand. I hope that my work will aid the faster, more affordable development of potential new drugs.

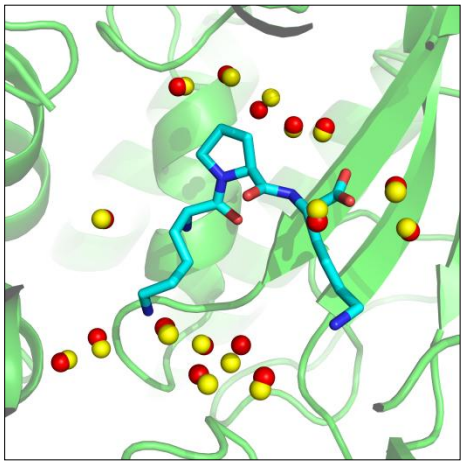


Figure 3. An example of my rapid water prediction method. A ligand (blue sticks) is shown bound to the protein OppA (green cartoon). My predictions (yellow spheres) are overlaid on top of water molecules from the crystal structure (red spheres). All water locations are correctly determined.

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[5] Clarke, C., Woods, R. J., Gluska, J., Cooper, A., Nutley, M. A., & Boons, G. J. (2001). Involvement of water in carbohydrate-protein binding. *Journal of the American Chemical Society*, *123*, 12238-12247.

Producing a critical edition of a Golden Age Spanish play

Naomi Walker

Abstract: *This article was originally written as a talk at the Humanities Subject Family event at St Anne's College. In it, I give an overview of the methodology for my DPhil thesis, a critical edition of a seventeenth-century Spanish play by Lope de Vega. I also outline some of the issues involved in producing a modern critical edition of an early modern text.*

Lope de Vega was one of the most popular, and certainly the most prolific, playwrights of his time. Born in Madrid in 1562, he wrote an impressive number of plays before his death in 1635, in addition to poetry and prose works. Of his plays, approximately four hundred are extant, a staggering figure in itself, although in fact Lope claimed to have written in excess of one thousand five hundred plays. It is generally agreed that he wrote something in the region of at least six to seven hundred, many of which have been lost.[1] In the seventeenth century, they were first published in collections known as *partes* which gathered together approximately twelve plays in each; in total, twenty-five *partes* are officially attributed to Lope. One of the consequences of Lope's vast literary output is that much of his work has been overlooked in academic terms. The *ProLope* group in Barcelona have recently set out to rectify this sad lack of proper scholarship engaging Lope's corpus and are in the process of publishing good critical editions of all of his plays. For my DPhil thesis, I am producing a critical edition of *Contra valor no hay desdicha*, which appears in *Parte XXIII*. Translated literally, the title means 'No misfortune shall prevail against valour'. My edition of *Contra valor* will precede the *ProLope's* production of this *Parte*, and I hope to collaborate with them in the future.

Contra valor no hay desdicha is based on the early life of King Cyrus the Great of Persia (Ciro), the narrative taken from sources by both the Greek historian Herodotus (5th century BC) and the Roman historian Justin (c. 2nd-3rd century AD). Cyrus is a genuine historical figure, but the action of the play follows the largely mythical accounts of his early life, from his humble beginnings having been abandoned in the wilderness by his paranoid grandfather King Astiages and brought up by the peasant Mitridates (a rather familiar tale from other hero myths such those of as Oedipus, and Romulus and Remus), to his eventual accession to the throne, proving that, as the title of the play suggests, valour wins out over all adversity. The plot is entertaining, but, in addition to being a well-written play with characters of real psychological interest it also contains much of relevance to contemporary debates on kingship.[2] These debates centred on the qualities necessary for a good monarch and were largely a reaction to Machiavelli's *Il Principe* ('The Prince', first printed in 1532) which was condemned by most Spanish political theorists as

[1] Dixon, Victor. (2004). 'Lope Félix de Vega Carpio'. In Gies, David T., (Ed.). *The Cambridge History of Spanish Literature* (pp. 251-64). Cambridge and New York: Cambridge University Press.

[2] For more on this, Melveena McKendrick's groundbreaking study *Playing the King: Playing the King: Lope de Vega and the Limits of Conformity* (London: Tamesis), 2000, is an extremely enlightening study of Lope's treatment of the kingship theme; McKendrick did not, however, include *Contra valor* in this book.

an evil work that was contrary to Christian ethics and principles.

My work is to produce a scholarly study of *Contra valor no hay desdicha* that encompasses the elements necessary for a modern critical edition. This includes an in-depth examination of: early printings of the play; the date and circumstances of its composition; its sources; its staging; a critical discussion of the work including analysis of its characterisation, imagery and themes; a breakdown of its versification.

No manuscript of *Contra valor no hay desdicha* is known to exist;[3] therefore, to set about defining a version of the text for use in this edition, it was necessary to rely solely on early printed editions of the play.[4] I first worked through *Contra valor* with reference to its previous editions which, of course, contain no critical material but give only the dramatic text, and made informed decisions as to my own rendering of the play. This involved conducting a line-by-line comparison of all seven previous printings (two from 1638, three from the eighteenth century and two from the nineteenth century) and noting where my version differs from any one of them in a list of textual variants.

I should make clear, however, that the definitive version of my text in this edition does not correspond exactly to the *editio princeps*. Much of the punctuation in the early printed editions is not natural to the modern reader. This is added to the orthography of early modern Spanish, which, although not overly problematic to modern eyes is neither of any real advantage in the context of a critical edition.[5]

It is evident from these comments that I have made the decision to modernise both the punctuation and orthography of my edition of *Contra valor*. This is based on careful consideration of the relative merits of both conservation and modernisation, informed by a reading of various scholars on the theory of critical edition. Arellano, Cañedo and others have made a strong case for the modernisation of text for a number of reasons including those I have just outlined. It is also the strategy adopted by ProLope for their new series of editions of the complete works of Lope de Vega (already mentioned).[6]

In a wider sense, however, I have attempted to bring the text back to a version more closely related to the 1638 first edition than the later editions from the eighteenth and nineteenth

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[3] Presotto, Marco. (2000). *Le commedie autografe di Lope de Vega: Catalogo e Studio*. Kassel: Edition Reichenberger. This compiles a full collection of the plays existing in manuscript by Lope de Vega, *Contra valor* not being one of them.

[4] Of course, the problems caused by the errors and, at times, intervention of early-modern printers in the work they were printing are well-documented, and it is important to bear this in mind when approaching the play. For more on this, see pp. 134-136 of Profeti's 'Editar el teatro del Fénix de los ingenios', in *Anuario de Lope de Vega*, II (PROLOPE: Milenio), pp. 129-151. Also, see chapters 2 and 3 of Andrés Escapa and Garza Merino, (Eds.). (2000). *Imprenta y crítica textual en el Siglo de Oro*. Valladolid: Fundación Santander Central Hispano, Centro para la Edición de los Clásicos Españoles.

[5] For more on these issues of orthography and punctuation, see Arellano, Ignacio. 1995. 'La edición de textos teatrales del Siglo de Oro. Notas sueltas sobre el estado de la cuestión (1980-1990)'. In J. Canavaggio. *La comedia*. Madrid: Casa de Velázquez (pp. 13-50, especially pp. 36-42).

[6] Arellano, Ignacio. 1995. 'La edición de textos teatrales…'; Cañedo, Jesús, & Arellano, Ignacio. 1987. 'Observaciones preliminares sobre la edición y anotación de textos del siglo de oro'. In Cañedo, J., & Arellano, I., (Eds.). *Edición y Anotación de Textos del Siglo de Oro*. Pamplona: Ediciones Universidad de Navarra'; ProLope (Eds.). *Obras completas de Lope de Vega*

centuries. The last of these was by Menéndez y Pelayo, published in 1896.[7] This approach was especially pertinent in relation to stage directions, which had been altered significantly by the nineteenth century editors: my edition uses mainly the stage directions of the *princeps*, and those that have been altered are noted.

In terms of punctuation it is difficult to say with any certainty what form the original would have taken; as mentioned in fn. 4 above, early modern printing was neither reliably accurate nor faithful to the playwright's original text. Weight of evidence (such as the two 1638 editions using the same punctuation at a given point for example) can be useful, but due to the inherent difficulty of settling upon what exactly the intention of the author was, it is often a case of making a sensible and considered editorial decision based upon a close reading of the text. This type of decision-making can be seen as not only the prerogative, but the duty of an editor.

The literary aspects of the play and its technical features are essentially interdependent, as a literary reading of the text can aid with editorial decisions, and the opposite is also true, a technical decision sometimes affecting a critical reading of the work. In turn, this demonstrates very clearly that an editor's job is not simply to implement a blanket policy regarding technical issues such as punctuation, but rather to recognise that editorial decisions do have implications for a reading of the text itself, and to be sensitive to this when making such decisions.

To conclude, it is evident that one's chosen editorial methodology will always depend heavily on the purpose for which an edition is being produced. Here I suggest that the main aim of a critical edition for scholarly study in the 21st century is to provide a text which as far as possible is faithful to the original intent of the author, which is accessible for the reader, and which, through proper research and careful referencing has all the information that a reader could need for an overview of how the text has evolved from its first edition to the most recent. This is not to the neglect of the idea of performance, of course; there has been a recent, encouraging upsurge of interest in the performance of Golden Age plays in the UK and the USA in the last decade.[8] A high-quality edition is of crucial importance in giving a director the tools (s)he needs to understand and appreciate a text fully so that it can be produced onstage.

Editorial decisions regarding technical aspects of the text have consequences for the modern reception of the play, whether by performers or by readers, in addition to leaving a legacy for other scholars as they read an edited play. In my view, it is important to remember that a modern critical edition is just another link in the chain of the evolution of a given text. In the same way that a literary study is expected to be fully supported by a substructure of documentation and referencing, so the modern editor has a responsibility to ensure their text is likewise supported by scholarly evidence of the highest quality, in order to make it as erudite as possible. It is undeniably tempting for the modern editor to see their work as the end result of a finished process. However, it is not inconceivable that in the years to come the edition produced today will take its place and be studied alongside all the other editions published over the years since the play's first run off the press in a seventeenth-century Madrid printing house.

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[7] 1896. *Obras de Lope de Vega*: *Comedias mitológicas y comedias históricas de asunto extranjero: edición y estudio preliminar del Marcelino Menéndez y Pelayo.* Madrid: Real Academia Española, 1890-1913, VI.

[8] For example, the RSC season of Golden Age plays in 2004, and the recent launch of the 'Out of the Wings' website (www.outofthewings.org), devoted to promoting and translating from all periods with a view to their performance in English speaking countries.

St Anne's Research

In this section we have a selection of the research interests and academic achievements of St Anne's members across the JCR, MCR and SCR.

The articles collected here are based on research conducted by the MCR members during the academic year 2010-11.

Assessing Opportunities for a Sustainable Wood-biomass Energy System in Southeast Alaska

Munish Sikka

Abstract: *In Southeast (SE) Alaska, the local communities based on different islands are dependent on oil for heating and are therefore facing enormous challenges due to globally increasing oil prices. The high cost of energy in the far North has constrained the local economy and is a major roadblock in the development of the region. The present study looks at the potential benefits of developing a local wood-pellet industry in Southeast Alaska by utilising residues from local saw-mills and logging operations. The study explores the economic, environmental and social benefits of developing a sustainable wood-pellet industry that displaces fossil-fuel for heating energy in the region. It also briefly discusses the Alaska's historic land settlement act of 1971 that gave land rights to local communities by organising them into corporations. These corporations can further play important role in the development of local wood-pellet industry*.

Introduction

The region of Southeast (SE) Alaska is a resource-dependent economy with communities relying primarily upon hunting, fishing, timber, mining, and tourism for their livelihood. The region comprises of more than a dozen communities with populations from as low as 50 and to over 30,000 (Juneau, the state capital) residents located throughout the archipelago. These communities draw their energy either from local hydro-power stations or fossil-fuels (oil/diesel-oil) imported via sea-routes. Whilst hydro energy is a major source of electricity in the region, for heating buildings, most communities rely upon oil (Alexander, Henderson,&Coleman, 2010, p.84).

The increase in global oil prices has therefore left these rural communities to face an energy crisis, threatening their very survival. Therefore a concerted effort to promote small-scale, self-sustaining energy options in rural areas is required to meet the energy needs of the region and the entire state of Alaska. Besides the high cost of oil, there is an environmental risk involved in shipping, handling and storing the petroleum products, especially the potential for spills in the harsh Alaskan climate and ocean conditions (Alexander et al.,2010,p.8). While exploring avenues for alternative energy, it is important to note that the region is home to the Tongass National Forest spread over 17 million acres of land. Under the Tongass Land Management Plan developed for the region, 576,000 acres is designated as suitable for timber harvest. Therefore, an enormous potential lies in converting locally available forest-biomass into wood-pellets or other forms of clean and affordable biomass-energy.

One unique feature associated with Alaska is the "Alaska Native Claims Settlement Act" (ANCSA) of 1971 that aimed to settle Native Americans' claims to virtually all of Alaska's roughly 400 million acres of land. This was done by organising Alaska's hunting and gathering peoples into 13 regional and 220 village corporations. The corporations were devised as an institutional means to give the native tribes the capital, infrastructure and incentives to develop and manage

their own natural assets, thereby increasing their self-sufficiency and reducing the government's trust responsibility (Thornton, 2007).

The Sealaska Corporation is one of the regional corporations formed under ANCSA and is involved in the land and natural resource management in SE Alaska (Sealaska - Who We Are, 2011). Sealaska recently installed a wood-pellet based heating system in their office building in Juneau as a potential step in biomass energy development. The Corporation is further taking steps to develop a regional industry for wood-pellets including through:

- Spreading awareness amongst the native community members and policy makers, regarding the benefits of switching from oil to wood-pellets to heat buildings; and
- Capacity building of existing saw-mills to start a wood-pellet production facility.

Developing a biomass-energy industry in the region that produces wood-pellets to be consumed as heating fuel is expected to benefit the region in several ways. These wood-pellets could be made from current saw-mill and logging residues in SE Alaska and does not require any new tree to be harvested particularly for biomass-energy.

The fact that residues often have low or even negative costs and therefore could be utilised for development of biomass-energy is also supported by Rosillo-Calle et al.(2007,pp.6-7). These authors suggest that residues from forestry and agricultural activities are a large and underexploited potential energy resource, almost always under-estimated and represent many opportunities for better utilisation. Globally the energy potential available from residues is about 70 Exa Joules[9] (EJ) including 36 EJ from forestry residues alone. However, these estimates are regarded as rough indications only with considerable variation estimated.

The present study attempts to identify potential economic, environmental and social benefits of establishing a wood-pellet industry in the region. These three types of benefits together constitute the Triple Bottom Line framework of sustainability (Slaper & Hall, 2011). In order to demonstrate the environmental benefits, the study uses the emission factor values published by Obernberger & Thek (2010,p.305) to calculate the potential savings in Carbon Dioxide (CO2) emissions that could be achieved by displacing oil with wood-pellets as heating fuel in residential and commercial buildings. The study further examines a potential demand-supply scenario using the available literature and conducts the price sensitivity analysis of wood-pellet and oil. This sensitivity analysis is based on a methodology developed by Brackley, Barber, & Pinkel (2010,p.19) where the price per unit of energy is determined at different prices of oil and wood-pellets.

Methods

The current study is based on an in-depth literature review, participant observation and semi-structured interviews with key informants on the existing energy situation and trends in the forest industry in Southeast Alaska. Semi-structured interviews are composed of predetermined questions, but the order and content of the questions can be modified based upon the

[9] 1 EJ = 10^{18} Joules

interviewer's responses. Moreover, the questions' wording can be changed and particular questions which seem inappropriate with a particular interviewee can be omitted, or additional ones included (Robson, 2002,p.270). One benefit of semi-structured interviews, as opposed to formal surveys or questionnaires, is that they enable respondents to express perspectives in their own words, with the opportunity to elucidate and clarify their response through follow-up dialogue with the interviewer (Thornton, et al.,2010,p.23).

Figure 1. **Top Left**: Forest Residue Site in Sitka, Alaska. **Top Right**: Mr. Nathan Soboleff, a young Tlingit business leader, showing wood-pellet based heating system installed at Sealaska's corporate office site. **Bottom Left**: Tlingit Community Members narrating stories – Hoonah, Alaska. **Bottom Right**: Tongass National Forest- Juneau, Alaska.
Photo Courtesy: Munish Sikka

Currently, there is no existing wood-pellet manufacturing facility in SE Alaska. The present study attempts to consolidate the efforts of various individuals and entities working on this issue. Therefore, the semi-structured interview approach was especially useful in carrying out the present study as the respondents shared their knowledge about local-context and individual perception on wood-biomass energy. In-depth interviews were conducted with researchers and field staff associated with the US forest services, Sealaska executives, and representatives from non-governmental organisations working on the issues related to conservation in SE Alaska.

Calculations: While doing the economic and environmental calculations, the quantity of wood-pellets has been represented in tons. It is a popular measurement unit in USA and various regional studies consulted have used this unit for analysis. For environmental benefit analysis, the emission quantities of various gases have been calculated in 'tonnes'[10] which is a different unit from 'tons'[11] representing wood-pellets. The quantity of various gases emitted by burning wood-pellets and oil for centralised heating systems has been taken from Obernberger & Thek (2010,p.305). These values are based on the Austrian framework conditions concerning fuel supply, distribution and utilisation. Therefore, minor differences are expected in these values in a different country due to possible differences in energy consumption during the production of fuels. However, this is presumed to have minimal absolute influence and has been ignored in the calculations.

Global Climate Change Mitigation and Tongass National Forest

Around the world, forests are seen as an important source of mitigating climate change through carbon sequestration. On the other hand, burning wood-biomass for energy would lead to the release of stored carbon into the atmosphere. Therefore, it is important to consider climate change related impacts of promoting wood-biomass in SE Alaska. In this regard the Intergovernmental Panel on Climate Change (IPCC) has expressed that, "In the long term, a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual sustained yield of timber, fibre, or energy from the forest, will generate the largest sustained mitigation benefit" (IPCC,2007). Another study by Lippke et al (2011) uses the life cycle carbon accounting approach to compare the emission impacts of using fossil-fuel and biomass for energy. Whilst fossil-fuel emissions flow one way from deep reserves to the atmosphere, carbon emitted by burning biomass could be absorbed by the regenerating forests, thereby making the latter a renewable source of energy.

In SE Alaska, the saw-mill and sort yard residue produced from timber industry is currently unutilised. It eventually decays and emits CO_2 during that process. Therefore, using those residues to displace fossil-fuels could significantly reduce greenhouse gas emissions through avoided burning of oil for heating (JEDC, 2011, p.173).

Results and Policy Recommendations

The study attempts to explore the potential benefits of wood-biomass industry in SE Alaska. It includes literature on the historic land settlement act- ANCSA and the Native Corporations established for the overall development of local communities. The major findings of the study are:

- Potential demand for wood-biomass exists in SE Alaska and could increase with an increase in international oil prices.
- Supportive policy instruments such as a carbon-tax on fossil-fuels, the investment subsidies and feed-in tariffs could facilitate quick adoption of wood-pellets as has happened in several European countries such as Netherlands, Belgium and Sweden (Obernberger & Thek, 2010). These policy instruments are likely to address regional energy security and community vulnerability issues and provide environmental benefits

[10] Tonne is known as the metric ton; 1 tonne = 1000 Kilograms
[11] Ton is also referred to as short ton; 1 ton = 2,000 pounds (907.18474 kg). (source: internet)

by displacing oil in SE Alaska and similarly in other parts of the world especially where biomass is a locally available resource.

- A regional wood-pellet industry that utilises a range of raw materials such as sawmill and logging residue could lead to optimal resource use in the forest industry of SE Alaska.
- Currently, utilising saw-mill residue and other economically available biomass could meet almost 65% of estimated heating fuel demand in the region. Promoting sustainable wood-biomass energy opens up an opportunity to achieve multiple benefits on all three pillars of sustainability – Economic, Social and Environmental;
    - Economic: Access to affordable energy for heating, possible revival of forest industry
    - Environmental: Huge savings in CO_2 expected
        - Approximately 23,000 tonnes avoided by consuming 15,000 tons of wood-pellets and displacing oil for heating [proposed production capacity of an upcoming facility in SE Alaska].
        - Approximately 264,395 tonnes avoided by consuming 174,400 tons of wood-pellets and displacing oil for heating [economically available quantity of residue-biomass as estimated by Mater and Miles (2009)].
    - Social: Reduced energy vulnerability due to rising oil prices as well as increased and sustainable employment in the region.
- Rosillo-Calle et al.(2007,pp.10-11) reports that biomass-energy is difficult to quantify and the task of obtaining information related to production and use of biomass-energy is considerably difficult due to the paucity of reliable long-term data. In order to overcome these issues and to put biomass-energy on a comparable basis with fossil-fuels there is a need to develop certain standardised measures. In this regard, the present study utilised the supply and demand information on biomass local to SE Alaska and calculated the environmental benefits using a framework developed by Obernberger & Thek(2010). **The formulae generated within the scope of this study could be used to conservatively calculate environmental benefits of promoting wood-biomass over oil in other regions of Alaska and possibly in other parts of the world.**

Conclusion

The ANCSA provided opportunities for economic and social development of Alaskan Natives. This is a unique feature of the place where native corporations exists and seek to achieve overall sustainability by addressing issues related to native population and natural resource management. Currently, access to affordable and clean energy is an issue in SE Alaska, similarly to many other remote parts of the world. One advantage SE Alaska has is the presence of access rights in the form of resources (land) and capital for Native communities to develop alternative energy systems to fossil-fuels, for their overall development. This could be one important message for other parts of the world where property-rights for native communities still remain a distant reality. Another important message is the need for supportive policies and grants at a national level which promote alternative energy systems like wood-biomass. Despite having access to biomass, additional incentives are required for its conversion and adoption as a heating fuel.

The study concludes that a sustainable wood-biomass energy industry could be developed in SE Alaska. It relies on residues from existing forestry operations including saw-mill residue

and logging waste generated in the region. It is also observed that an economic incentive exists for users to switch to wood-pellet based systems at the current oil prices of over $4.00/gallon. However, initial investment costs remain high in the present situation which could discourage the switch. Therefore, some policy support in the form of carbon tax or investment subsidies is required to facilitate a switch to wood-pellets. These initiatives have been implemented in many countries including Netherlands, Belgium and Sweden and could be replicated in SE Alaska and other places around the world.

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Gifted and talented education from the students' point of view

Robert Seddon

Abstract: *Educating able secondary-school students is an important issue, both politically and within the study of Education. Stemming from a personal dissatisfaction with provision for more able students that I encountered, both as a student and as a trainee teacher, I conducted research into students' opinions on the subject during my teacher training. As I present below, it emerges that able students are not academically satisfied with "normal" schooling and can often put forward their own, quite feasible, suggestions of how they can be better catered for.*

Introduction

The main route into secondary-school teaching in the UK is the Postgraduate Certificate in Education (PGCE), a course offered by the University of Oxford's Department of Education. I recently completed the Physics PGCE offered by the department, which involved on-the-job training in Oxfordshire comprehensive schools as well as academic work delivered by the department.

A major part of the academic side of the course is the production of a dissertation on an aspect of Education of the student's choice. I chose to study gifted and talented students' perceptions of the provision they receive. My interest in this topic was due to two factors. Firstly, I was identified as gifted and talented while at secondary school and received extra provision ranging from after-school talks to extended pieces of homework. However, I often found that after-school activities did not match my interests and I resented being given extra work that ate into my free time. In retrospect it seems that if someone had asked me what kind of extra provision I would have liked I might have been more enthusiastic and engaged. Secondly, when the problem of catering for our more able students arises in general conversation the solution frequently offered is to group students by ability, either through a grammar-school style system or ability grouping within comprehensives. Before I entered teaching I also saw this as the "obvious" answer, although it is not something I spent much time thinking about as a student.

For both these reasons I was keen to see what the students themselves suggested as possible solutions. Although we will see that grouping by ability commands strong support among students their comments reveal a slightly more complicated picture.

Who are gifted and talented students, and why should we care about them?

The now-defunct Department for Children, Schools and Families (DCSF) defines gifted students as "students who have the ability to excel academically in one or more subjects such as English, Drama, Technology" and talented students as "students who have the ability to excel in practical skills such as sport, leadership, artistic performance", adding that "the DCSF assumes a norm of around 10% of pupils per school/college population [will be gifted and talented]" (DCSF,

2007). This definition has the potential to include over a hundred students in an average-sized comprehensive school and is only a relative measure - a student in the top 10% of one school might find themselves outside it in another, a problem noted by the Council of Curriculum, Examinations and Assessment (CCEA, 2006). The DCSF therefore also defines "exceptionally able" students as those in "the top 2% nationally for one or more academic and talent areas" (DCSF, 2008). While we have rather well-defined categories for UK students, research in the area of gifted and talented education often originates overseas and authors often give imprecise descriptions of the abilities of students in their studies. Consequently, students in the studies mentioned below will not necessarily match DCSF criteria and many would probably be defined as exceptionally able.

Adequate provision for our more able students is clearly important given their potential to become the leaders and contributors of tomorrow (Boyd, 1984; DCSF, 2007) and inadequate provision can lead to boredom and frustration with lessons, a problem reported by students themselves (Fai, 2000). Furthermore, DCSF asserts that unless able children are challenged their abilities may not become apparent (DCSF, 2007, 2008). This latter point was brought home quite clearly to me when an able student in one of my classes appeared unengaged with the lesson. When I challenged him he complained that the lesson was pointless and that he wasn't learning anything; he therefore elected not to do the work that had been set. Although I argued that there was a purpose to the lesson, I had to admit to myself that the student had a point - the work was better suited to the less able students in the class and was not challenging enough for him.

What do the students think?

More able students are, on the whole, not satisfied with their normal lessons. Both Adams-Byers et al. (2004) and Fai (2000) found that students in their studies complained of low levels of challenge, slow place, repetition of work and resulting boredom. Both these sets of students had, however, attended out-of-school provision and some stated that normal schooling suffered by comparison (Fai, 2000), yet even when students receive special provision in school similar complaints emerge (Gallagher et al., 1997). A case for grouping students by ability emerges strongly when we see that all three sets of students complained specifically about having to wait for less able classmates to catch up.

The case for grouping by ability is reinforced by students in Adams-Byers et al.'s (2004) study. When asked for advantages of mixed-ability grouping they said that there was a slower, more relaxed place, the work was easier and repetition reduced the chances of failure. The desirability of these "advantages", though, is questionable to say the least and the students themselves admitted that they led to decreased motivation.

Student dissatisfaction leads to a range of coping strategies. Disruptive or unproductive behaviour is, unsurprisingly, reported by both Fai (2000) and Plucker & McIntyre (1996). However, students in both studies also reported that they sought to increase the intellectual challenge themselves either through adding extra tasks or depth to their work or taking part in extra-curricular activities. It may therefore be tempting to say that we can use mixed-ability grouping and simply let the more able look after themselves. The Office for Standards in Education, though, states that more able students "have as much of an entitlement to have their needs addressed as do other children" (Ofsted, 2001), an assertion supported by Renzulli &

Gable's (1976) who report that a third of students in their study desired more support in their classwork.

One issue which split students is that of helping their classmates in mixed-ability lessons. While Plucker & McIntyre (1996) report that students in their study were quite willing to help less-able classmates those in Adams-Byers et al.'s (2004) study were divided. Although DCSF asserts that more able students should not surrender their learning for the benefit of the less able (DCSF, 2007) they also note that helping others is good practice for life after school (DCSF 2008), something anecdotally acknowledged by students (DCSF, 2008; Adams-Byers et al., 2004).

Confirming much of the above, students are largely positive about specialised provision for more-able students, specifically praising increased pace and challenge, more discussion and not having to wait for less-able classmates (Adams-Byers et al., 2004; Fai, 2000; Gallagher et al., 1997). Such provision is not without its disadvantages though. The main academic complaints from students centre around too much pressure and too high a workload (Adams-Byers et al., 2004; Ford, 1978), dangers highlighted by DCSF (2008). A concerning disadvantage is also highlighted by Hertzog (2003). In her study of college students who had been in gifted and talented programmes while in school many commented on the negative social effects that ability grouping had had on them.

Conclusion

Students' comments provide a clear indication that they want to be intellectually challenged. Questions of implementation, however, are not as straightforward.

The use of grouping by ability appears to be an obvious and straightforward solution, although it is not without its disadvantages (both academic and social). Furthermore it can be politically difficult (e.g. in the case of grammar schools) or create significant organisational challenges for comprehensive schools (e.g. where students can be in different ability groups for different subjects).

The solution for mixed-ability classes which is drilled into all trainee teachers is differentiation, where the teacher challenges all students simultaneously, e.g. through giving different or modified pieces of work depending on ability. This, unsurprisingly, is not an easy task, a difficulty appreciated even by students (Fai, 2000; Gallagher et al., 1997; Kanevsky & Keighley, 2003). In answer to these complications Fai (2000) reports that some students expressed a willingness to attend after-school sessions. Although it is perhaps a manifestation of students creating their own intellectual challenge, the phenomenon of bright students attending lunchtime or after-school academic clubs is something any recent school-leaver (or trainee teacher) will be familiar with.

Students' views on implementation of provision for the more able is certainly an area that deserves more attention. Even if no immediate and acceptable solution offers itself, I believe that able students are able to offer mature, rational and practicable suggestions that I think we would be foolish to ignore. The need to cater for our most able students is clear, as are their educational ambitions and desires. Implementation, however, is likely to remain a difficult and polarising subject. Perhaps we should ask the kids.

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The Effects of the Navigation Acts on English Transatlantic Trade: An Overview

Mark Uttley

Abstract: *The Navigation Acts were a series of mercantilist policies passed in the years following 1651 aimed at improving England's international trading position. Broadly speaking, they were designed to increase the proportion of goods coming to and from England carried by English shipping and to wean English importers away from reliance on the Dutch entrepôt. My thesis focuses on whether the Navigation Acts significantly altered the direction of trade between England and her colonies in North America and the West Indies; and consequently, whether this had any effect on the economic development of early modern England.*

I. Introduction: The Navigation Acts

'In relation to trade, shipping, profit, and power it [the Navigation Act] is one of the choicest and most prudent acts that was ever made in England, and without it we had not now been owners of half of the shipping, nor trade, nor employed half of the seamen which we do at present'.

- Sir Josiah Child, 1st Bt., Governor of the East India Company. (Zahedieh, 2010)

In economic history, seeking institutional explanations, such the patent system or the nature of property rights, for divergent economic performance is in fashion. Often overlooked in this framework is one of the most defining and enduring institutional arrangements in England; the Navigation Acts. The Navigation Acts were a series of Acts of Parliament passed during the second half of the seventeenth century aimed at the protection of trade. As noted by Sir Josiah Child, the Acts were widely held by contemporaries to be responsible for promoting English colonial trade and shipping at the expense of her continental competitors. (Zahedieh, 2010) The first comprehensive Navigation Act was passed in 1651, and provided the underpinnings of a navigation code that was to span two centuries. (Harper, 1939) The Act of 1651 dealt solely with imports; under the provisions of this Act, imports were to be brought directly from the country where they were produced or from the usual port of first shipment and were only to be carried in ships of the country of origin or in English ships. According to Lawrence Harper, the authority on the subject, by cutting out third-party nations from trade with England this system was principally intended to 'cripple the carrying and entrepôt trade of the Dutch'. (Harper, 1939)

In 1660, the Navigation Act was re-enacted with several modifications of long-term significance. The Act of 1660 'enumerated' sugar, tobacco, cotton wool, indigo, ginger and fustic, which were produced in the colonies, and stipulated that they were only to be exported to England or other English colonies; thus cutting out direct trade between English colonies and continental Europe. (Harper, 1939) Moreover, all ships trading with English colonies were required to be of English or colonial ownership, with the master and at least three-quarters of the crew of English nationality. (Harper, 1939) While there were further Acts which tinkered with the Navigation code, there was only one more Act of central importance to my study. This was the Staple Act of 1663, which dealt with exports to the colonies, something neglected by earlier Acts.

This Act stipulated that no European commodities were to be carried to the colonies except via England, and that ships had to obey the same crew requirements as detailed above; essentially requiring colonists to purchase their European goods in England. (Harper, 1939) The purpose of these Acts is straightforward; firstly, the requirement that goods could only be carried to England on English ships was designed to exclude other carriers, particularly the Dutch, from the carrying trade with England and undermine the Dutch entrepôt. Secondly, by ensuring that goods were carried in English vessels and into English ports, the balance of trade might be enhanced through an improvement in invisible earnings; fitting the mercantilist ideal perfectly. (McCusker & Menard, 1991)

II. English Transatlantic Trade

My research focuses on the effects of the Navigation Acts on England's trade with her colonies in the Americas. In the second half of the seventeenth century and the eighteenth century, English transatlantic trade grew substantially and was the most dynamic sector in the economy. (Davis, 1962) Overall, Jacob Price finds that English (and later British) imports grew by 188% over the period 1699 to 1774, despite slow domestic population growth, with a significant component sourced from English colonies through commodities such as sugar and tobacco. (Price, 1989) These predominately colonial imports generated a thriving re-export trade with continental markets once they had arrived in England. Indeed, during the first three-quarters of the eighteenth century, re-exports ranged from 30% to 37% of total exports, a level never subsequently exceeded. (Price, 1989) In terms of transatlantic trade alone, imports grew at around twice the rate of total imports, and exports grew almost three times as fast as the total. (McCusker & Menard, 1991) Thus, it is evident that transatlantic trade was of increasing importance to the English economy in this period; therefore, any effects that the Navigation Acts had on transatlantic trade could be of great importance to the direction and speed of development of the English economy in the post-Restoration period.

Furthermore, Ralph Davis suggests that there were two stages of expansion in transatlantic trade. The first, occurring during the second half of the seventeenth century, was the re-export of colonial goods. While this continued to be of importance throughout the eighteenth century, it was overshadowed by the expansion of exports in what he terms 'miscellaneous manufactures' to the colonies. (Davis, 1962) Davis posits that the 'process of industrialization in England from the second quarter of the eighteenth century was to an important extent a response to colonial demands for nails, axes, firearms, buckets, coaches, clocks, saddles, handkerchiefs, buttons, cordage and a thousand other things'. (Davis, 1962) Indeed the population size of the protected colonial market increased by over 70% between 1670 and 1770, serving to increase demand for English manufactures. (Price, 1989) Moreover, Jacob Price argues that the 'commercial dynamism' of the eighteenth century left behind commercial and financial institutions such as clearinghouses, insurance companies, the stock exchange, commercial practices, commercial law, and enhanced human capital that served England well for centuries to come. (Price, 1989) Thus transatlantic trade increased the demand for English manufactures and stimulated technological improvements which might have been partly responsible for England's early industrialisation relative to other nations. Therefore, if the Navigation Acts are found to be of importance in directing transatlantic trade through England, they can be said to be responsible for the many benefits of the transatlantic trade itself which have been described above and were clearly of considerable importance to England in the seventeenth and eighteenth centuries.

III. My Research

In my research I intend to consider three research questions in order to explore the effects of the Navigation Acts on English transatlantic trade. Firstly, I will examine whether stipulating in the Act of 1651 that goods were to be carried to and from American colonies on English ships had any significant effect on the proportions of goods carried in English ships. This will involve examining the competitiveness of English freight rates vis-à-vis those of continental European powers who also traded to the Americas. If it emerges that English freight rates were on a competitive footing before the Acts were passed, then it can be argued that the Navigation Acts were not of critical importance in ensuring that English carriers were the carriers of choice and vice-versa. My second question explores the predominantly plantation-produced commodities which were 'enumerated' in the Act of 1660, allowing a substantial re-export trade to develop. I will therefore explore the differences between the proportion of enumerated and non-enumerated commodities shipped via England. Additionally, over the years that the Acts were in force, other commodities were added to the list; for example, rice and molasses were enumerated in September 1705. (Harper, 1939) Consequently, a comparison of the proportion of these commodities shipped to England before and after the date of enumeration can be made. My third and final research question relates to exports; as previously noted, the Staples Act of 1663 required that European manufactures be shipped through England before proceeding to the English colonies. This could well have given English-made manufactures a cost advantage over those produced elsewhere when the extra transportation costs of shipping through England are taken into account. This proposition will be investigated by examining the relative competitiveness of typical English exports to her American colonies compared to her competitors to see whether the Navigation Acts improved England's competitive advantage.

Through utilising these three research questions as a guiding framework, I hope to shed more light on the importance of the Navigation Acts in ensuring that it was England, rather than her competitors, that benefited from her growing American empire. Moreover, my research begs important questions about the role of protectionism in England's rise to world commercial hegemony. While England was later both a major proponent and a beneficiary of free trade, it might well have been the case that a protective trade policy actually created the leadership conditions necessary for Britain to benefit from such openness. This mirrors the controversial historical debate over the importance of tariffs for American industrialisation in the nineteenth century; in this debate it has been argued that, without the tariff, the development of American manufacturing would have been severely hindered. (Harley, 1992a; Harley, 1992b; Irwin & Temin, 2001) If my research reveals that the Navigation Acts did indeed give England a competitive advantage, prevented English colonial shipping from being taken over by the Dutch, and stimulated the development of an English entrepôt by ensuring that some important commodities were transported through England, then it can be tentatively argued that, at an early stage in economic development, free trade is not necessarily the most advantageous long-term policy to pursue.

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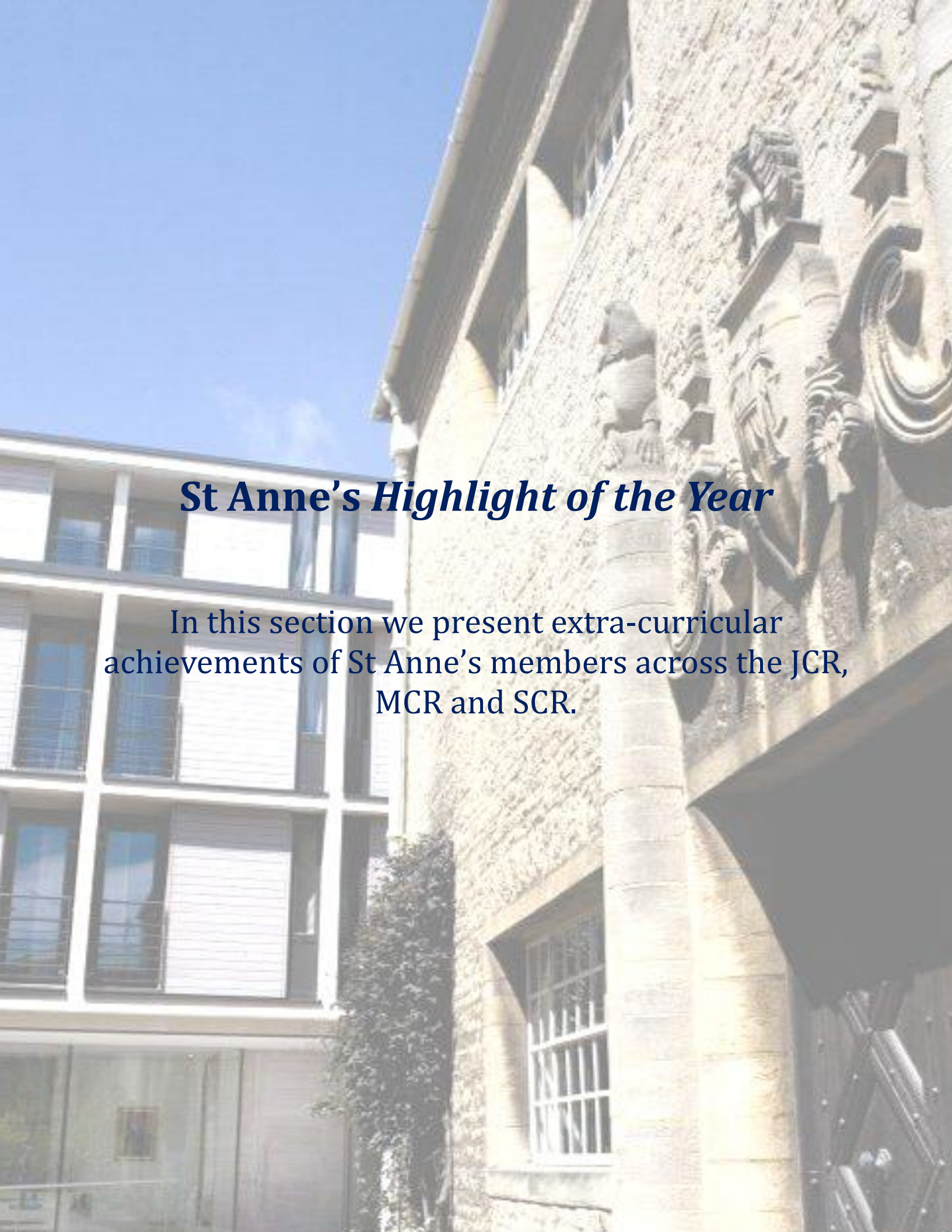

St Anne's *Highlight of the Year*

In this section we present extra-curricular achievements of St Anne's members across the JCR, MCR and SCR.

COURSEHORSE.IT – A team from Oxford wins SV2UK

Nilu Satharasinghe

Abstract: *Recently, a small team from the University of Oxford successfully competed in the Silicon Valley comes to the UK (SVc2UK) Award. As a proud participant within this team, I would like to take this opportunity to chronicle our journey from a small locally based competition in Oxford to the national awards ceremony at Number 10 Downing Street.*

The award, presented by Prime Minister David Cameron alongside *LinkedIn* co-founder Reid Hoffman and Angel Investor Sherry Coutu, reflects a growing requirement in the UK to consolidate and develop emerging talent in the IT industry. The competition required participating teams from around the country to submit software applications (commonly known as *Apps*) that capitalise on the vast data resources that the government has recently made public. That is, applications that would bring benefit to the public by simplifying that data into easily digestible and useful information sources. The competition was split into 3 categories: Healthcare, Education and Environment. Our entry, *CourseHorse* focused on Education.

CourseHorse, designed from the ground up, is a social enterprise application concerned with enabling easier access for the general public to information regarding vocational training courses available throughout the country. The initial data for these training courses were taken from a corpus of information outlining government backed schemes. The overall goal of the project, however, was to be a one-stop portal for training courses nationwide inclusive of both state-funded and independent providers. The driving factor for this application in the current socio-economic climate is providing the general public with the means to enhance their personal skill-set and thereby reduce unemployment levels through development and training of the national workforce.

The original *CourseHorse* team of 5 emerged from winning a locally run *App* competition held at Oxford University's *Said Business School* in mid-October. Hosted by the student group *Oxford Entrepreneurs* (OE), this competition focused on providing opportunities to students to develop their own business ambitions. At this stage *CourseHorse* was a technical demonstration without any real legs beyond a business idea with lightweight software application - while functional, it was a showcase technology.

Following this local competition, the *CourseHorse* team was recommended to participate at the national level by the OE group. The team, after losing a member Giovanni Milandri to a commitment overseas, refined the original idea into something more tangible. Unlike the Oxford based *appathon* the *Silicon Valley comes to the UK (SVc2UK)* required a more substantial entry that could be tested in full by the judging panel. The team refocused and took stock of the available skill set in order to determine the route forward to this end. This ultimate team comprised of:

- Fatima Sabar working towards an MSc Global Governance and Diplomacy, International Development and affiliated with Green Templeton College
- Ka Chung Lee doing a DPhil specialising in Quantum memory and Information Theory affiliated

with New College
- Nikhilkumar Adhia a student from the London School of Economics
- Niluka Dheep Satharasinghe focusing on a MSc Computer Science affiliated with St Anne's College

During a planning session we constructed a detailed project plan that helped us to determine where we should focus our efforts as a team in order to lift *CourseHorse* from its current state into a viable candidate entry. The key areas to be addressed were marketing and developing the software product. We met up shortly after the completion of the Oxford *Appathon* to develop the plan.

A major element of the marketing campaign was to create online video advertising that would showcase our submission and increase awareness of our project goals. Seeing the success of both G*oogle* and A*pple*'s simple videos which illustrated new products in friendly, conversational style, highlighting how they improved the user experience, inspired our own approach. We storyboarded the journey of an ideal user named Steve using our unique application. Our narrative had him successfully retraining from a truck driver to a plumber. Ka Chung took the lead here, using his video editing skills to capitalise on our storyboard ideas in order to fashion an impressive video - both easy to digest and distinctive within this particular marketplace.

The reach of our viral marketing campaign, showing how we were advertising our application and its effectiveness was another criterion being judged in our submission. That is, how easily our idea would spread across the Internet, effectively becoming visible trend as the subject materialised as a point of discussion in the digital commons. This initially was a problem as we had to decide how to measure our reach. Ultimately, the best metrics for analysis were through monitoring *Facebook* '*likes*' and *re-tweets*. Nikhilkumar focused on this side of the project and using his marketing skills advised the team on how to use our own social networks to increase the reach of the *CourseHorse* message. He concentrated initially on *Twitter* and *Facebook*, posting *tweets* and status updates to generate interest. After Ka Chung finished the video and posted it on *Youtube* we changed the scope of our advertising campaign to improving the views on the *Youtube* video, effectively using the view count as an indicator of success with our campaign. By carefully monitoring the trend analytics on our competitor videos we were able to find a relevant benchmark for assessing how well our viral campaign was performing. I found this an interesting exercise likening it to effectively giving ourselves a short-course in grassroots brand management.

The next key area to focus on was the development of the software application, which normally follows a set process from inception to completion:

- Understanding the scope of our application
- Designing the software
- Writing the software
- Acquiring and managing the government sourced data within the application
- Testing the software

During the Oxford *Appathon* we had designed the fundamentals of our software application, with the mentorship provided giving us food for thought as we were shaping our design. By imagining the actions that an individual using the software would make to sign themselves onto a relevant training scheme, we were able to wire-frame the interactions that would need to occur as well as the options that would need to be presented to a user; a wire-frame simply being a detailed design of a website, describing in detail the content and how it functions. This wire-

frame was turned into the technical demonstration that we used for the Oxford *Appathon* pitch. This needed to be fleshed out into a viable candidate application and additional information on courses was gathered as working with the governmental data was not as straightforward as we originally anticipated. Additional *api*'s, pathways that allow people to use systems designed by others, such as the *Google* maps *api* which gave us the ability to display *Google* maps, needed to be incorporated into the application. The maps would be useful to display the location of the various course providers. I focused on turning our technical demonstration into a more robust application.

The copy for the candidate application was crafted by Fatima, who also worked on the essential task of organising and managing our submission alongside ensuring that we stayed on track. She also worked on the governmental data that we were provided, collating the information and incorporating it into our application.

From a technical perspective a number of factors played key roles in my approach in the implementation of an application that met our planned requirements for the business idea.
I spent a lot of time initially trying to decide what language to write the app in and what environment to host it on. Eventually I decided that the *app* should be built in *Clojure*, which is a *Lisp* language that runs on top of the Java Virtual Machine. *Lisp* languages are a family of programming languages that share certain properties such as having the function appear first, followed by the arguments, wrapped in parenthesis. For example: (+ 1 2 3) would produce 6, this alongside other characteristics, allows for a certain style of programming. I chose *Clojure* because I had some experience building software in it in the past; it integrates well with the Java universe of software so I would be able to use Java libraries if I needed to and because *Lisps* are very expressive languages so it is possible to do a lot with frugality which appealed to my sense of minimalism. The application was hosted on the *Heroku* cloud provider, which dispense remote storage and other services, accessible via the Internet, that I have experience with, as they provide a good service to developers who want to release an application to the general public with minimal fuss.

This experience proved to be a useful introduction to the life of an entrepreneur, showing us the ins and outs of pitching our ideas to a group of investors, incorporating their feedback to make a successful product offering as well as working on the creation and nurturing of a brand. Winning the award has been an amazing experience which has helped to open doors in our quest to improve the ease of transitioning to our lives beyond the University and increased our confidence in working on problems that apply to the world outside academia. We feel that the University has been pleased with our achievements.

Ideally I would like to see further opportunities for teams like ourselves to grow as developers able to offer versatile and dynamic solutions with real tangible offerings to the business world. This experience alone has opened my eyes to the possibilities available to talent eager for experience in a results driven climate.

We are looking towards expanding *CourseHorse*, integrating it with educational providers to give a seamless experience to users, however it currently serves as a testament to the various skills displayed by our team and the aid that we received to get as far as we did. The future on this remains uncertain, but the build experience represents a significant milestone for our team and the future of making recognisable *Apps* relevant to everyday needs.