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# The 2nd Annual Graduate Student Research Symposium

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**Power Center Ballroom, Duquesne University  
November 7, 2014**

Sponsored by:  
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The second annual

# Graduate Student



Research  
Symposium

November 7, 2014  
Power Center Ballroom  
Duquesne University

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Proceedings



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# ACKNOWLEDGEMENTS

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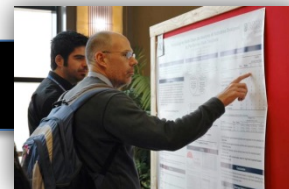
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School of Nursing  
Office of the Provost  
Office of Research, Christine Pollock, & Mary McConnell

# SCHEDULE



## Friday, November 7, 2014 | Power Center Ballroom

Poster Participant Set-up Boxed Lunch for Participants	9:00 am to 12:00 pm 12:00pm
Doors Open to the Public Opening Remarks	12:30 pm
Oral Presentations Session 1 A & B Session 1A- <i>Power Center-Section A</i> Session 1B- <i>Power Center-Section B</i>  Details on Page 6	1:00 pm to 2:00 pm
Poster Session <i>Power Center-Section C</i> Guests are invited to walk around, peruse student projects, and engage w/ students.	2:00 pm to 3:00 pm
Oral Presentations Session 2 A& B Session 2A   <i>Power Center-Section A</i> Session 2B   <i>Power Center-Section B</i>  Details on Page 7	3:00 pm to 4:00 pm
Snack Break Judges make final decisions	4:00 pm to 4:30 pm
Awards & Closing Remarks	4:30 pm

# Presentation Session 1



## Power Center Ballroom-Section A and Section B

Session 1 Section A		Session 1 Section B	
1:00	<p><b>Gina Johnson</b>  <i>Campus Buildings as Living Laboratories: Overcoming Challenges to Zero-Energy Retrofitting — A Case Study</i>                      A.J. Palumbo School of Business Administration                      Abstract Number: 59</p>	1:00	<p><b>Stephen Hallenback</b>  <i>Benjamin and Contemporary Art: Communicating Truth in Experience</i>                      Philosophy   McAnulty College and Graduate School of Liberal Arts                      Abstract Number: 58</p>
1:15	<p><b>Zhe Ji</b>  <i>Shallow talk of Chinese higher education: Inequity within Chinese Higher Education Admission</i>                      Department of Foundations and Leadership   School of Education                      Abstract Number: 55</p>	1:15	<p><b>Benjamin Burkholder</b>  <i>Luke's Last Supper Sayings (Luke 22:19-20): Scribal Interpolation, Parroted Tradition, or the Basis of Lukan Atonement Theology?</i>                      Theology   McAnulty College and Graduate School of Liberal Arts                      Abstract Number: 53</p>
1:30	<p><b>Chris Rawls</b>  <i>Spinoza's Ethology</i>                      Philosophy   McAnulty College and Graduate School of Liberal Arts                      Abstract Number: 56</p>	1:30	<p><b>Bryon Williams</b>  <i>Censorship and the Archive: A Case Study in Power, Intent, and Editorial Theory</i>                      English   McAnulty College and Graduate School of Liberal Arts                      Abstract Number: 49</p>
1:45	<p><b>Christine Skrzat</b>  <i>Revisiting Advance Directive Planning from a Holistic Perspective</i>                      Center for Healthcare Ethics   McAnulty College and Graduate School of Liberal Arts                      Abstract Number: 46</p>	1:45	<p><b>Jayna Bonfini</b>  <i>Towards a model of trauma-informed correctional care</i>                      Counseling   School of Education                      Abstract Number: 57</p>

# Presentation Session 2



## Power Center Ballroom-Section A and Section B

Session 2 Section A		Session 2 Section B	
3:00	<p><b>Eric Perry</b>  <i>"The Interactive Primer Model: Where High Tech and Old World Collide"</i>                      Counselor Education and Supervision   School of Education                      Abstract Number: 62</p>	3:00	<p><b>Elif Gokbel</b>  <i>Does Teacher Questioning Matter in Student Engagement?</i>                      DILE   School of Education                      Abstract Number: 50</p>
3:15	<p><b>Ian Butcher</b>  <i>Limits of Political Correctness in Perfect Agreement, Blue Angel, and Japanese by Spring English</i>   McNulty College and Graduate School of Liberal Arts                      Abstract Number: 52</p>	3:15	<p><b>Benjamin Andrick</b>  <i>Predicting viral cross-reactive epitopes in adalimumab, infliximab and etanercept: implication of therapy failure due to anti-drug antibodies</i>                      Pharmaceutics   Mylan School of Pharmacy                      Abstract Number: 61</p>
3:30	<p><b>Joseph Smith</b>  <i>Ressourcement Theology and the Supernatural Debate: Toward a Christological Ontology</i>                      Theology   McNulty College and Graduate School of Liberal Arts                      Abstract Number: 54</p>	3:30	<p><b>Cebrail Karayigit</b>  <i>Counseling implications for Muslim graduate international students: A Practical Approach</i>                      Counselor Education &amp; Supervision   School of Education                      Abstract Number: 60</p>
3:45	<p><b>Stephanie Mullen</b>  <i>To Pay or Not to Pay? Variables Influencing Hostage Outcomes in Terrorist</i>                      Social and Public Policy   McNulty College and Graduate School of Liberal Arts                      Abstract Number: 63</p>	3:45	<p><b>Shelley Kobuck</b>  <i>Global Health Disparities from a Catholic Social Teaching Perspective</i>                      Healthcare Ethics                        McNulty College and Graduate School of Liberal Arts                      Abstract Number: 51</p>





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Co-Authors: Chris Garbark, Shreya Patel, Shelby Boord, Sarah K. Woodley, Ph.D.

Biology | Bayer School of Natural and Environmental Sciences

Faculty Advisor: Sarah AWoodley, PhD | Abstract Number: 35

### Emily Benner

*Transport and Conformational Change: Reset of the Dopamine Transporter*

Co-Authors: Marco J. Acevedo, Ph.D.

Chemistry and Biochemistry | Bayer School of Natural and Environmental Sciences | Abstract Number: 65

Faculty Advisor: Jeffry D. Madura, Ph.D. | Abstract Number: 65

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*Losing Schools to the Economic Chasm*

Mathematics and Computer Science | McAnulty College and Graduate School of Liberal Arts

Faculty Advisor: John C. Kern II, Ph.D. | Abstract Number: 47

# Award Winners



## School of Nursing

Award for Graduate Research: \$250

**Patricia Scott**

*Quality of Life of African Americans with Inflammatory Bowel Disease*  
Graduate Nursing - Doctoral Program | School of Nursing

Faculty Advisor: Lenore Resick, PhD, CRNP, FNP-BC, Noble J. Dick Endowed Chair in Community Outreach, Clinical Professor |  
Abstract Number: 48

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**Alicia Taylor**

Outstanding Scholarship

*Normative data collection for the Standardized Touchscreen Assessment of Cognition*

Co-Authors: Koren Beardshall, Anna Olexsovich, Andrea D. Fairman, PhD, MOT, OTR/L, CPRP  
Speech-Language Pathology | Rangos School of Health Sciences

Faculty Advisor: Sarah E. Wallace Ph.D., CCC-SLP | Abstract Number: 64

**Benjamin Burkholder**

Honorable Mention

*Luke's Last Supper Sayings (Luke 22:19-20): Scribal Interpolation, Parroted Tradition, or the Basis of Lukan Atonement Theology?*  
Theology | McAnulty College and Graduate School of Liberal Arts

Faculty Advisor: William Wright IV, Ph.D. | Abstract Number 53

**Jeff Mosley**

Honorable Mention

*Single Cell Detection of Circulating Melanoma Via Photoacoustic Flow Cytometry*  
Biotechnology | Bayer School of Natural and Environmental Sciences

Faculty Advisor: John Viator, Ph.D. | Abstract Number: 34

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*Ressourcement Theology and the Supernatural Debate: Toward a Christological Ontology*

**Bryon Williams**- English | McAnulty College and Graduate School of Liberal Arts \*Paper not available

*Censorship and the Archive: A Case Study in Power, Intent, and Editorial Theory*

## **Predicting viral cross-reactive epitopes in adalimumab, infliximab and etanercept: implication of therapy failure due to anti-drug antibodies**

Benjamin Andrick

Pharmaceutics | Mylan School of Pharmacy

Faculty Advisor: Wilson Meng, Ph.D. & Lauren O'Donnell, Ph.D.

**Predicting Viral Cross-reactive CD4 T-cell Epitopes in TNF $\alpha$  Inhibitors: Implications for Immunogenicity of Pharmaceutical Biologics**

Benjamin J. Andrick<sup>#</sup>, Alexandra I. Schwab<sup>#</sup>, Lauren A. O'Donnell\*, and Wilson S. Meng\*

Division of Pharmaceutical Sciences, Mylan School of Pharmacy, Duquesne University, PA 15282

**Key words:** Rheumatoid arthritis, HLA polymorphism, immunogenicity, meta-sequence analysis, MHC binding motifs, IEDB, biologic drugs

**#Equal contribution**

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## Introduction

Tumor necrosis factor-alpha (TNF $\alpha$ ) is a driving inflammatory mediator in rheumatoid arthritis (RA) (Elliott and Maini 1994). Anti-TNF $\alpha$  drugs provide measurable benefits to RA patients in reducing disease activity and in some cases, by inducing remission (Tracey et al. 2008). In 2013, infliximab, adalimumab, and etanercept were the top three prescription drugs sold in terms of total revenue. Currently, these three agents account for mainstay of the anti-TNF $\alpha$  drugs used in RA patients in the United States. Despite the generally positive outlook in long-term health benefits, one-third of the patients receiving a given anti-TNF $\alpha$  do not respond to the treatment (Bendtsen 2011). Recent clinical studies have reported cases of persistent active diseases, despite continuing treatments at higher doses (Aarden et al. 2008), suggesting potential neutralization of the drug by the immune system. Moreover, drug-related injection site reactions are common in patients (Beuthien et al. 2004). A mechanistic understanding of the immunological basis underlying these phenomena will lead to improved treatment outcomes.

Multiple factors are implicated in dictating the clinical responses to TNF $\alpha$  inhibitors in patients, but a known cause of treatment failure is the development of anti-drug antibodies. Such immunological reactions can result in rapid drug clearance, vasculitis and/or rashes and swelling at the site of injection or infusion. Infliximab, adalimumab, and etanercept are recombinant proteins engineered to reduce the intrinsic immunogenicity of the drugs. Infliximab is a chimeric IgG1-kappa monoclonal antibody with mouse variable regions (~25% of amino acids) grafted into human constant regions. Bendtsen *et al.*, however, reported that 44% of the 106 RA patients tested were found to have serum anti-infliximab antibodies six months after initiation of treatment (Bendtsen et al. 2006). In some of these patients (13%), anti-drug antibodies were

detected as early as 1.5 months, or as few as after three infusions. Such antibodies were associated with low trough serum levels of infliximab and poor efficacy. Among RA patients that tested positive for anti-infliximab antibodies, Wolbink et al. reported fewer responders (36%) compared to patients without the antibodies (69%), (Wolbink et al. 2006). The rapid development of anti-drug antibodies against infliximab suggests that prior environmental factors or exposures may enhance the extrinsic immunogenicity of the drug in certain patients.

Induction of anti-drug antibodies correlates with the presence of CD4 T cell epitopes presented by class II major histocompatibility complex (MHC-II). Presentation of peptide epitopes occurs when antigen-presenting cells (APCs), including B cells, internalize (via membrane-bound immunoglobulin, or B-cell receptors) and digest the drug protein into small fragments by proteasomal degradation. A subset of the trimmed peptidic fragments would bind to at least one MHC-II allele expressed by the individual. A small fraction of the MHC/peptide complexes are recognized by CD4 T cells bearing cognate T-cell receptors (TCR). The small population of CD4 T cell clones then activates B cells presenting drug-derived epitopes. The B cells in turn differentiate into plasma cells from which anti-drug antibodies are released. Thus, the repertoires of peptides selected by MHC alleles define the boundaries of anti-drug antibody responses.

The variability of antibody response is in part a function of the diverse genetic make-up in humans; an individual's helper (CD4) T cell repertoire and HLA alleles together shape the scope, magnitude, and kinetics of antibodies. The context in which the antigens are presented may be an overriding factor; intense exposure to certain exogenous antigens may sensitize an individual

towards a certain biologic drug. Cryptic epitopes in apparently non-immunogenic proteins may be visible to the immune system when the same, or similar, sequences are presented in inflammatory milieus (Li and Uetrecht 2010).

In order to investigate potential cross-reactive viral epitopes, we focused on influenza A viruses because new strains are routinely introduced into the population due to seasonal variability. We postulate that influenza A viruses sensitize certain individuals to develop anti-TNF $\alpha$  reactive antibodies and T cell responses. The rationale is that embedded within an immunogenic biologic are MHC-II ligands that resemble epitopes in the major antigens of the viruses. In the first global influenza pandemic in 40 years, the 2009 H1N1 strains replaced the viruses previously circulating in humans. The viruses have maintained a continual presence in North America through seasonal endemics (Brankston et al. 2007; Zimmer and Burke 2009), albeit with minor shifts in the major antigens hemagglutinin (HA) and neuraminidase (NA). This recent emergent of new H1N1 strains may just beginning to manifest in subsets of the population, with drug hypersensitivity as one of the clinical consequences. Viral antigens that shared similar MHC-II ligands with an anti-TNF $\alpha$  drug would generate memory CD4 T cells, which in turn activate B cells that produce antibodies against both the drug and the virus. A systematic analysis of such epitope analogues would identify patients who may be at higher risk of developing anti-drug antibodies toward a particular anti-TNF $\alpha$  drug (Baert et al. 2003; Solau- Gervais et al. 2006; Svenson et al. 2007). The presence of virus-primed helper T cells that recognize epitopes in anti-TNF $\alpha$  drugs would lower the threshold of drug-specific B cell activation. Consequently, anti-drug antibodies may arise sooner and to higher titers. This form of molecular mimicry may heighten the sensitivity to a given drug in individuals exposed to certain viruses.

We described herein a bioinformatics strategy used for scanning HA-cross-reactive MHC-II ligand in adalimumab, infliximab, and etanercept. We hypothesized that a systematic computational



analysis of HLA ligands can generate similar sequences in HA and anti- TNF $\alpha$  drugs. Such sequences, termed analogues here, may stimulate the same TCRs when presented by the same MHC alleles. Using the public database Immune Epitope Database and Resources (IEDB) and custom scripts, ligands were predicted for HLA-DR1\*0101 (hereafter referred as 0101), HLA-DR1\*0401 (0401), and HLA-DR1\*1001 (1001), three MHC-II alleles that are implicated in RA . Presumably, patients who express one or more of these alleles are overrepresented in the population who are being treated with anti-TNF $\alpha$  agents. Ligands of infliximab, adalimumab, and etanercept were matched against those predicted from H1N1 influenza type A hemagglutinin (HA) antigens. The analysis revealed a potential molecular rationale that may drive the development of anti-drug antibodies.

## **Methods**

Predicting peptide binding to MHC molecules is arguably the most advanced applications among the compiled proteomes. Current methods integrate primary sequence analysis, experimental binding data, and structural information, including x-ray data. Many are accessible as public domains.

Constructions of these algorithms have benefited from that all MHC-II alleles share the same structural topology; a  $\beta$ -pleated sheet supporting two raised  $\alpha$ -helices together form a peptide-binding groove. Residues in the MHC binding groove form “pockets” that accommodate peptide side chains of similar size and electrostatics. Unlike MHC class I, the class II binding groove has an “open” configuration; theoretically there is no limit to the length of bound peptides, but typical ligands consist of 15 amino acids. Longer peptides tend to be thermodynamically unstable. Most of the MHC-peptide interactions take place within the binding groove, with MHC residues making contacts with typically a core of nine amino acids in the bound ligand.

### *Strategy of Analysis*

Our strategy entailed combining the data-rich predictive power of IEDB with custom scripts that generate

analogous sequences. Potential MHC-II ligands in HA and anti-TNF $\alpha$  drugs were identified using the “peptide binding to MHC class II molecules” under the tab “T cell Epitope Prediction Tool” in IEDB (<http://www.iedb.org/>). The function operates on validated algorithms that integrate established structural criteria with experimental binding data. We used the “IEDB recommended” option; in this mode, IEDB defaults to the “Consensus approach” in which the combined results from at least three algorithms (NN-align, SMM-align, Sturniolo, and/or ComLib in predicting binding (<http://tools.immuneepitope.org/mhcii/help/#Method>)). MHC molecules that lack at least three predictors are analyzed using the NetMHCIIpan method. Peptides are scored based on the the median rank in at least three algorithms (Wang et al. 2010). Such ranking has physical meaning insofar relative strong binding affinities (IC<sub>50</sub> < 1000 nM) are correlated with low percentiles. In our analysis, the IEDB server selected the consensus method for 0101 and 0401, with 1001 queried based on the NETMHCII method (<http://tools.immuneepitope.org/mhcii/help/#Method>). These output sequence files generated in IEDB were downloaded as Excel spreadsheets for subsequent analyses. These and other output files can be found in Supplemental Materials. We predicted potential T cell epitopes in HA and the anti-TNF $\alpha$  based on similarities of IEDB generated ligand sequences. Custom scripts were created in Matlab to analyze the sequences generated in IEDB. The main script “FindMHCIIAnalogues.m” calls Compare.m, and two merging scripts (MergeSortStructIdx.m and MergeStructIdx.m).

In the context of this study, “analogue” is defined as having at least 8 of the 15 amino acids being identical or similar (defined in Table 3) at each position in the 9mer core. The threshold was chosen based on the notion that side chains interacting MHC and TCR in a given bound peptide do not overlap. Four MHC-contacting side chains, or those pointing toward the floor of the binding groove, together define the binding motifs of the HLA alleles. An additional four or more upward orienting peptide side chains are seen in x-ray structures interacting with TCRs. Peptides with identical and similar amino acids at the same positions in the majority of the 15mer frame would likely to have similar bound conformations, thereby

presenting conflat

molecular surfaces to TCRs. To limit the scope of the analysis to the highly probable epitopes, we compared HA and drug ligands up to the tenth percentile in binding affinities, the same affinity-related threshold used by Wang et al (Wang et al. 2010). Predicted ligands of each drug were matched with ligands of HA. As such, for each HLA allele, 15mers of infliximab, adalimumab, and etanercept were compared independently against 15mers of the viral antigen.

## Results

We leveraged the predictive power of integrating multiple MHC-binding algorithms in IEDB to identify candidate MHC-II ligands for three commonly used anti-TNF $\alpha$  biologics and influenza HA. The HA sequences CA07 and NY12 strains of the influenza A virus were used because these were part of the 2009 H1N1 pandemic. Another influenza A strain isolated in 2014, CA3726, was examined to compare with those that emerged in 2009. These are now considered as part of the regular seasonal influenza infections because they are so widely spread in the United States. The scanning routines were internally validated for consistency by confirming matching identities of sequences generated in the FASTA input and IEDB output (data not shown). A separate script, SimilarSeq.m was used to identify similar sequences across drugs and alleles using the output files generated by FindMHCIAnalogues. We limited the analysis to sequences ranked within the tenth percentile in relative binding strengths in order to eliminate ligands with less chance of specific binding and to remain within the IEDB recommended cutoffs for affinity.

### *Viral HA ligand analogues in adalimumab, infliximab, and etanercept*

To identify potential epitope analogues, high affinity ligands (defined as those ranked up to 10<sup>th</sup> percentile) predicted in each drug were compared with the high affinity ligands predicted in HA antigens. A given drug sequence identified is defined by three vectors: the percentile ranking of its own binding to the MHC allele, percentile ranking of its homologous HA peptide to the same allele, and the

extent of homology (identical or similar amino acids) to the homologous HA sequence at each position in the 9mers. The results showed that 0401 would present more analogues than 0101 and 1001 for all three anti-TNF $\alpha$  agents. For example, in adalimumab heavy chain, 56 sequences bear resemblance to ligands in CA07 HA. Of these, 11 are within the 3<sup>rd</sup> percentile, suggesting exceptional high affinities of both drug and viral ligands. Fifteen (shown in red) of the 56 heavy chain sequences contain more than 9 (out of 15) identical or similar amino acids, including three with 10-amino acids homology (Table 2). In adalimumab light chain, 19 analogues are restricted by 0401. The same pattern holds true for infliximab heavy chain in that more high affinity analogues are restricted by 0401 than for 0101 and 1001. In the infliximab heavy chain, seven sequences were found bearing resemblance to HA-derived 0401 ligands. Of these, one sequence was found within the 3<sup>rd</sup> percentile region. The heavy chains of infliximab and adalimumab contain more analogues compared to their light chains. Overall, fewer high affinity analogues are predicted in etanercept: 12 are predicted for 0401, three for 0101, and none for 1001.

Influenza virus undergoes substantial sequence variation over time, leading to the emergence of specific strains that are geographically and temporally unique. To determine if distinct influenza strains produced similar HLA epitopes, we analyzed influenza strains from different locations and from different years. Scanning of a 2014 HA sequence (CA 3726) yields similar scattering of sequences, in particular within the 3<sup>rd</sup> percentile regions (Figure 3). This is consistent with the notion that the 2009 HA remains dominant in the population. Some minor changes are evident between 6 and 8 percentiles (on x-axis and y-axis), showing that the analysis is able to detect minor antigenic drifts. Applying the same analysis to a 2009 New York (NY 12) shows no global effects on the extent of shared epitopes in all three drugs and HLA alleles analyzed.

The analysis described herein aims to narrow the number of candidate peptides required for testing in mapping cross-reactive epitopes. The sequences define the boundary for designing combinatorial

libraries for in vitro T cell assays. Alternatively, the analogous sequences generated can be screened for known HA epitopes. The influenza HA peptide PKYVKQNTLKLAT (residues 306-318 in functional sequence, 320-334 or 321-335 in precursors), is a dominant epitope restricted by DR1 alleles. T cells that recognize this epitope have been isolated in humans exposed to influenza viruses. It is predicted as a high affinity ligand in 0401(percentile=8.02) and 1001 (percentile=6.79) in IEDB. Embedded in the same sequence (PKYVKSTKLRLATGL) in CA07 and CA3726, the known HA epitope is mapped to PAVLQSSGLYSLSSV, a peptide in the CH1 region of infliximab (residues 174-188) and adalimumab (residues 175-189). Another peptide, PKLLIYASSTLQSGV, residues 44-58 in the variable region of adalimumab light chain, is mapped to PKYVRS AKLRMVTGL in HA NY12 (residues 320-334) that embeds the HA epitope. All drug sequences are predicted as high affinity ligands; in particular PKLLIYASSTLQSGV scores 0.93 in 0401 and 1.22 in 1001. Molecular modeling of the analogues indicates that the resemblances are due to MHC rather than TCR- contacting side chains. In PAVLQSSGLYSLSSV, all identical or homologous amino acids are hydrophobic or uncharged that are conducive to interacting with residues in MHC binding pockets. The lack of basic side chains that are seen interacting with the TCR in the x-ray structure (1FTY) of HA306 makes PAV an unlikely candidate of molecular mimicry. On the other hand, PKLLIYASSTLQSGV contains not only homologous MHC-contacting side chains, but also the proline-lysine at the N-terminus. It could active HA320-specific TCRs as an altered peptide ligand [Allen, #] that generates deviated T cell responses, or even immunological tolerance.

## **Discussion**

Using a meta-analysis approach, we demonstrated in this study that HA cross-reactive ligands of MHC class II molecules may be embedded within the amino acid sequences of adalimumab,

infliximab, and etanercept. The results highlight HLA polymorphisms as a contributing factor. It provides the basis for designing molecular diagnostic tests for predicting non-responders. Candidate cross-reactive T cell epitopes embedded in the anti-TNF $\alpha$  agents can be screened in vitro using patients' peripheral blood mononuclear cells. The utility of the method is to narrow the scope of the peptides that needed to be screened by identifying the analogues. The results also reveal potential relevance of subdominant epitopes in influenza viruses and biologic drugs. In adalimumab heavy chain, there are more than 50 analogues. These high affinity ligands may collectively drive cross-reactivity of influenza virus and the anti-TNF $\alpha$  agent.

The current analysis has several limitations. The approach taken was aimed to balance sensitivity and specificity of the search, but weighing towards minimizing false negatives. False positives could be eliminated by filtering sequences through conformational analysis, upstream antigen processing criteria (proteosomal cleavage sites), and experimental T cell activation assays. We focused on matching MHC ligands in drugs and a viral antigen, but only a subset of presented ligands would elicit T cell activation. With this in mind, we searched for analogues of a known epitope in HA and identified a potential cross-reactive candidate in infliximab. This approach, however, would likely omit many sub-dominant epitopes, given the degeneracy of T cell recognition. Another limitation is that antigen presentation may subjugate to non-HLA predispositions in RA, for example, polymorphisms in the human interleukin-10 gene. Despite these caveats, the results support the hypothesis in that a systematic analysis can yield similar sequences in HA and anti-TNF $\alpha$  as targets of experimental studies.

The novelty of this paper is that the results provide a reference point for analyzing T cell cross-reactivity of protein drugs and viruses. We envisage the research may pave the way for individualized anti-TNF $\alpha$  treatment protocols optimized for sustained therapeutic benefits in RA patients. Patients who are at high risk of treatment failure may be identified via pharmacogenomics analysis. The results may provide the basis for pre-treatment testing of anti-drug antibodies and desensitization protocols. The approach and custom scripts can be modified for analysis of other viruses and bacteria that may predispose anti-drug antibodies toward biologic drugs.

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**Table 1: Definition of similar amino acids based on physiochemical properties<sup>a</sup>**

Acidic	Basic <sup>b</sup>	Non-polar	Aromatic	Hydrophilic <sup>c</sup>
D, E	R, K	A, V, L, I, M	F, Y	S, T, N, Q

<sup>a</sup>Acidic and basic amino acids have side chains that are ionized at pH 7.4. All natural amino acids are included except cysteine (C), proline (P), glycine (G), tryptophan (W)

<sup>b</sup>Although not included in the current analysis, a fraction of histidine (pKa ~ 6.5) is ionized even at neutral pH and could be considered similar to R or K

<sup>c</sup>These amino acids contain hydrophilic side chains that are not ionized at pH 7.4

**Table 2 HA epitope analogues in TNF<sup>a</sup>**

HLA-DR1 allele	Adalimumab		Infliximab		Etanercept
	Heavy chain	Light chain	Heavy chain	Light chain	
<b>0101</b>	19 <sup>b</sup> (5 <sup>c</sup> , 1 <sup>d</sup> )	9 (0,0)	13 (5,1)	2 (0,0)	3 (1,0)
<b>0401</b>	56 (15,11)	19 (1,12)	39 (8,8)	14 (2,5)	12 (2,0)
<b>1001</b>	11 (3, 4)	12 (0,3)	5 (1,0)	4 (1,2)	0 (0,0)

<sup>a</sup>H1N1 influenza A California strain 2009 (accession #227831808)

<sup>b</sup>Total number of analogues mapped to ligands in HA in which both were predicted to bind to the allele with the 10<sup>th</sup> percentile

<sup>c</sup>Number of sequences containing at least 9 (out of 15) identical or similar amino acids to the viral HA

<sup>d</sup>Number of “exceptional” high affinity ligands defined as sequences that are predicted to bind to the allele within the 3<sup>rd</sup> percentile



**Luke's Last Supper Sayings (Luke 22:19-20): Scribal Interpolation, Parroted Tradition, or the Basis of Lukan Atonement Theology?**

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**“Luke’s Last Supper Sayings (Luke 22:19-20): Scribal Interpolation, Parroted Tradition, or the  
Basis of Lukan Atonement Theology?”**

Benjamin J. Burkholder

For the past century, Lukan scholars have—with a few exceptions—agreed that the two-volume work of Luke-Acts suppresses or entirely avoids the notion that Jesus’ death acquires forgiveness by atoning for human sin.<sup>1</sup> Decades ago, Conzelmann set the tone by declaring that Luke-Acts betrays “no trace of ... any direct soteriological significance drawn from Jesus’ suffering or death. There is no suggestion of a connection with the forgiveness of sins.”<sup>2</sup> Even conservative scholars like Tannehill agree: “The death of Jesus is never interpreted as atonement for sins in the mission speeches of Acts, nor is the death of Jesus ever singled out as the basis for the release of sins or the salvation in Jesus’ name which the missionaries are proclaiming.”<sup>3</sup> Suffice it to say, the current consensus in biblical research has concluded that Luke has either avoided or failed to develop the notion that Jesus’ death brings the forgiveness of sin.

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<sup>1</sup> Three observations are usually marshaled for support. First, Luke has allegedly deleted Mark’s term “ransom” from a similar saying in Luke 22:24-7. Second, though Luke directly connects Jesus with the final servant song of Isaiah, he never cites the portions of the song that would suggest Jesus’ death functions as a vicarious atonement. On this point, see Morna D. Hooker, *Jesus and the Servant* (London: S.P.C. K., 1959). Third, the sermons in Acts unanimously fault the Jewish people for Christ’s death and credit God with the resurrection rather than making Jesus’ death the means of salvation. For an overview of recent research, see: Timothy W. Reardon, “Recent Trajectories and Themes in Lukan Soteriology,” *Currents in Biblical Research* 12, 1 (2013): 77-95.

<sup>2</sup> Hans Conzelmann, *The Theology of St. Luke*, trans. Geoffrey Buswell (New York: Harper & Row, 1961), 201.

<sup>3</sup> Robert C. Tannehill, *The Gospel According to Luke*, vol. 1 of *The Narrative Unity of Luke-Acts: A Literary Interpretation*, 2 vols. (Philadelphia: Fortress, 1986), 285; cf. I. Howard Marshall, *Luke: Historian & Theologian*, 3d. ed. (Downers Grove: InterVarsity, 1988), 175; Stephen Finlan, *Options on Atonement in Christian Thought* (Collegeville, Minn.: Liturgical, 2007), 38.

Despite this consensus, there are passages that potentially challenge this viewpoint.<sup>4</sup> The most significant of these passages—and the focus of our study—occurs at the Last Supper when Jesus uses the bread and wine to symbolize the salvific effects of his death. Regarding the bread, Jesus says: “This is my body, which is given for you. Do this in remembrance of me” (Luke 22:19). Over the cup, Jesus proclaims, “This cup that is poured out for you is the new covenant in my blood” (Luke 22:20). In these statements, Jesus affirms that his death will benefit his followers (“for you”) and that it will do so by inaugurating the new covenant, which was to bring the forgiveness of sin.

Modern scholars are well aware that Luke 22:19-20 challenges the current consensus and offer three different explanations. First, some contend that Luke 22:19b-20 is a later scribal interpolation. The supporting manuscripts are not in agreement regarding Luke’s Last Supper, and one important manuscript and several translations are missing Luke 22:19b-20.<sup>5</sup> However, the vast majority of textual witnesses support Luke 22:19b-20 as authentic.<sup>6</sup> Nevertheless, because Luke 22:19b-20 supposedly departs from Luke’s traditional theology in modern consensus, some scholars aver that Luke 22:19b-20 must stem from a later hand trying to conform Luke’s text to the Eucharist in Mark and Paul. For them, it is inconceivable that an author who intentionally avoided atonement theology would include Luke 22:19b-20. For them this can only be a scribal interpolation.<sup>7</sup>

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<sup>4</sup> In addition to Luke 22:19-20, Acts 20:28 potentially challenges the consensus: “Keep watch over yourselves and over all the flock, of which the Holy Spirit has made you overseers, to shepherd the church of God that he obtained with the blood of his own Son.”

<sup>5</sup> The Uncial D and some of the Italian translations (it<sup>a, d, ff2, i, l</sup>) are missing the final part of Luke 22:19 (“which is given for you. Do this in remembrance of me”) and the entirety of 22:20, the cup saying. See Bruce M. Metzger, *A Textual Commentary on the Greek New Testament*, 2d ed. (Stuttgart: Deutsche Bibelgesellschaft, 2002), 149.

<sup>6</sup> See the textual apparatus in *The Greek New Testament*, ed. Barbara Aland et al., 4th ed. (Stuttgart: Deutsche Bibelgesellschaft, 2001), 295.

<sup>7</sup> Arthur Vööbus, “A New Approach to the Problem of the Shorter and Longer Text in Luke,” *NTS* 15, no. 4 (1969): 457-63; Bart D. Ehrman, *The Orthodox Corruption of Scripture: The Effect of Early Christological Controversies on the Text of the New Testament* (New York: Oxford University Press, 2011),

Unlike the first view, the second accepts the authenticity of Luke 22:19b-20, but denies that it reveals the author's own soteriology. Joel Green is representative here when he writes that passages like Luke 22:19-20 are instances of Luke simply "parroting ancient phraseology."<sup>8</sup> According to him, Luke has inserted this material in a "mechanical" and simply records what happened without integrating it into his theological viewpoint.<sup>9</sup> Thus, Luke's inclusion of the Last Supper was not because he had adopted this particular view of Jesus' death but because he was simply parroting the tradition of the Eucharist practiced in his church.<sup>10</sup>

The third option propounded by some Lukan scholars is that Luke 22:19-20 does represent Luke's theology, but in a concession to the modern consensus of Luke's soteriology they say, "The atoning significance of the death of Jesus ... is not the aspect which Luke has chosen to stress."<sup>11</sup> Typical of this view is that Luke 22:19-20 does reflect an aspect of the author's point of view, but that these verses have not been integrated into Luke's portrait of the cross in Luke-Acts.

Though my view is closest to the third option, it is my contention that all three fail to observe how Luke has integrated the Luke 22:19-20 into his narrative and theology. Based upon the following observations, I will argue that, when the ideological and linguistic connections between Luke 22:19-20 and the rest of Luke-Acts are taken into account, Luke 22:19-20 forms

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233; David C. Parker, *The Living Text of the Gospels* (Cambridge: Cambridge University Press, 1997), 151-7.

<sup>8</sup> He initially says this of Acts 20:28, but the same judgment would be applicable to Luke 22:19-20 since these are the two passages that he singles out as representative of atonement theology in Luke. Joel B. Green, "The Death of Jesus, God's Servant," in *Reimagining the Death of the Lukan Jesus*, ed. Dennis D. Sylva (Frankfurt am Main: Anton Hain, 1990), 7; cf. Joel B. Green and Mark D. Baker, *Recovering the Scandal of the Cross: Atonement in New Testament & Contemporary Contexts* (Downers Grove: InterVarsity Press, 2000), 70; Joel B. Green, "'The Message of Salvation' in Luke-Acts," *ExAud* 5 (1989): 24.

<sup>9</sup> Joel B. Green, "The Death of Jesus," 4, 7.

<sup>10</sup> Richard Zehnle "Salvific Character of Jesus' Death in Lukan Soteriology," *TS* 30, no. 3 (1969): 439-40.

<sup>11</sup> Marshall, *Luke*, 175; cf. Augustin George, "La sens de la mort de Jésus pour Luc," *Revue Biblique* 80 (1973): 186-217.

an adequate basis for Luke's atonement theology and cannot be discredited as a scribal interpolation or parroted tradition.

### ***Forgiveness and the New Covenant***

First, Luke speaks of Jesus either forgiving or offering the "forgiveness of sins" more than any other New Testament author, which is peculiar in light of the fact that atonement theology is ostensibly more securely rooted in Matthew, Mark, or Paul according to most scholars.<sup>12</sup> This, however, should not surprise, for Luke's account of the Last Supper has uniquely identified Jesus' death as inaugurating the "new covenant" (Luke 22:20), which is an intentional allusion to Jeremiah's promise that God would create a new covenant with Israel wherein he would forgive Israel's "iniquity and remember their sin no more" (Jer. 31:34).<sup>13</sup> Since Luke explicitly states that Jesus inaugurates the new covenant with his death, it would be completely sensible to emphasize the effects of the new covenant, which is precisely what Luke does.

Moreover, Jesus' pronouncements of the forgiveness of sin often come within the context of his meals with those bearing the opprobrium of sinners (e.g. Luke 7:36-50). In fact, Luke has emphasized Jesus' practice of eating meals with sinners more than any other Gospel,

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<sup>12</sup> When one compares the frequency with which the forgiveness of sins (ἄφεσις ἁμαρτιῶν) is mentioned in the various New Testament writers, Luke-Acts clearly exceeds others: Matthew: 9:2, 5-6; 12:31; 18:21; 26:28. Mark: 1:4; 2:5-10; 3:28-9. Johannine Literature: John 20:23; 1 John 1:9; 2:12. Paul: Col. 1:14. General Epistles: Heb. 9:22; James 5:15. Luke-Acts: Luke 1:77; 3:3; 5:20-24; 7:47-9; 24:47; Acts 2:38; 5:31; 10:43; 13:38; 26:18.

<sup>13</sup> The entire new covenant promise is: "The days are surely coming, says the Lord, when I will make a new covenant with the house of Israel and the house of Judah. It will not be like the covenant that I made with their ancestors when I took them by the hand to bring them out of the land of Egypt—a covenant that they broke, though I was their husband, says the Lord. But this is the covenant that I will make with the house of Israel after those days, says the Lord: I will put my law within them, and I will write it on their hearts; and I will be their God, and they shall be my people. No longer shall they teach one another, or say to each other, 'Know the Lord,' for they shall all know me, from the least of them to the greatest, says the Lord; for I will forgive their iniquity, and remember their sin no more" (Jer. 31:31-4; NRSV).

and this practice was a tactile demonstration of the forgiveness God offered.<sup>14</sup> The Last Supper stands near the end of Jesus' meal sequence and provides the theological explanation for why Jesus can eat with sinful people and offer them forgiveness. Thus, if we are going to seek for the ideological rationale behind Luke's emphasis on the forgiveness of sin and Jesus' practice of dining with sinners, we should look to the meal at the zenith of the narrative where Jesus clarifies that his death will inaugurate the new covenant for his followers.

### ***Post-Resurrection Meal in Emmaus***

Second, not only do the earlier meal scenes with notorious sinners anticipate the theology of the Last Supper, but the post-resurrection meals also look back to the Last Supper. The first of these begins when the risen, but unrecognized Jesus happens upon two disciples traveling toward Emmaus mulling over the Passion events. When Jesus joins the pair, the narrator explains that "their eyes were kept from recognizing him" (Luke 24:16). Perceiving that Jesus is ignorant of the crucifixion and resurrection reports, the two quickly inform him about the crucifixion, which not only extinguished Jesus' life but also their hopes "that he was the one to redeem (ὁ μέλλων λυτροῦσθαι) Israel" (Luke 24:21).<sup>15</sup>

The account is thick with irony. The disciples who believe the crucifixion has crushed the hope that Jesus could redeem Israel no longer recognize him physically. Moreover, the disciples openly proclaim their incomprehension of Jesus' identity when they describe him as just "a prophet mighty in deed and word" (Luke 24:19), but nothing more. To compound the irony, the disciples believe that Jesus is the one who is ignorant of the recent happenings in

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<sup>14</sup> Peter-Ben Smit, *Fellowship and Food in the Kingdom: Eschatological Meals and Scenes of Utopian Abundance in the New Testament* (Tübingen: Mohr Siebeck, 2008), 199; William R. Crockett, *Eucharist: Symbol of Transformation* (New York: Pueblo, 1989), 6.

<sup>15</sup> I disagree here with those who believe λυτρόω (to redeem) simply speaks of liberation, because they fail to see that Luke continues to connect this to the necessity of death and resurrection and ultimately to the forgiveness of sins. E.g. Zehnle "Lucan Soteriology," 439. It is more likely that Luke uses this word with the connotation of "ransoming" rather than simply bringing salvation or liberation.

Jerusalem, but in reality they are. They fail to see what God was doing in and through the death and resurrection of Jesus Christ.<sup>16</sup> Thus, their physical inability to recognize Jesus epitomizes their spiritual myopia.

In response to their confusion, the risen Jesus does not deny that he is the one to “redeem Israel,” but redefines how this would occur, namely, through Jesus’ death and resurrection. In fact, the risen Christ seems incredulous with the disciples on the road to Emmaus for failing to recognize this and responds to their quandary by saying: “Oh how foolish you are, and how slow of heart to believe all that the prophets have declared! Was it not necessary that the Messiah should suffer these things and then enter into his glory?” (Luke 24:25-6). Jesus’ response does two things. First, it establishes Jesus as more than a prophet. Jesus is the Messiah, the one to whom the prophets pointed. Second, it presumes that the Old Testament prophecies necessitated the suffering of the Messiah. Therefore, his death was not the annihilation of their hopes for redemption, but following the course that the prophets predicted. Despite receiving a thorough lesson on biblical prophecy, the disciples still do not recognize Jesus, even though the Scriptural precedent for his death and resurrection was traced through the Old Testament, “beginning with Moses and all the prophets” (Luke 24:27). They implore the unrecognized Jesus to stay for the night, and he consents after demurring for a time.

The next scene is essential for seeing how this episode is linked to the Last Supper. Seated at the table Jesus “took bread, blessed and broke it, and gave it to them” (Luke 24:30). The language used to describe Jesus’ actions at the meal linguistically reduplicates Jesus’ actions at the Last Supper and casts this post-resurrection meal as a Eucharistic meal, even if the wine is

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<sup>16</sup> Jon A. Weatherly, “Eating and Drinking in the Kingdom of God: The Emmaus Episode and the Meal Motif in Luke-Acts,” in *Christ’s Victorious Church*, ed. Jon A. Weatherly (Eugene, Or.: Wipf and Stock, 2001), 21.

absent.<sup>17</sup> It is only at this point, at the breaking of the bread, when “their eyes were opened, and they recognized him; and he vanished from their sight” (Luke 24:31). Their former inability to see and understand Jesus is removed by the breaking and blessing of the bread.

What occurs at the meal in Emmaus is something akin to Mark’s centurion gazing at Jesus on the cross. Those familiar with Mark will recall that, for Mark, it is only by gazing upon the cross that the Roman centurion understands Jesus’ identity as God’s Son (Mark 15:39). The same phenomenon occurs here, only the event that provides the insight into Jesus’ identity and mission is not the crucifixion but the Eucharist, which gave a theological explanation for the crucifixion.<sup>18</sup> The disciples of Emmaus who cannot believe a redeeming Messiah could suffer such an ignominious death realize in the Eucharistic act of breaking bread that the crucified one was and still is the Messiah.<sup>19</sup> By locating the moment of recognition at the point of breaking bread and not with Jesus’ recitation of Scripture, Luke reveals that it is not Scriptural precedent that necessitates Jesus’ death but the theological rationale provided at the Last Supper. The Scriptural antecedents were only “a preparation” for the understanding that was about to dawn,

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<sup>17</sup> Compare Luke 22:19: “λαβὼν ἄρτον εὐχαριστήσας ἔκλασεν καὶ ἔδωκεν αὐτοῖς” with Luke 24:30: “λαβὼν τὸν ἄρτον εὐλόγησεν καὶ κλάσας ἐπέδιδου αὐτοῖς.” Several scholars concur that an intratextual allusion to the Last Supper is present: Eugene LaVerdiere, *Dining in the Kingdom: The Origins of the Eucharist in the Gospel of Luke* (Chicago: Liturgy Training Publications, 1994), 170; Jacques Dupont, “The Meal at Emmaus,” in *The Eucharist in the New Testament*, ed. Jean Delorme, trans. E. M. Stewart (Baltimore: Helicon Press, 1964), 116-9. Because the “breaking of bread (τῆ κλάσει τοῦ ἄρτου)” refers to the Eucharist in Acts 2:42, it is most likely the case in Luke 24 as well. Not all, however, are convinced that a Eucharistic meal is implied in the Emmaus account. E.g. John Nolland, *Luke 18:35-24:53* (Nashville: Thomas Nelson Publishers, 1993), 1208. However, it seems that the verbal parallels mandate that we see this as Eucharistic.

<sup>18</sup> The point of the episode, unlike the one that follows it, is not to provide apologetic evidence for the resurrection but rather to explain how the crucifixion brings salvation. Dupont, “Meal at Emmaus,” 109-10.

<sup>19</sup> Thus, I think Carroll and Green’s conclusion on the Emmaus episode is still a half-way house on the road to penetrating what Luke is actually communicating. About these verses, they write: “But rather than draw a bridge from Jesus’ death to this full-bodied notion of redemption, characters within Luke’s story understand the crucifixion as a denial of their hope that Jesus would be the one to redeem Israel (Luke 24:19-21). Even though the narrator labels this view a profound misunderstanding, he goes on to show only that the cross was not a contradiction of such longings, not that the cross was directly instrumental in instigating God’s redemption.” John T. Carroll and Joel B. Green, *The Death of Jesus in Early Christianity* (Peabody, Mass.: Hendrickson, 1995), 267-8.



but not an efficient cause of it.<sup>20</sup> By connecting the Emmaus scene linguistically to the Last Supper, the author has led his reader back to an event where Jesus once before broke bread and gave the theological and ideological explanation for how his death would benefit his followers. Thus, Jesus is not a redeeming Savior simply in spite of his death but by means of his death.

### ***New Covenant in Acts***

In Luke's second volume, Acts, there is another ideological connection with Luke 22:19-20 where the passage presupposes the new covenant era has dawned, this time on the lips of Paul in one of the most developed examples of Paul's preaching in Acts. At the end of this sermon, Paul says "Let it be known to you therefore, my brothers, that through this man forgiveness of sins is proclaimed to you; by this Jesus everyone who believes is set free from those sins from which you could not be freed by the law of Moses" (Acts 13:38-9). Paul contrasts the Old Covenant ("the law") mediated by Moses with the forgiveness of sins now offered through Jesus. Though there is no explicit affirmation in the passage that the new covenant has been inaugurated, it is hard to imagine that anyone remotely familiar with Jeremiah's promise of a new covenant and its promise of forgiveness would miss the theological assumption that Jesus constitutes the turning point in the eras.<sup>21</sup> In effect, Paul is affirming that Israel's former state of exile, which was the punishment for breaking the Mosaic Law, has ended.<sup>22</sup> Through Jesus the forgiveness of sins, the promised state of affairs in the new covenant, has arrived.

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<sup>20</sup> Dupont, "Meal at Emmaus," 120.

<sup>21</sup> Thus, those who suggest the new covenant ideology is foreign to Luke overlook what seems quite apparent in texts like the above. E.g. Bart D. Ehrman, "The Cup, the Bread, and the Salvific Effect of Jesus' Death in Luke Acts," *SBLSP* 30 (1991): 578-9.

<sup>22</sup> Here I am drawing from the notion of Israel's continuing exile as developed in N.T. Wright, *Jesus and the Victory of God* (Minneapolis: Fortress, 1996).

This should be nothing new to the reader of Luke-Acts, for this is precisely what Luke laid out in Luke 22:19-20 where Jesus' death was described as the inaugurating sacrifice of the new covenant. Moreover, Paul's sermon clarifies the first observation we made, namely, that the proclamation of the forgiveness of sins throughout Luke-Acts is ideologically contingent upon Luke 22:19-20 where Jesus frames his death as the means by which the new covenant would arrive.

### ***Conclusion***

More could be said in support of the current thesis, but these three observations warrant a change in the common consensus of Luke-Acts, especially as articulated by Conzelmann and Tannehill. Since other portions of Luke's Gospel—like the Emmaus episode—are linguistically and ideologically connected to the Last Supper account and because Luke's emphasis upon the "forgiveness of sin" derives from his belief that Jeremiah's new covenant era has dawned as Acts 13 demonstrates, then Luke 22:19-20 cannot be simply parroted tradition that fails to represent Luke's own theology. Moreover, since the ideological conviction that the new covenant era has dawned with Jesus undergirds the forgiveness of sins in Luke-Acts as implicitly seen in the sermon of Acts 13, one cannot contend that Luke 22:19b-20 is a scribal interpolation on the grounds that it is a theological aberration. As we have seen, the belief that Jesus inaugurated the new covenant is present in other portions of Luke-Acts. Therefore, I conclude that Luke 22:19-20 is neither scribal interpolation nor parroted tradition, but indicative of Luke's theology because it has been woven into the longer narrative and theology of Luke-Acts.

**Limits of Political Correctness in *Perfect Agreement*, *Blue Angel*, and *Japanese by Spring***

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**The Limits of Political Correctness in *Perfect Agreement*, *Blue Angel*,  
and *Japanese by Spring***

Ian Butcher

Almost twenty five years ago, political correctness (PC) burst onto the national stage through high-profile coverage of the supposed crisis of PC on university campuses.<sup>1</sup> Despite the gradual fading of this context, PC remains resonant—a convenient catchall term of grievance for political pundits and internet commenters alike. How did this come to pass? Given that PC was an academic (in both the strong and pejorative senses) concern, how did it come to capture the public imagination to such an extent that it has left this cultural residue? How was PC understood in academe and what happened in academe once PC became a national issue? To answer these questions, I will consider academic novels, or novels written about university professors set primarily on campus and focused on academic life and culture, especially those written during and immediately following the PC Wars (the height of national attention to PC from roughly 1990 to 1995)—Michael Downing’s *Perfect Agreement* (1997), Francine Prose’s *Blue Angel* (2000), and Ishmael Reed’s *Japanese by Spring* (1993).

PC first emerged from the New Left of the 1960s as a somewhat mocking term of self-critique that Ruth Perry termed “a suspiciousness of orthodoxy of any kind” (Perry 77). In the 1980s, the Right seized on PC as a way to attack the Left, calling it a Leftist orthodoxy. For the Right, the institution responsible for producing PC and indoctrinating students with it was the university. Coming from the humanities, and fields formed out of the student struggles of the 1960s like African American Studies, Women’s Studies, and various Ethnic Studies programs, PC was said to be “a sort of unofficial ideology of the university” (Bernstein E1).<sup>2</sup> The presence of PC in universities was no laughing matter for the Right;

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1 For example, a variety of popular periodicals—including *Time*, *Newsweek*, *Forbes*, *The Atlantic*, and *The Village Voice* featured articles (and, in some cases, cover stories) on PC, as did television programs like the *MacNeil-Lehrer Newshour*.

2 PC was, for the Right, one way to attack the legacy of the 1960s, and particularly the student protest movements that had pushed for changes to the university. Allan Bloom called the 1960s an “unmitigated disaster” for American higher education, and for neoconservatives as a whole—many of whom, like William Bennett (former director of the NEH and later Secretary of Education) and Roger Kimball, were influential culture warriors—

as the *Wall Street Journal* put it, “[e]very day now echoes of trouble on the nation’s campuses sound louder . . . American universities have embraced thought control, political re-education and other basics of totalitarianism” (“Politically Correct” A10). Evolving out of the debates in the 1980s about canon revision, multiculturalist curriculum reform, and the politicization of the university undertaken most prominently by William Bennett, Allan Bloom, and Lynne Cheney, the PC Wars came to a head in Fall 1990.<sup>3</sup> Dinesh D’Souza, Roger Kimball, George Will, Carol Iannone, and others argued that PC was a threat to freedom of speech, academic freedom, and American society at large.<sup>4</sup> Moving away from a concern about canons and multiculturalism, this second phase of the Right’s attack on PC lasted through the mid-1990s and focused on affirmative action in university admission, hiring, and promotion procedures, speech and conduct codes and their implication for free expression of ideas on campuses and in research, and university offices (like Residence Life or newly formed Multicultural Affairs and LGBT Affairs offices) and their role in spreading a doctrine of sensitivity and tolerance in service of what D’Souza called “the Victim’s Revolution” (D’Souza 2).

The PC Wars were in fact a smokescreen for the Right’s systematic attack on higher education in America. Motivated by a desire to “to impose its vision of America on all of us,” the PC Wars provided the Right with a way to propose “restricting access to higher education” as part of “a Thatcherite vision of an American education system designed . . . to channel young people into levels of the workforce for which they are ‘appropriately’ prepared” (Messer-Davidow 46; Lauter 212, 218). Indeed, former President George Bush declared in 1991 that PC was an enemy of free trade and limited the United

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“[m]ore than the *bête noir* of neocons, the New Left [of the 1960s] was their *raison d’être*” (Bloom 320; Neilson 66).

- 3 For the Right’s position in these debates see Bloom’s infamous *The Closing of the American Mind* (1987). Bennett described the problems facing higher education in a report he authored while head of the National Endowment for the Humanities, *To Reclaim a Legacy* (1984), claiming that “educators . . . have given up the great task of transmitting a culture to its rightful heirs” in favour of trendy approaches that are “the handmaiden of ideology” or come out of “special interest politics” (Bennett 1, 16).
- 4 Of these, Dinesh D’Souza’s *Illiberal Education* (1991) was the most influential, though Kimball’s *Tenured Radicals* (1990) was also fairly popular. Due to his position as a nationally syndicated columnist, Will may have had the greatest reach of all.

States' global competitiveness. Despite these rather sinister objectives, the Right's construction of the PC threat fit in with the Culture Wars—that moment in the 1980s and 1990s when the shape and meaning of American culture was particularly contested—and the effects of the economy's shift from Fordism to post-Fordism. These contexts, both of which involved the increased prominence of previously marginalized groups in American culture and the experience of a more diverse America, coupled with widespread dissatisfaction with American higher education to make PC into a national concern.

The Right was successful in making its version of PC into a populist, common sense understanding of societal problems because of its deployment of a rhetoric of crisis, bolstered by a series of dramatic (though largely manufactured) anecdotes said to illustrate the workings of PC, and disseminated by a well-funded network of pundits, columnists, and pseudo-academics who had the ear of the media.<sup>5</sup>

What is more, by focusing on free speech, the Right ensured that American liberals would largely abandon the Left.<sup>6</sup> For its part, the Left was not successful in meeting this challenge. Though many of the actual academic issues were resolved in the Left's favour—like the expansion of the canon and the incorporation of critical theory and other new methods drawn from Feminism, Queer Studies, and Postcolonial Studies, among other fields—PC on a national scale was a victory for the Right. The Left had little if any media support and exposure, and its countering of the Right's falsified narratives with reasoned analysis and critique, however incisive, failed to capture the public's imagination.<sup>7</sup> Even worse, though many on the Left saw the PC Wars as a chance to re-engage with a public that seemed increasingly to deny the relevance of the humanities, no such "going public" occurred. The Left's response to PC was, as Christopher Newfield put it, "mild and reluctant" where it existed at all, which

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5 On the creation of this right-wing network and its influence in the Culture Wars, see Ellen Messer-Davidow's "Manufacturing the Attack on Liberalized Higher Education" and Sara Diamond's "Managing the Anti-PC Industry" *After Political Correctness: The Humanities and Society in the 1990s* (1990), Jim Neilson's "The Great PC Scare: Tyrannies of the Left, Rhetoric of the Right" in *PC Wars*, and John K. Wilson's *The Myth of Political Correctness: The Conservative Attack on Higher Education* (1995).

6 Prominent liberals who supported the Right's argument about PC included Richard Bernstein, Eugene Genovese, C. Vann Woodward, Arthur Schlesinger, Jr., and Russell Jacoby, among others.

7 On the problems of leftist representation in media, see Michael Bérubé's *Public Access: Literary Theory and American Cultural Politics* (1994), Neilson, and Wilson.

meant that “many people assumed that the conservative stories had a great deal of validity” (Newfield 109; Wilson 25).

Why, then, look at academic novels and their treatment of PC? As PC is something of an inside-outside issue that started within academe but quickly moved to a larger stage, it makes sense to look at its treatment in a genre that has a similar inside-outside scope. Where academic novels have in the past been an insular genre—they are a record of “policies and practices which official accounts have overlooked”—the contemporary academic novel is equally concerned with “facets of the prevailing national culture and their ultimate diffusion to campus life” (Thelin and Townsend 202, 189). Indeed, as the number of academic novels has exploded over the past three decades and many respected American fiction writers have turned to the genre, the academic novel has become mainstream and its content “links seamlessly with contemporary American life and culture” (Williams “Rise” 565).<sup>8</sup> The academic novel of PC, then, seems a useful register of both the anxieties surrounding PC within academe and their translation into mainstream culture at large.

The academic novel of PC is particularly useful in probing PC’s status as common sense. As these novels tend toward middlebrow realism, they appeal to the Right’s construction of the PC threat to allow their narratives to register as plausible, accurate, and topical. However, as Catherine Belsey notes, “common sense betrays its own inadequacy by its incoherences, its contradictions and its silences,” and *Perfect Agreement*, *Blue Angel*, and *Japanese by Spring* all demonstrate the limits of PC as common sense (Belsey 3). Whether the academic novel of PC deals with the drama of race (*Perfect Agreement*), sex (*Blue Angel*), or both (*Japanese by Spring*), PC is ultimately able to explain neither the issues raised by these novels nor the larger problems masked from view by the spectre of PC. United by their consideration of the white male victim of PC, these novels continually run up against PC’s contradictions,

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8 On this expansion of the scope of the academic novel, see also Robert Scott’s “It’s a Small World After All: Assessing the Contemporary Campus Novel,” Gyde C. Martin’s “The New University Novel: A Mirror Not Just of Academe,” and David G. Bevan’s “Images of Our Tottering Towers: The Academic Novel as a Metaphor for Our Times.”

which undermine its claims about higher education and American society at large. Without an explanatory foundation, these novels are unable to offer any kind of closure and reveal the need to move beyond PC to understand the very real problems faced by American universities: namely, its penetration by and participation in the support of an increasingly voracious global capitalism.

The story of Mark Sternum, Director of Writing Programs at fictional McClintock College, *Perfect Agreement* looks at political correctness via affirmative action and its relationship to academic standards and the white male victim. Sternum fails an African American student named Rashelle Whippet on a remedial writing test required of all McClintock students and is dismissed after a charge of racism is levelled against him. Recognising the need for firm academic standards, Sternum nonetheless believes that schools like McClintock have a duty to students from underrepresented groups and despairs of the possibility of reconciling these two points. At the same time, Sternum's dismissal is a *cause célèbre*. He is held up as "the Standard Bearer for Standards," despite his own distaste for the groups so calling him, and becomes the model of the white male victim of PC (Downing 5). Supposedly the victim of "the victims" (women and minorities), white males are, according to the Right, discriminated against through affirmative action and are the most disenfranchised and least empowered group in society. Given their previously unchallenged dominance of academe, many white male professors tenured in the decades immediately after the Second World War found this narrative particularly seductive as new voices appeared to challenge that hegemony.<sup>9</sup>

*Perfect Agreement* complicates this narrative, though, as Sternum cannot reconcile being a victim with his knowledge of Whippet's life and education. He undermines the narrative of victimhood that the Right's conception of PC affords him, instructing the reader to pause "before you entertain any gripes on my behalf" and listing the privileges afforded professors like salary, vacation time, and parking

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9 On this construction of the white male victim, see D'Souza, Frederick Lynch's *Invisible Victims: White Males and the Crisis of Affirmative Action* (1991), and Richard Blow's "Mea Culpa." For refutations of this figure, see Bérubé, Wilson, and Stanley Fish's *There's No Such Thing as Free Speech: And It's a Good Thing, Too* (1994).



spaces (Downing 5). Whippet, the university student who cannot spell the word “juice,” is the real victim, and McClintock’s PC-friendly efforts to help Whippet are no more a remedy for the systemic failures that she is witness to than are the Right’s false appeals to “merit” and “standards.” Only a post-PC framework, something unavailable to *Perfect Agreement*, would allow for an effective reconciliation of academic standards and access to higher education. Within the Right’s narrative of PC, these two issues can only be opposed to each other, an ultimately destructive understanding for students like Whippet as systematic inequalities and university’s complicity in them are brushed aside in favour of political posturing.

*Blue Angel* demonstrates a similar need to abandon PC as a framework for understanding higher education and social problems through its unabashed embrace of the Right’s narrative of PC. A sexual harassment novel, *Blue Angel* explores the relationship of Ted Swenson, Creative Writing professor, and Angela Argo, his student.<sup>10</sup> Fascinated by a novel that Argo is writing about a high school student who has an affair with one of her teachers, Swenson crosses the line from professional to personal. After a failed sexual encounter, Argo accuses Swenson of sexual harassment when he fails to show her work to his editor. In its treatment of Argo, Swenson, and the accusation, *Blue Angel* attempts to demonstrate that sexual harassment is simply a PC invention, a tool that women use for professional advancement, and another way that white males are victimised by groups who claim to be victims.

Swenson is an academic everyman, a figure whose struggles with his students, colleagues, and work are eminently relatable. In contrast, Argo is presented as calculating and manipulative, preying on Swenson’s weaknesses as part of an ambitious plot to use him for his contacts in the publishing world. Swenson is the victim here, the novel implies, and when the sexual harassment charge comes to light he faces a “swell of tormentors and accusers” as the PC bureaucracy swings into action (Prose 290). This narrative of victimhood relies on a consistently downplayed set of privileges that Swenson enjoys,

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<sup>10</sup> Elaine Showalter suggests that sexual harassment novels constituted “[t]he dominant plot” among academic novels by the start of the twenty-first century (100).

though. As Argo points out to him, “It’s easy for you . . . [with] your nice fat teaching job, your tenure forever and ever. . . . [I]f I wind up working in a drugstore—and with my parents’ connections, that’s the best-case scenario—I will not have time to write” (Prose 236). Swenson’s conduct is deemed unprofessional for good reason: the power dynamic that exists between teacher and student makes any such relationship grossly inappropriate. As long as Swenson can understand himself as a victim, facing at his disciplinary hearing a “gang of thugs that must be appeased,” though, the points that Argo makes about his privilege can be dismissed as irrelevant (Prose 270). In addition to masking the problem of sexual violence on campuses, PC here allows figures like Swenson to ignore any issues that cause discomfort because of their challenge to white male authority and to continue asserting their privilege in blissful, though forced, ignorance.

Unlike both *Perfect Agreement* and *Blue Angel*, *Japanese by Spring* sets out deliberately to expose the flaws of the Right’s narrative of PC and the PC Wars as a whole. The novel focuses on Benjamin “Chappie” Puttbutt, an untenured professor of English at fictional Jack London College. In an attempt to gain tenure, Puttbutt adopts a virulent anti-affirmative action stance that supports the white male victim narrative. When Puttbutt’s tenure is denied because of department politics and a Japanese consortium purchases the college, Puttbutt moves into administration and attempts to get revenge by revealing his former colleagues’ racism.

Though the racist implications of arguments from the Right made by figures like D’Souza and Bloom are an obvious (and easy) target, *Japanese by Spring* also challenges positions taken by the Left that display a subtler racism. Common feminist and multiculturalist sentiments mouthed on the Left are demonstrated to coexist comfortably with anti-Semitism and racial essentialism. Through his dealings with various professors, Puttbutt reveals the extent to which the positions with which the Left opposed the Right’s attacks on PC relied on the problematic notion of tolerance, which as Slavoj Žižek argues is

based on the premise that “the Other is just fine, but only insofar as his presence is not intrusive, insofar as this other is not really other,” rather than actually confronting racial and class difference (Žižek 41).

Ultimately, *Japanese by Spring* ends up re-affirming the need to start from a post-PC framework to understand the problems facing higher education. Though it attempts to connect PC to its larger contexts, particularly globalization and its link to the corporate university, *Japanese by Spring's* opposition of a new, “true” multiculturalism to the PC Wars feels naïve and underdeveloped. At the very moment that it has blown apart PC’s ability to serve as any kind of common sense understanding of higher education, *Japanese by Spring* fails to take the necessary next step in its argument.

By the mid-1990s, PC had retreated from its *Newsweek* cover story heights. Though it remained indelibly stamped into popular culture—*Law and Order* and *The Simpsons*, for example, continued to poke fun at PC into the next decade—PC was no longer the *bête noire* of academe. In their failure to operate in a post-PC understanding of the university, academic novels of PC help to reveal the real, sublimated anxieties beyond the limits of the Right’s narrative of PC: the consolidation of what Jeffrey Williams has called the “post-welfare state university” was taking shape behind PC (Williams “Post-Welfare” 197). Increasingly corporatized and run according to the tenets of academic capitalism—the restructuring of universities according to the demands of the market in the face of a mass defunding of higher education by the state—this post-welfare state university has been shaped by and participated in a “moving away from the social programs in health, employment, and retirement, as well as education . . . toward a national security state” (Slaughter and Leslie 8-12; Williams “Post-Welfare” 197). At the limits of political correctness, then, one finds a mandate for both education and society that must be vigorously opposed by the Left, and that the residue of the PC threat has allowed to remain invisible to mass culture. In their lack of resolution caused by their dependence on PC, *Perfect Agreement*, *Blue Angel*, and *Japanese by Spring* represent the extent to which the problems of the contemporary

university—corporatization, casualization of labour, and instrumentalization within a debt economy—  
have been misunderstood.

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## **Does Teacher Questioning Matter in Student Engagement?**

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## The Relationship between Teacher Questioning and Student Engagement

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### Abstract

In this study, we look closely at the teacher-student dialogues during mathematics lessons and examine more specifically the ways in which students participate in relation to teacher questioning. Previous researchers have suggested some frameworks and questioning styles teachers can use to rebuild their own questions in more effective ways (Sorto, et al. 2009; Boaler & Humphreys, 2005; Nikki, 2003). This study aims to extend the literature to show how one can analyze questions and more importantly students' responses in context to better understand close connections between them. We examine whether higher-order teacher questions generate high-level student responses, and we seek to understand specifically what types of higher order questions generate high-level student responses. The data were collected from 4 mathematics teachers in a large urban school district. Four lessons (one from each teacher) were analyzed from video recordings of 90-minute block class periods for: 1) types and levels of questions the teacher asks, 2) types of responses student provides, 3) the length of student response (number of words used). Teacher-student dialogues were obtained from the whole-class discussion part of the lesson. Frameworks used in the analysis include Boaler and Humphreys' (2005) questioning types, Wimer's (2001) categories of higher order and lower order questioning, and Boston's (2012) rubrics for high vs. low-level student responses. Our results show that teachers asked 61 general questions during mathematical discussions; 21 of the questions were identified as higher order questions, and 17 of which generated high-level student responses. High-level questions were responded by up to 35 words, while the number



of words used on average was 9. The findings are important because some teacher questioning practices were more likely than others to yield longer student explanations leading students to engage more during the discussion.

## **Introduction**

Numerous researchers demonstrate that the questions teachers ask have a key role in classroom instruction. In a classroom, teachers use questions as instructional signals to evaluate student progress and to prompt student thinking. Teachers frame students' engagement with the task and provide opportunities for conceptual learning (Kazemi & Stipek, 2001). Henningsen and Stein (1997) noted that teachers are responsible for consistent and active support to students' engagement as well as appropriate set up of mathematical tasks. More importantly, teacher questioning in a mathematical environment can lead students through the task in particular ways (Boaler and Humphreys, 2005). In this regard, some teachers ask deeper questions allowing students to find their own way, while some ask surface questions that are not built on key concepts.

Many previous studies address questioning by developing theoretical models, analyzing different levels and types of questions (Boaler & Humphreys, 2005; Nikki, 2003), by investigating the value of questions (Sorto, et al. 2009), and even by separating questions into categories (Tienken, et al. 2009). This study extends these ideas to show how one can analyze both questions and more importantly students' responses in context to better understand the close connections between them. It takes into account flow of the discussion, while focusing on the individual teacher questions and student responses.

In this study, we investigate whether the type of questions that teachers asked seems to impact on the nature of student responses. More specifically, we examine whether a higher

order teacher question indicates a high-level student response in a mathematical context. If so, we seek to understand what types of higher order teacher questions generate high-level student responses.

## **Methods**

### *Participants*

This study was conducted in a large urban school district. There were 3 schools from this district; 2 middle schools and 1 high school. Four mathematics teachers were selected for this study. Two of the teachers were female while the other two were male. The teachers shared many similarities as all teachers came from similar schools, taught similar concepts and skills, used similar classroom structures (a combination of collaborative group and whole-class discussion of problem-solving strategies), and had an average class size of 24 students.

### *Videotaped Lessons*

Four teachers were observed once during a two-week data collection period. In total, 4 lessons were recorded and the recordings lasted an entire block class period of 90 minutes without any break.

### *Identifying Dialogues*

Each classroom had a standard structure including three phases: Warm-up, activities, and whole class discussion. In some classrooms, classroom interaction required this structure to be repeated more than one time. First, each classroom teacher presented a brief introduction of the lesson. During the activities phase, the teachers posed a problem and students worked on the problem and discussed the solution within a smaller group composed of 2 to 4 students.

Last, during the share and discuss phase, the teachers led a whole class discussion before moving on to the next question. In this study, teacher-student dialogues were obtained from whole class discussion part of the classroom hours.

### *Teacher Questioning*

Since a range of question types is recorded in our observations, we analyze the questions in terms of three aspects: Cognitive level, type of question, and number of words in the students' response. The potential cognitive levels of teacher questions are measured into two categories: Higher order and Lower order questioning (Wimer, et al. 2001). Second, we identify the type of teacher question using a framework by Boaler & Humphreys (2005). This framework consists of nine types of questions: Gathering information (G), inserting terminology (IT), exploring mathematical meanings and relationships (EMM), probing (P), generating discussions (GD), linking and applying (LA), extending thinking (ET), orienting and focusing (OF), and finally establishing context (EC).

**Figure 1. Classification of teacher questions by level and type**

Categories		Examples
<b>Level</b> (Wimer, et al. 2001)	Higher order	<i>Why did that work in this case?</i>
	Lower Order	<i>What is the special name of the triangle?</i>
<b>Type</b> (Boaler and Humphreys, 2005)	Gathering information, checking for a method (G)	<i>What is the value of y in this equation?</i>
	Inserting terminology (IT)	<i>What is this called in mathematics?</i>
	Exploring mathematical meanings and relationships (EMM)	<i>What does perpendicular mean?</i>

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Probing (P)	<i>How did you get ten?</i>
Generating discussion (GD)	<i>Is there any other opinion about this?</i>
Linking and applying (LA)	<i>In what other situations could you apply this?</i>
Extending thinking (ET)	<i>Would this work with other numbers?</i>
Orienting and focusing (OF)	<i>What is the problem asking you to do?</i>
Establishing context (EC)	<i>How do meteorologists decide the chance of rain?</i>

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### *Students' Responses*

Student responses were analyzed from transcripts of classroom talk and videotaped lessons. Each response provided by students is identified and scored using the *Student Discussion Following the Task* rubric of the Instructional Quality Assessment (IQA) in Mathematics Rubrics, which has been tested for reliability and validity in secondary classroom settings (Boston, 2012). Using the selected rubric, we scored the cognitive demand of student responses into two categories: High-level (scored as 3 or 4) and low level responses (scored as 1 or 2). We also identified the number of words in each student response in order to explore how long students engaged in providing a response.

**Figure 2. The categorization of students' responses by *Student Discussion Following the Task* IQA rubric.**

Indicators	Score Level
The student response provides evidence of students' mathematical thinking and reasoning (such as multiple representations or strategies, diagrams, etc.) AND <u>an explanation is explicitly required</u> . Ex:	
T: Chris, what could you tell us about the pattern from set A? S: <i>They are parallel and they increase at a rate of 3. And we call it the slope. (Used his own diagrams to explain)</i>	4

The student response provides evidence of students' mathematical thinking and reasoning (such as multiple representations or strategies, diagrams, etc.) BUT no explanation is required. Ex:

T: How could you multiply this,  $K^8 \cdot J^7 \cdot K^{13}$ ? 3

S: *First, we have to group two k's to be k to the 21<sup>st</sup> power.  
(Showed his solution pathways)*

The student response is a computation or procedure...or procedural explanation such as "Show your work." Ex:

2

T:  $X-3=9$ . So, what do we need to do here?

S: *Add 3 to both sides*

Students provide brief numerical or one-word answers (e.g., fill in blanks, provide only the result). Ex:

1

T: Is a rectangle a parallelogram?

S: Yes

## Results

Our study shows that during the whole class discussion, teachers ask between 12-20 questions. However, more than half of the questions are lower order questions requiring students to give short (yes/no) answers, state only facts, and follow procedures.

Table 1 demonstrates how the level of teacher questions relates to the level of student responses: a) 21 out of 61 were higher order questions, while 40 out of 61 were lower order questions; and b) 82% of the identified higher order teacher questions generated high-level student responses, whereas 95 percent of the lower order teacher questions generated low-level student responses.

**Table 1. Level of Teacher Questions in Relation to Level of Students' Responses**

		Level of Student Responses		SUM
		High	Low	
Level of Teacher Questions	High	17	4	<b>21</b>
	Low	2	38	<b>40</b>
<b>SUM</b>		<b>19</b>	<b>42</b>	<b>61</b>

There were several important findings from this study. First, we found that the level of teacher questioning significantly impacted the level of student response

( $\chi^2 = 37.04$ ;  $p < .0001$ ).

More specifically, probing (P) type of question most frequently generated high-level student responses (scoring a 3 or 4 on the IQA rubric). This specific type of questions led students to explain their thinking for their own benefit and for the class. The second type of question most often generating high-level student responses was Linking and Applying (LA) that refers to the relationships among mathematical ideas and mathematics and other areas of study or life. The most interesting finding was that although Gathering Information (G) type of questions were the most frequently used (29 out of 40) type of question causing low-level responses, it sometimes led students to develop a considerable amount of deeper and high-level responses. Table 2 shows examples of how G-type of questions can generate different level of student responses in different scenarios. Second, our results indicate that average of number of words in students' responses for higher-order questions is significantly higher than the average of number of words in students' responses for lower-order questions ( $t(59) = 3.17$ ;  $p < .01$  [one-tailed]). So, the type and the level of teacher questions affect how much students engaged in providing response. High-level questions were answered by up to 35 words while the number of words used was 9 on average. On the other hand, student responses to lower-order questions included up to 20 words and 5.6 on average. In sum, some teacher questioning practices were more likely than other to yield longer student explanations leading students engage more during the discussion.

Overall, when the lessons with high-level implementation are compared to lessons with low-level implementation, they differ in some ways. We can conclude that higher-order teacher questioning can support high-level students responses that are evidence for mathematical

thinking and reasoning. The results enabled us to examine also the length of student engagement by the number of words used. Our findings suggest that high-level student responses provide evidence for more engaging and deeper student participation. The more times students spend engaged during instruction, the more they learn (Gettinger & Seibert, 2002)

**Table 2. Example of “Gathering Information” Questions and Different Levels of Student Responses.**

Examples of teacher questions	Student responses	The score of Student response
<b>Lets look at <math>r^3 (s^7 + r^2)</math>. What property do you need to use in order to simplify it?</b>	Distributive property	1
<b>How could you multiply the following, <math>K^8 \cdot J^7 \cdot K^{13}</math> ?</b>	First, we have to group two k's to be k to the 21 <sup>st</sup> power. (Explaining with his own diagram)	3

### Implications and Discussion

Before we discuss the implications of the findings, we identified two limitations within the design of the study. First limitation was the study’s sample size of 4 teachers at the middle and high school level. To increase the study’s validity, a larger sample size would be desirable. A second limitation is that the presence of the cameras may have altered teachers’ instructional behaviors in a direction that would please the researchers.

The findings of this study help researchers better understand what type and level of mathematical questions create classroom environments in which students are more engaged. The study examines how teacher questioning affects student responses that are evidence of conceptual understanding. Based on the findings, this study suggests that teachers can improve

student engagement by asking Linking and Applying (LA) and Probing (P) types of questions during the discussion. In other words, the results of this study may profoundly guide teachers in planning better classroom discussions with the purpose of developing teacher-student dialogues.

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**Benjamin and Contemporary Art: Communicating Truth in Experience**

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***Benjamin and Contemporary Art: Communicating Truth in Experience***

For centuries there has been a battle regarding the definition of truth: what exactly is truth? Where do we look for truth? How do we look for truth? Is truth a totality or is it multiple, consisting of many singular truths but no complete truth? And finally what is it (facts, experiences) that enables one to approach a concept of truth? I doubt I will be able to definitively answer these questions over the next fifteen minutes, but they are some of the questions one must keep in mind while engaging in a discussion of truth. What I do intend to do is to argue for a theory of truth that aligns itself with experience of the material, or profane, world. One where truth is not something searched for on high where the one in search of truth can merely retrace a well-worn path, all be it with some difficulty, to arrive at truth. Rather, this notion of truth is one that embeds itself in the world of experience as it unfolds through time and flashes into existence in the “now of knowability.” I will first attempt to outline the theory of truth that presents itself in the writings of Benjamin. I will then show that by using Benjamin’s concept of truth in experience, one is able to illustrate the importance of contemporary painting as a source of profane illumination, and as a medium in which experience is kept alive and transmitted. Contemporary art as that which can save experience, that “has fallen in value”, and prevent experience from “[falling] into bottomlessness” (Benjamin, “The Storyteller” 143).

A quick note on the difficulty of interpreting Benjamin. Benjamin develops an intricate portfolio of work that stretches across the liberal arts genres; philosophy, literature, critical theory, aesthetic theory, and history to name but a few. Because of this, Benjamin’s concepts are presented in a number of different frameworks. The task of interpreting Benjamin entails understanding the way his concepts operate within a variety of frameworks and then finding a common thread within these varied instances that can be united to form a more complete concept. To further complicate the situation, Benjamin’s untimely death, while trying to escape the Nazi’s, left much of his work incomplete and unpublished. Therefore, one must operate as Benjamin would want and construct out of his literary fragments a

dialectical image such that “in the analysis of the small individual moment the crystal of the total event [is discovered]” (Benjamin, *Arcades...* 461).

### *I. Sketching a Theory of Truth in Benjamin*

Benjamin states that truth is “made up of ideas. ... Truth is not an intent which realizes itself in empirical reality; it is the power which determines the essence of this empirical reality. ... [Ideas] are not so much given in a primordial language as in a primordial form of perception” (Benjamin, *The Origin...* 36). To this, Benjamin adds that truth “is an intentionless state of being” (Benjamin, *The Origin...* 36), “is not watertight” (“Language and Logic” 272), “resides in the ‘now of knowability’” (“Theory of Knowledge” 276), and does not exist “about an object. Truth is only *in* [an object]” (“On the Topic of...” 404). These examples, taken from multiple works, must be analyzed more thoroughly to gain a clear understanding of this concept of truth.

However, before deconstructing these examples, perhaps it is beneficial to quickly illustrate the notion of truth to that Benjamin is arguing against. Benjamin refers to the more routine and socially accepted idea of truth as “the bourgeois conception of truth.” By this theory, truth is thought to be an aggregate of knowledge of judgments. This type of knowledge is testable, calculable, repeatable, universal and able to be easily communicated and catalogued. In this way, truth is composed of knowledge that consists of information or data. Benjamin argues that this knowledge is important, and has a relationship to truth, but truth is not composed of this knowledge. As Benjamin claims, “Knowledge and truth are never identical; there is no true knowledge and no known truth. Nevertheless, certain pieces of knowledge are indispensable for an account of truth” (Benjamin, “Truth and Truths/...” 279). It is important to understand that Benjamin is not attempting to completely negate the importance of knowledge as information, but merely wants to distance it from truth.

Returning to Benjamin’s definitions of truth, one is immediately struck by the relationship these definitions share to temporality and the material/objective world. Humanity experiences truth

temporally and truth presents itself in a historical moment as a constellation or dialectical image. This is not to say that truth itself is momentary, merely that humanity can only perceive truth momentarily when it flashes forth and is recognized in a historical constellation. This idea of recognition presupposes something pre-existent, to which one has not yet awakened. Truth blasts through the continuum of history and intersects with the present moment. Temporally, everything exists in the present moment, in 'now-time,' even the past. When one analyzes the past, one does so within the confines of the present moment.

It is essential to understand the temporal aspect within Benjamin's theory in order to illustrate an accurate image of truth in experience and how contemporary art is vital to its transmission. To begin with, temporality serves to separate knowledge in experience from mere knowledge of information. As Benjamin illustrates, "The value of information does not survive the moment in which it was new. It lives only at the moment; it has to surrender to it completely and explain itself to it without losing any time" (Benjamin, "The Storyteller" 148). Opposed to this idea of information, is the storyteller, the artist, whose work "does not expend itself. It preserves and concentrates its energy and is capable of releasing it even after a long time. ... It is like those seeds of grain that have lain for centuries in the airtight chambers of the pyramids and have retained their germinative power to this day" (Benjamin, "The Storyteller" 148). What is at stake in this distinction is the very manner by which humanity approaches the material world. Objects such as artworks (visual, literary and sonorous) have a connection to truth that unfolds through time. Their meaning expands through time as the artworks continue to intersect with an ever-changing present moment. Information, conversely, becomes obsolete. Its ability to interact with the present moment ceases the instant a new set of information replaces it. With the ever-increasing prevalence of the Internet in society's daily life, the transmission of information is reaching an intensity unfathomable in Benjamin's time.

The notion of amplification of experience found within the framework of artworks, given their ability to unfold through time, is central for Benjamin's theory of truth. I have already stated that truth is made up of ideas, but additionally, each "idea is a monad - that means briefly: every idea contains the image of the world. The purpose of the representation of the idea is nothing less than an abbreviated outline of this image of the world" (Benjamin, *The Origin...* 48). So then "The task of interpreting works of art is to concentrate creaturely life in ideas" (Benjamin, "Letter to Florens..." 389). Works of art operate as types of language that communicate the natural world through the presentation of the idea within the medium of the art. However, one must remember that this image of the natural world comes into being only at the moment when multiple ideas resonate together to form a constellation. This means that every artwork is not at all times communicating the truth of creaturely existence. Artworks are merely special sites that allow for truth to speak through them at certain moments.

## *II. Truth, Experience and Contemporary Painting:*

The decisive development within painting is the introduction of the camera and its widespread use in society. The first cameras were actually invented in the 16th century, but they started to become prevalent in the middle of the 19th century. Cameras "lead to a crucial insight: for the first time in world history, technological reproducibility emancipates the work of art from its parasitic subservience to ritual" (Benjamin, "The Work of Art..." 256). I completely agree with Benjamin on this assessment; however, he uses this assessment to then argue that painting becomes tied to exhibitions and politics. I counter that this freeing of the work of art by use of the camera allows painters to finally begin to experiment with painting as a means of representing forces and experiences outside the confines of painting literal subjects (people, gods and buildings). Art is able to be that which makes "secret visions seen" (Klee 51).

Just as the storyteller is fading away within society and taking with her/him the ability to communicate knowledge through experiences (Benjamin, "The Storyteller" 144-146), the artist as

painter is able to take as its subject matter the presentation of experiences. Prior to the camera, painting was eternally bound to conveying, at least in part, information. The majority of paintings were portraits, still-lives or landscapes and these paintings were judged on their ability to represent the subject matter faithfully. I do not want to suggest that prior to the 19th century art was based solely in the mimetic representation of the world of appearances. I would actually argue that what sets masterpieces apart as artworks that have remained relevant as they unfold through time, is precisely that they present much more than merely a faithful representation of the subject matter on which they are based. Moreover, it seems as though the intent of great artists in all fields has always been to represent more than what meets the eye at first gaze.

The artist:

does not attach such intense importance to natural form as do so many realist critics, because, for him, these final forms are not the real stuff of the process of natural creation. For he places more value on the powers which do the forming than on the final forms themselves. He is, perhaps unintentionally, a philosopher, and if he does not, with the optimists, hold this world to be the best of all possible worlds, nor to be so bad that it is unfit to serve as a model, yet he says: 'In its present shape it is not the only possible world'. (Klee45)

Paul Klee illuminates the artist as one invested in the natural language of the world. Only, the artist presents this natural language as images on the canvas. Perhaps in some instances, before translating the language of nature into the language of man, it is necessary to present the language of nature as an idea, an image, a painting.

Contemporary painters differ from painters of the past in the degree of their freedom to pursue these 'unseen visions' in their artworks. Gerhardt Richter focuses on themes such as "faith versus skepticism; hope versus pessimism; engagement versus neutrality; self-determination versus fatalism;

imaginative freedom versus ideology” (Storr 17). In his abstract work *December* (Figure 1), Richter presents a canvas that at once arrests the gaze of the viewer. To begin with, one must keep in mind the size of the work. Its dimensions are roughly 10.5ft x 13ft, so the viewer is literally absorbed into the work. Next, one notices the color choice. Richter uses colors associated with the month of December; we see black, white, grey, and a smattering of light yellow, pale blue and burnt orange. However, these are not the colors of December in Hawaii. One gets the feeling of being in a northern region, one that is cold, barren, and isolated. Along with the choice of colors, Richter uses techniques to both blur (more so than blend) the colors and create vertical and horizontal striations. Depending on the association of the viewer with the month of December, or more generally winter, these vertical striations may come to the foreground causing the scene to appear as though light and snow are visible as one looks out across mountains or a forest. However, the horizontal striations give the impression of a reflection in water, causing the viewer to think of looking out across a lake in winter. However one chooses to interpret this painting, the key is that Richter has not presented a representation of a single object or event, and the name he has given the work attests to that fact. December, a month, a duration of time and a general event so plebeian it is something every individual has experienced.

Josephine Halvorson is a contemporary painter who focuses on profane objects. Rusty door hinges, old blinds, scrap metal, books or a fire place are all perfect examples of objects Halvorson paints. The first painting of hers I would like to discuss is titled *Heat 2* (Figure 2). Halvorson has painted an entire series of fireplaces. The fireplace itself is nothing special. In fact, there is nothing at all in this work that stands out and identifies it as being special except for its ability to communicate the sensation of heat through the painting. Not only does it communicate heat, it communicates a specific type of heat. It is a cozy heat that implies security and comfort; possibly family and home. It is a painting one would want to come inside and stand near during the winter. This painting is of an everyday object that most people have seen a thousand times, and yet, the painting is able to awaken something in the viewer;

this involuntary awakening is a feeling, a past experience, story or memory. It has the potential to awaken as Benjamin might say, “a not-yet-conscious knowledge of what has been” (Benjamin, *Arcades* 458).

The second painting of Halvorson’s I would like to analyze is *Woodshed Door* (Figure 3). This painting is exactly what the title implies, a woodshed door. But it is an old, decaying woodshed door. Once again, the painting is bringing forth through the intensity of the detail and the everydayness of the image, a general opening to shared past experiences. This door might be a grandparent’s house, the spooky abandoned shed next door, or the reminder of the decay of man-made society and civilization. With Halvorson’s technique, there is no distance between the object being painted and the viewer. Everything is painted as if the viewer is standing right next to the object in the painting. This forced nearness to the object makes it appear as though it is actually coming to you in your minds eye. There is no surrounding context for the object, so the viewer’s mind is forced to provide a context on its own and does so by arranging this painting in relation to a memory or past experience. As it turns out, this painting is actually of the woodshed door at the artist’s home, and thereby has an actual sentimental value to her, but it is a detail unnecessary to interpreting the work. Halvorson says an interesting thing happens for her when she paints an object such as this door in that the painting becomes part of the door, but the door also starts to become part of the painting. She no longer looks at the door without thinking of it as a painting and vice versa.<sup>1</sup> I include this merely to illustrate that paintings can have specific, concrete meanings to the artists themselves, but this does not mean that the interpretation of the work as it unfolds through time must necessarily, or even should, be grounded in this intentionality of the artist.

One must be careful when analyzing specific works not to fall into a trap where the value or meaning of the work is solely attributed to the psychology of the viewer, the ability of the viewer to

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<sup>1</sup> This information was gathered at a lecture by Josephine Halvorson at the Philosophy and the Arts Conference at Stony Brook University, March 29th, 2014.



connect the work with a memory. One must analyze the way the work is able to unfold and allow for an amplification of meaning through the experience of the work. As Benjamin argues, “an experienced event is finite—at any rate, confined to one sphere of experience; a remembered event is infinite, because it is merely a key to everything that happened before it and after it” (“On the Image...” 238). In the case of *December*, Richter is conveying an experience of nature, an experience of a season that spreads out in time. This is not an image frozen in time, but rather an image that exposes a duration and depth of time. *Heat 2* conveys an experience of sensation, the experience of warmth. And *Woodshed Door* translates the experience of the profane object of decay and forces the subject to supply the context, to arrange it in a constellation of one’s own memory.

For Benjamin, it is the art of the storyteller that embodies to the fullest degree the ability to transmit experiences through time, allowing them to unfold and amplify within the now-time of the present moment. Benjamin’s grave concern is that the art of the storyteller, and the transmission of experience it provides, may be lost due to both the disappearance of oral traditions within society and the loss of the ability of the subject to properly experience the art of the storyteller. I counter that contemporary art is uniquely suited to step in and fill the void of the storyteller. However, I share in Benjamin’s concern that within modernity the individual who can understand, so to speak, the storyteller is increasingly rare. It is not the case that one must be ‘educated’ correctly to be able to understand the storyteller or the painting, but it is a way of experiencing life that is required. This way of experiencing life, taking one’s time, allowing oneself to be absorbed or consumed within a work or a situation that one does not comprehend, is not embraced by American society. In fact, American society often reacts with hostility against that which it is not able to quickly comprehend. Benjamin speaks of art as types of language, and just as learning a new language takes time and repeated exposure so, too, does understanding the language of art.

Americans are enmeshed in an on-line world where Twitter and Facebook have replaced newspapers and journalism. I do not want to devolve into a critique of modern society. However, as a society we must strive to re-emphasize the importance of the experience of everyday life. It is this experience, the experience of the trivial, the mundane, that connects humanity throughout history, and it is through art that the truth in this experience can be transmitted. It is the truth of the natural world, truth of creaturely existence, that contemporary art strives to communicate, but it requires the appropriate gaze of the viewer in order to “blast open the continuum of history” and “blast a specific era out of the homogeneous course of history” (Benjamin, “On the Concept...397).

Appendix



Figure 1. Gerhard Richter, *December*, 1989. Oil on canvas, 126" x 158."

The Saint Louis Art Museum, St. Louis.

<http://paulcorio.blogspot.com/2010/03/paintings-i-like-pt-51.html> , accessed May 4th, 2014.



Figure 2. Josephine Halvorson, *Heat 2*, 2014. Oil on linen, 16 x 19 in.

Sikkema Jenkins & Co. New York.

<http://www.sikkemajenkinsco.com/?v=exhibition&exhibition=5287ed23a563d#null> , accessed May 4th, 2014.



Figure 3. Josephine Halvorson, *Woodshed Door*, 2013. Oil on linen, 70 x 35 in.  
Sikkema Jenkins & Co. New York.

<http://www.sikkemajenkinsco.com/?v=exhslideshow&slideNum=7&exhibition=5287ed23a563d&type=artwork>

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## **Shallow talk of Chinese higher education: Inequity within Chinese Higher Education Admission**

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PROFESSIONAL DOCTORATE IN EDUCATIONAL LEADERSHIP

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**Duquesne University 2<sup>nd</sup> Graduate Symposium Research Paper**

**Shallow Talk of Chinese Higher Education: Chinese Higher Education Amission Is Inequitable**  
**by**  
**(ZHE JI)**

Submitted on Nov. 2, 2014 in partial fulfillment of the requirements 2<sup>nd</sup> Graduate Symposium  
Conference  
Duquesne University.



### **Introduction**

China is experiencing a brain drain in which Chinese students are seeking higher education in locations other than China. The definition of brain drain in this paper indicated that the inequitable Chinese higher education causing increasing numbers of native intelligent students seeking academic achievement in overseas, especially U.S. The problem of practice investigated within this paper is: the inequitable Chinese higher education admission process is causing a brain drain, especially to U.S.

Higher education is seen as one of the important ways to change one's destiny in China. The Chinese national test is in some ways like the American SAT, except that it lasts more than twice as long. The nine-hour test is offered just once a year and is the sole determinant for admission to virtually all Chinese colleges and universities. About three in five students make the cut (LaFraniere, 2009). In other words, China's annual National Higher Education Entrance Examination is life-altering. How to ensure educational equity and how to ensure equal access to Chinese higher education increasingly becomes the focus of attention by native Chinese people. Inequities in Chinese higher education are based on many complex reasons, and China should take the necessary policy measures to address the issue of fairness of higher education admission in order to achieve the progressive realization of Chinese higher education fairness.

### **High Leverage Problem**

In contemporary Chinese society, there is nothing more important than Chinese higher education, which is the most controversial topic. Under the traditional Chinese values of education, almost all the parents will put all their expectations, energies and savings into the process of their child's academic journey, which makes higher education in China a fervent topic (Liu, Ma, & Zhang, 2005). However, as a developing country, China's educational system has a long way to go, and one of the typical problems is that the Chinese society lacks the necessary checks and balances to promote

educational equity. It is hard for most ordinary citizens' children or the majority of Chinese social class (which means the Chinese middle classes' children) to get into major colleges and better universities. For example, China has "211 project" universities and some universities are 'key point' institutions drawing students by quota from all provinces of China. These universities are under direct control of the State Education Commission (Harman, 1994). Most ordinary students have to pay more expensive tuition fees, sponsorship fees, and so on, than those students who have different "backgrounds." Furthermore, the saddest fact is that students from civilian families who study so hard in order to get a higher score from the Chinese national test still would not be able to enter those better colleges or access their own long-standing favorite college because of the unfair treatment in Chinese higher education. Those students who have "background" might much easier enter a better college without a better test score.

Higher education in China has grown vigorously over the last two decades (Min, 1991; World Bank, 1997). However, the rapid development of the Chinese higher education environment has also caused different problems, and the most impactful issue is about the admission process of Chinese national higher education entrance examination. China's higher education has been following a nationwide program of enrollment, and officially stated there is no injustice in sexism, racism, and traditional Chinese ethnic discrimination. Nevertheless, China's higher education opportunities and admission process still have been facing some inequitable treatment in regional distribution, students' family background distribution, and other aspects of urban and rural distribution.

Although the Chinese higher education system has been expanding enrollment in institutions for students, the rate of admission in different provinces has been occurred many differences. "Strong on paper, weak in practice" (Lawrence & Martin, 2013). This simple sentence definitely expresses the voice of millions of Chinese students, and it is powerful, profound, and thought-provoking. Students must be enrolled in the Chinese national higher education entrance examination in their hometown of

household registration, which means that candidates and enrollments from different locations in different regions facing the same national entrance examination have a significantly different admission score line in the whole admission process. Under the current system, each year a uniform entrance examination is given simultaneously in all parts of China. The State Education Commission organizes groups of experts to set examination papers. “The minimum entry marks for different levels of institutions are determined by provincial admissions committees according to the overall performance of applicants and the number of students to be enrolled in the province, laid down by the annual state plan. This differs from province to province and from year to year” (Wang, 1992, p. 141). Candidates face a different admissions process for attending their dream school at the outset.

### **Systematic and Intentional Inquiry**

To understand the multiple issues of Chinese higher education, researchers are responsible for making sense of the contemporary political system of China, not only in Chinese education, but also all other aspects of Chinese society fully under control by the government. China’s Communist Party dominates the state and society in China, is committed to maintaining a permanent monopoly on power, and is intolerant of those who question its right to rule (Lawrence & Martin, 2013). According to the contemporary statistics of Power Distance Index, the PDI normally is the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally (Bassbe & Ros, 2005). At a score of 80, China sits in the higher rankings of PDI – i.e. a society that believes that inequalities amongst people are acceptable. One of the major influential factors for educators who keep a strong will to despite all risks, tear down barriers that obstruct democracy and justice in Chinese higher education is educational corruption. Tsang (2000) addressed that “in post-1949 China, the State has a dominant role in all major aspects of national life, including education affairs; and the CCP has a monopolistic power over the Chinese State” (p. 23). Obviously, it is hard for educators, administrators, and teachers to demonstrate the justice in education under

bureaucratic social circumstances, for instance, educational corruptions, centralization and inequitable admission.

China has 23 provinces, four municipalities, five autonomous regions, and two special administrative regions (Hong Kong and Macau). Except the two special administrative regions, all other high school graduate students who come from any other locations and wish to enroll into Chinese colleges or universities for undergraduate study have to take the national entrance examination, which commonly known as GaoKao. The Chinese massive, multi-day test "gaokao" which is the national college entrance examination is commonly seen as the only factor that determines a young person's future in China. Each student's score on the test determines whether or not they will go on to college, and additionally the "gaokao" might be unfair for those high school graduates, geographical segregation and discriminations exists in the admission process between different provinces. For instance, under the present Ministry of Education– approved quota system, the chance for a test taker in Henan to be admitted into college, especially into a first-tier college (colleges directly affiliated with the Ministry of Education), is much lower than that of students in most other provinces (Peking University Constitutional and Administrative Law Center 2009). At this point, assume that three students graduated from a high school in Henan province and took the National College Entrance Exam in 2006. They scored 522 (science track), 506 (humanity track), and 457 (humanity track), respectively. If they had been test takers in Beijing, they would have had a chance to be admitted to a first-tier college, because their scores surpassed the minimum line for admission into first-tier colleges in Beijing. The issue of regional discrimination in college admission came to register in the public mind and became an unfading topic in media coverage (Zhang, 2010).

China's current college entrance examination system performs the implementation of the entrance quota allocated by region. For instance, Beijing is the capital of China, and Beijing candidates normally accounted for around 1% of the total number of candidates enrolled in the national test over

the years. Its actual admission quota assigned to Beijing still exceeded that of all other provinces, although the population of Beijing only ranked 27 out of the 34 provinces and regions (National Bureau of Statistics of China 2001). Tsinghua University is the national top leading University located in Beijing, and normally Tsinghua University would accept around 3,000 freshmen each year through Chinese national entrance exam. Tsinghua University makes about 20% of the admission quota allocated to Beijing, which means around 600 individuals are admitted, while each of the other provinces only admit less than 200 individuals of the admission enrollment. As a result, this particular practice directly causes those candidates whom have household registration in Beijing to have a lower admission score line. Alternatively, in all other provinces' students are facing difficult situations, higher admission score lines, and more competitive challenges in order to be admitted to Tsinghua University. This fact clearly belongs to the admission quota injustice. In 2012, more than nine million Chinese high school graduate students have taken the national entrance test, whereas the tendency and numbers of enrollment in the national exam keep descending because of those complex inequitable issues in recent years.

### **Critical Review of Data and Perspectives**

The Institute of International Education (LIE) Open Door Report 2012 is supported by a grant from the Department of State's Bureau of Education and Cultural Affairs, and is the world's largest and most experienced international education and training organizations founded in 1919. The following chart is retrieved from LIE's professional statistics, and shows you the top sending places of origin and percentage of total international student enrollment. Utilize the chart to provide the transparent comparison in order to investigate my problem of practice.

Table 1

*Degree Level, Top 10 Places of Origin for the United States, 2011-2012*

Total	Non-degree-	Students
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	Top Ten	Number of	Undergraduate	Graduate	seeking	Optional
Place of	Places of	International	International	International	International	Practical
Origin	Origin	Students	Students	Students	Students	Training
#1	China	194,029	74,516	88,429	12,690	18,394
#2	India	100,270	13,059	59,014	1,425	26,742
#3	South Korea	72,295	38,232	21,260	6,996	5,807
#4	Saudi Arabia	34,139	14,344	6,133	13,214	448
#5	Canada	26,821	12,866	11,190	625	2,140
#6	Taiwan	23,250	6,000	12,007	1,866	3,377
#7	Japan	19,966	9,359	4,403	4,611	1,593
#8	Vietnam	15,572	11,244	2,649	864	815
#9	Mexico	13,893	7,564	4,188	1,096	1,045
#10	Turkey	11,973	3,495	6,198	989	1,291
Total of All Places of Origin	Total	764,495	309,342	300,430	69,566	85,157

Source: Institute of International Education. (2012). Open Doors Report on International Educational Exchange.

The statistics above provide a comprehensive information resource on international students and scholars studying or teaching at higher education institutions in the United States in 2012. The

growth is largely driven by strong increases in the number of students from China, particularly at the undergraduate level. The Open Door Report addressed that Chinese student enrollments increased by 23 percent in total and by 31 percent at the undergraduate level from 2011 to 2012 (Open Door Report, 2012), and a 207% increase from a decade ago, according to the Institute of International Education. This statistic is not only true for 2012, but also the Chinese students occupied the number one international students list of the U.S. for three consecutive years from 2009 to 2012 (Open Door Report, 2012).

Attending a U.S. institution of higher learning is a costly venture for Chinese families, more than 60% of who privately funded students' costs. The chart above might not directly show the reason of my problem of practice issues, whereas immediately one may observe the tendency of Chinese students to seek academic achievement in U.S. and express brain drain. By coincidence, the following comparative chart is personal made based on the stats from the Open Door Report 2012, and providing audiences with a clear blueprint of statistics of Chinese national entrance examination in recent years as well as the same shown time above, and the tendency goes down while the oversea students keep increasing. The numbers of national entrance exam from 2009 to 2012 has significantly decreased, while the numbers of Chinese students study in overseas from 2009 to 2012 has increased, and the numbers of Chinese students study in America from 2009 to 2012 has also increased, see table 2 below.

Table 2

*Relationship of Stats Among Chinese Students in Overseas, U.S., and National Exam*

	2009	2010	2011	2012
Numbers of	10.2 Millions High	9.57 Millions High	9.33 Millions High	9.15 Millions High
National Entrance Exam	School Graduates	School Graduates	School Graduates	School Graduates
	2009	2010	2011	2012

Numbers of				
	2008/2009	2009/2010	2010/2011	2011/2012
Chinese Students	230,000	280,000	340,000	400,000
Study in Overseas				
Numbers of				
	2008/2009	2009/2010	2010/2011	2011/2012
Chinese Student	98,235	127,822	157,558	194,029
Study in America				

Notes: this is where author provide extra information important to the data, such as findings of the relationship among three types of statistics.

By analyzing the chart above, I personally concluded that the number of college entrance exams keeps diminishing while the number of students going abroad, especially to U.S., has increased. In addition, it is worthy for scholars, educators and researchers to ponder how reductive numbers of college entrance exams could promote the reform of the Chinese higher education admission process, and this might be a concern to Chinese people. But, statistically, it seems that there is not very obvious relationship between the number of national tests and the numbers of Chinese students in U.S. In Chinese culture, America is a dreamland for most Chinese intellectuals, as soon as Chinese students finish their studies, they will have better opportunities in China and it is up to them to decided to return to their homeland (Liu, 2008). However, behind these boundaries, the data also highlights the problems of the Chinese college entrance examination system and its admission process causing Chinese parents to choose other countries especially U.S. for better educational circumstances as well as the impact of Chinese traditional values in a modern pluralistic society.



### Critical Social Theories and Epistemological Frameworks

Democratic education is a theory of learning and school governance in which students and staff participate freely and equally in a school democracy. In a democratic school, there is typically shared decision-making among students and staff on matters concerning living, working, and learning together (Saltmarsh, Hartley, & Clayton, 2009). In recent years, new ideology and different educational ethos springing up constantly in world educational fields have a deep impact on the educational system in China. Furthermore, because democratic education is one of the most popular educational pedagogies in the world, most Chinese scholars and researchers are familiar with democratic educational theory. These scholars commonly believe that the future nature of China's educational modernization is the organic composition of educational democratization, educational freedom, and educational autonomy. All of those characteristics are the essential connotation of self-determination of higher education.

Nowadays a growing number of young Chinese logs onto websites for free video courses offered by prestigious U.S. colleges and try to accept the new ethos and American democracy culture. America's capacity to survive as a democracy relies not only on the provision of free public education, although that is a crucial foundation; it rests on the kind of education that arms people with an intelligence capable of free and independent thought (Darling-Hammond, 1996). In addition, As Lee, Ira, and John (2007) argue in *Dewey's Dream*:

For universities and colleges to fulfill their great potential and really contribute to a democratic...revolution, they will do things very differently than they do now. To become part of the solution, higher Eds must give full-hearted, full-minded devotion to the painfully difficult task of transforming themselves into socially responsive civic universities and colleges. To do so, they will have to radically change their institutional cultures and structures, democratically realign and integrate themselves, and develop a comprehensive, realistic strategy (p. 84).

China is endeavoring to strengthen its education, and is learning from those countries including America,

which are strong in education, science and technology. Although these new educational ethos and trends are causing a huge impact on China's education system, the essence of China's education system has not changed and there is no influence on substantial changes of Chinese higher education, especially the admission process of Chinese higher education. The nature of most Chinese educational reforms still has no significant progress. Most students haven't received proper equal rights in higher education and are still facing those conflicts and unfair treatments based on the three main obstructions: centralization, bureaucracy, and educational corruption.

Today, Chinese educators who keep strong will despite all risks and tear down barriers ought to keep fighting with the three major influential factors in order to overcome those obstructions for a wholesome educational system of democracy and social justice in Chinese higher education. Obviously, to be honest, it is hard for educators, administrators, and teachers to demonstrate the social justice in Chinese higher education under bureaucratic social circumstances in China. For instance, educational corruptions and centralization cause inequitable admission process and the inequitable admission process causes more and more Chinese students to make the difficult decision to seek academic achievements overseas instead of native admission process of Chinese higher education.

### **Institutional Networks of Power**

In terms of Chinese institutional networks power, we probably have to take a detailed look into the Chinese Exam-Oriented system. The inequitable Chinese higher admission process is one of the major consequences of an exam-oriented system, and also one of the significant reasons (Yin & Gordon, 1994). Currently, the Chinese national test is the only way to determine students either were admitted into college or never went through the admission process, and also it is the only factor and requirement in the whole Chinese higher education admission process. Foreigners might marvel at the progress of Chinese people made in every field of study, except the methods of testing students' knowledge and ability remain as primitive as ever. It is really extraordinary that along with the rapid

development as a developing country in recent years, Chinese educationists have still failed to devise anything more efficient and reliable than examinations (Kwong, 1997; Yin & White, 1994). For all the pious claim that examinations test what you know, it is common knowledge that Exam-Oriented methods might be a good means of testing memory, or the knack of working rapidly under extreme pressure, but won't tell anything about a person's true ability and aptitude.

As examinations are second to none in China, everything for high school graduates depends on the test. It is the mark of success or failure in Chinese society, and the whole future might be decided in one fateful day. The moment children begin school in China, all of them enter a world of vicious competition where success and failure are clearly defined and measured. Can we wonder at the increasing number of 'drop-outs' young people who are written off as utter failures before they have even embarked on a career? Examinations do not motivate students to read widely, but to restrict readings; do not enable students to seek more knowledge, but induce cramming (Mok & Ngok, 2001).

Through the whole admission process, the most powerful roles in institutional networks are those anonymous examiners. The results of each single examination and the methods of evaluation only depend on a subjective assessment by some anonymous examiner. Examiners or reviewers obviously are Chinese educators and teachers, therefore, how to select academic examiners becomes the most controversial issue during whole admission process. Assume that anonymous examiners may get tired and hungry; anonymous examiners may make mistakes. Yet anonymous examiners have to mark stacks of hastily scrawled scripts in a limited amount of time and finally provide students a last life-altering score. Do you think this particular admission process expresses the social justice, equality, or inequity? Anonymous examiners work under the same sort of pressure as the candidates, and their words carry weight. After examiners' decision on students' examination, normally students have the right of appeal, but this never works. There must surely be many simpler and more effective ways of assessing students' true abilities. It is cynical to suggest that examinations of the whole admission process are merely a

profitable business for the institutions that run them.

All my previous analysis leads me to make an analogy between the United States and China, and makes me recall the cultural pedagogy. Chinese teaching-learning process looks like teachers “Putting knowledge into”; American teaching-learning process should be “Digging knowledge out” (Pugach & Kohl, 2006).

**Conclusions:**

In sum of the discussions and arguments from above, we may refresh our prospective and manners for future educational circumstances as future Chinese educators and education leaders. In terms of admission process as the significant issue in Chinese higher education study areas, the future researchers and practitioners may stand on an alternative overview of the development of Chinese education policy. By analyzing educational conflicts within social status at that time, and resolving conflicts of both negative and positive essentials of the Chinese education system, it might be important for educational reformers to break those difficulties in order to claim that the admission process -- the major part of Chinese higher education as a matter of social justice.

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**Campus Buildings as Living Laboratories: Overcoming Challenges to Zero-Energy Retrofitting — A Case Study**

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## **Campus Buildings as Living Laboratories:**

### **Overcoming Challenges to Deep-Energy Retrofitting - A Case Study**

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Ultra-low-energy buildings have many proven benefits, including utility bill savings, occupant comfort, worker productivity, resiliency, and reduction of greenhouse gas emissions. It is a goal of particular urgency, as the building sector consumes nearly half of all energy produced in the United States.<sup>1</sup> In 2012, it accounted for \$297,206.5 million in retail electricity expenditures.<sup>2</sup> However, retrofitting the existing 5.6 million commercial U.S. buildings<sup>3</sup> poses two key challenges: financing, and timing when to perform the upgrades with least disruption for occupants.

The benefits of deep-energy retrofits are proven and well-understood. Yet, these two obstacles remain entrenched, causing many building owners to view deep-energy retrofits as unfeasible and uneconomical. Our question as researchers becomes, are deep-energy retrofits, in fact, too expensive and disruptive to be a viable option?

Facing these same obstacles in retrofitting Duquesne's Rockwell Hall, alumni, students, and faculty of the Palumbo Donahue School of Business are implementing a novel strategy to retrofit the business school building, at minimal up-front cost, for extremely low energy usage. Through this "retrofit as you maintain" approach, upgrades and financing occur over time as needs arise and facilities management selects the optimal repairs and upgrades for high-efficiency performance. There is no significant occupant disruption. Transforming the building to low energy usage is projected to ultimately

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<sup>1</sup> "U.S. Electricity Consumption by Sector," *Architecture 2030*. Architecture 2030, n.d. Web. 31 Oct. 2014. Data Source: U.S. Energy Information Administration 2012.

<sup>2</sup> "U.S. States, State Profiles and Energy Estimates, 2012" *Energy Information Administration (EIA) Data*. U.S. Energy Information Administration, n.d. Web. 03 Nov. 2014.

<sup>3</sup> "2003 Commercial Buildings Energy Consumption Survey (CBECS)." *Energy Information Administration (EIA) Data*. U.S. Energy Information Administration, n.d. Web. 31 Oct. 2014.



reduce energy usage at Rockwell Hall 30 percent per year and increase the building's value.<sup>4</sup> The effort also supports the mission of Duquesne's Sustainability MBA program, headquartered at Rockwell Hall, provides a learning laboratory for its students, and a foundation for research and collaboration on campus.

### **A Field-Based Research Methodology - Establishing Baseline Performance**

Any deep-energy-retrofit plan depends on a deep understanding of the building's energy usage, including a baseline estimate of its energy usage and an assessment of its envelope air-tightness. As the Rocky Mountain Institute details in its *RetroFit Depot* guides, that enables the project team to then identify opportunities to reduce loads, determine how loads might be met passively, select appropriate and efficient heating and cooling systems, find synergies between systems and measures, and optimize controls.<sup>5</sup> Because utilities at Rockwell Hall are not metered at the building, the next best way to determine the building's heating and cooling energy usage is to create an energy model to simulate consumption based on whole-building modeling.

As an initial step in creating that model, alumni, students, faculty and local efficiency companies have completed an air-leakage test of the 165,945-square-foot (15,417-square-meter) Rockwell Hall. As Waite and O'Brien of the engineering firm, Simpson Gumpertz & Hager, write, "In many areas of the United States, reduced air infiltration can produce significantly better results than [other] common energy-efficiency measures related to the building envelope."<sup>6</sup>

Rockwell Hall comprises 10 numbered floors plus three levels below the first floor. It contains classrooms, offices, assembly places, and utility/building service spaces. In order to determine Rockwell Hall's envelope air leakage, we worked with and developed a research team of local building-efficiency

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<sup>4</sup> Fuerst, Franz; McAllister, Patrick (April 3, 2009). "[New Evidence on the Green Building Rent and Price Premium](#)" (PDF). Henley Business School. Web. 31 Oct. 2014.

<sup>5</sup> *RetroFit Depot: Identifying Design Opportunities for Deep Energy Retrofits*. Publication. Snowmass, Colo.: Rocky Mountain Institute, n.d. Web. 31 Oct. 2014.

<sup>6</sup> Waite, Michael B., and Sean M. O'Brien. "Air Leakage: Difficulties in Measurement, Quantification and Energy Simulation." Building Enclosure Science & Technology Conference (BEST2). Portland, Ore. 2010. Speech.

experts who installed 16 blower-door fans in exterior door openings throughout the lower floors of the building. They were all connected to a central, computerized control and data-recording station. Using these tools, the consulting team created building-wide pressure differentials between indoors and outdoors. To ensure that they had achieved the proper air-pressure differentials throughout the building, the team used air-pressure gauges throughout the lower floors and on the top floor of the building. We performed the testing using the procedures detailed in ASTM International's E779-10, "Standard Test Method for Determining Air Leakage Rate by Fan Pressurization."<sup>7</sup> This was one of the first, and largest, building blower-door tests ever performed at a commercial building in the United States.

Rhett Major and Samuel Major at The Energy Doctor led the testing effort on Friday, August 15, when most students were on break, with testing help and equipment supplied by members of the Diagnostic Energy Auditors of Western PA (DEAWP.org). Other Pittsburgh-area experts involved in the testing and analysis included Rob Hosken and Eric Gambal of Building Performance Architecture; Jonathan Nadle, Anthony Saccamango, and Garrett Fabian of Conservation Consultants Inc.; Brian Keech of Comfy House; Jerry Hulsenbeck of Energy Eagles; Greg Wozniak of G.A. Wozniak & Associates; Charles Cook of Home Consulting Services; Frank Ross of New Leaf Home Energy; and independent consultant Rodney Morgan. Additional blower door equipment was provided by Andy Haak and Tim Carryer of Inspired Business Development, along with Tom Branch, and Minneapolis-based The Energy Conservancy provided TECLOG 3 Software and support. Craig Stevenson and others from James Construction, along with faculty and staff at Duquesne University, also contributed valuable help.

An analysis of the test data by Pittsburgh-based Building Performance Architecture reveals that Rockwell Hall's whole-building envelope leakage of 0.61 CFM<sub>50</sub>/sq.ft., or 0.79 CFM<sub>75</sub>/sq.ft., is slightly

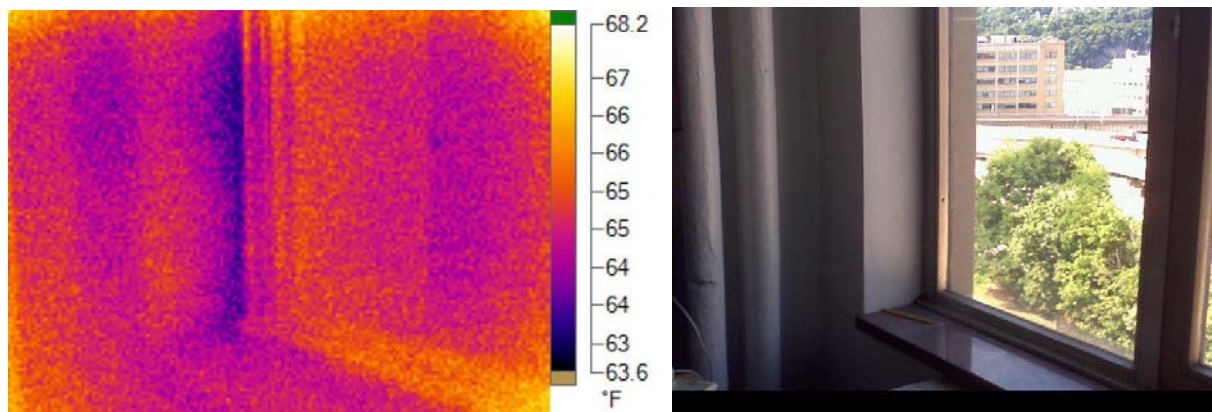
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<sup>7</sup> *Building Envelope Air Leakage Diagnostics*. Report. Pittsburgh, Pa.: Building Performance Architecture, 2014. PDF. Accessed 31 Oct. 2014.

lower than that of the average 20<sup>th</sup>-century commercial building.<sup>8</sup> However, it is much higher than prescribed by high-performance building standards. The Air Barrier Association of America recommends that the whole-building air leakage should be no more than 0.4 CFM<sub>75</sub>/sq.ft.<sup>9</sup> Our field-based research has been summarized in a Building Performance Architecture report, with independent experts also confirming the validity of the test results.<sup>10</sup>

In addition to the air-leakage testing, the energy consulting team shot thermographic images in a few rooms of Rockwell Hall, in order to pinpoint air-leakage areas. As seen in the photos below, some minor leakage can be seen around the window sides and window sills. The leakage appears as blue trails on the images. This combination of multi-method quantitative and qualitative data collection supports the need for field-based research in pioneering new techniques and research questions.

According to The Energy Doctor’s Rhett Major, who compiled the IR report for Rockwell Hall, the biggest problem identified by the thermographic images appears to be related to thermal bridging of the metal and glass in the windows. “The metal and glass windows are going to be much hotter than ambient indoor temperatures in the summer and during solar exposure, and much colder than ambient indoor temps in the colder months,” according to the report. “That is likely resulting in uncomfortable rooms, as well as energy gain/loss year-round.”<sup>11</sup>



<sup>8</sup> Ibid.

<sup>9</sup> Waite and O’Brien.

<sup>10</sup> *Building Envelope Air Leakage Diagnostics*.

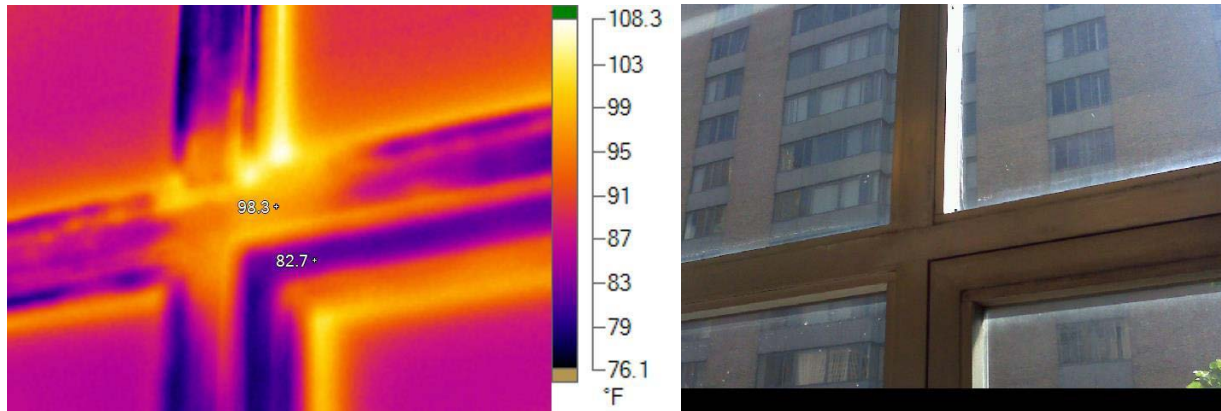
<sup>11</sup> Major, Rhett. *Rockwell Hall IR Report*. Report. Irwin, Pa.: The Energy Doctor, 2014. PDF. Accessed 31 Oct. 2014.

IR008887.IS2

Visible Light Image

8/15/2015 11:07:54 a.m.

**Discernible leakage can be seen at sides of windows, where frame meets jamb.**



IR008913.IS2

Visible Light Image

8/15/2015 11:22:31 a.m.

**Thermal bridging through the window framing is extreme – appears to be greater on frame than on moveable windows. Some leakage visible around movable sash.**

The air-leakage data gleaned from the test, along with the in-process whole-building energy model of Rockwell Hall, will provide benchmarks for a deep-energy-retrofit plan described in the Sustainability Plan for Duquesne University, Rockwell Hall (another outcome of this research project, and available upon request).

### **Moving to Ultra-Low Energy Usage at Rockwell Hall**

The Sustainability Plan for Rockwell Hall has two guiding themes: “the cheapest form of energy is energy that is never used, and building performance must have a financially justifiable return-on-

investment (ROI) payback.”<sup>12</sup> As such, the Plan focuses on energy conservation measures, implemented on a “retrofit as you maintain” basis. As mentioned, this strategy minimizes both up-front financial investment and disruption for building occupants, two major obstacles to deep-energy retrofitting.

The plan builds on an impressive sustainability track record at Duquesne University, which includes a 100 percent reliance on natural gas and renewable energy credits. The University recently joined Pittsburgh’s 2030 District (which promises to cut energy consumption on campus 50 percent by 2030). In addition, Duquesne is home to the Sustainability Master of Business Administration program ranked by the Aspen Institute as No. 1 worldwide among schools of its size and No. 8 overall.<sup>13</sup> The program’s students have competed in LEED student competitions redesigning 39,000 sq. ft. of Rockwell Hall with a \$2M budget for the past five years.

Outcomes of our field based research have led to the following insights. Rather than delaying upgrades until a wholesale retrofit can be approved, financed, and performed, the “retrofit as you maintain” strategy entails tackling energy-efficiency upgrades over the next decade, as general-maintenance needs arise for the 56-year-old building. Whereas conventional maintenance upgrades are performed piecemeal, deep energy retrofits take a whole-building approach that achieves far greater efficiency, far more economically, ideally by tackling multiple systems approaching the end of their useful lives.<sup>14</sup> Financing occurs over time as facilities management selects the optimal repairs and replacements to achieve high energy efficiency. Not only will Business School students and other building occupants experience no significant disruption, they will be fully informed of retrofit progress through classwork, building signage, and regular updates via campus-wide communications.

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<sup>12</sup> Stevenson, Craig E. *Sustainability Plan for Duquesne University, Rockwell Hall, An Existing Building*. Report. Pittsburgh, Pa.: James Construction and Avon Architects, 2014. PDF. Accessed 31 Oct. 2014.

<sup>13</sup> Duquesne University. *Duquesne University Sustainability Report: Greening an Urban Campus*. Rep. Pittsburgh, Pa.: Duquesne U, n.d. PDF. Accessed 31 Oct. 2014.

<sup>14</sup> *RetroFit Depot*.

The deep energy retrofit of Rockwell Hall is detailed in a Sustainability Plan prepared by members of our larger research team, Duquesne University Business School alumnus Craig E. Stevenson, executive vice president at James Construction in Pittsburgh, in collaboration with Dr. Robert Sroufe, Murrin Chair of Global Competitiveness at the School of Business and the project's faculty leader. The plan seeks to integrate principles of several advanced green building standards: the PassivHaus energy-efficiency standard, the U.S. Green Building Council's LEED building rating system, and the Living Building Challenge performance standard. As stated in the Sustainability Plan, the goal of the project "is improved building performance, defined by a dramatic increase in Energy Utilization Intensity (EUI) balanced with financial payback measures for an existing building."<sup>15</sup>

As a parallel goal, Rockwell Hall will become "living laboratory" through the retrofit process. The effort will expose Business School students to advanced building standards, the cost-benefit analyses that will be part and parcel of the initiative, and the real-life complexity concerned in striving for aggressive building-performance goals involving many disparate stakeholders. Rockwell Hall's lessons are expected to reach far beyond Duquesne University, offering a model for owners of the nation's millions of aging commercial buildings.

The Sustainability Plan for Rockwell Hall details the process for moving to extremely low energy usage, from Baseline Analysis through the Post-Occupancy Evaluation phases. An overview follows.<sup>16</sup>

**Baseline Analysis.** With the building-envelope analysis complete and Rockwell Hall's whole-building energy model near completion, the project stakeholders continue to conduct baseline analysis of the building's energy performance as of November 2014. The analysis will include building-usage interviews with Duquesne's Facilities Management team and building occupants, as well as review of construction design documents. It will involve a survey of campus-wide renewable energy systems, including Duquesne's co-generation plant and high-efficiency cooling system chiller. It will examine the

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<sup>15</sup> Stevenson.

<sup>16</sup> Ibid.

building's lighting levels and distribution. As a next step, the team, in collaboration with Facilities Management, will consider EUI-reduction goals. Each goal will be performance-based, quantifiable, and include a timeframe for completion.

**Continued Research - Strategic Planning and Design.** The next phase involves assembling an integrated team of experts to lead the Sustainability Plan for Rockwell Hall. Ideally, the "Rockwell Hall Energy Team" will include Duquesne Business School students (including myself), as well as Facilities Maintenance personnel, local experts, and faculty. Our team will engage project stakeholders and industry experts to yield a holistic approach aligned with University mission, Facilities Management goals, and the 2030 Challenge of reducing energy consumption by 50 percent.

Next, our team will identify measures for energy optimization. Such measures typically relate to the building envelope, site, heating and cooling systems, lighting, controls, renewable energy systems, and policy modifications.

Using the knowledge gained through the effort of identifying optimization measures, our team will create bundles of measures. After analyzing the various potential measures in relation to the project goals, the team will logically group and analyze them for their potential compounded contributions to project goals. According to the Sustainability Plan, "Studies have proven that combining individual optimization measures is the most efficient method to maximize building performance."<sup>17</sup>

We will first evaluate the proposed bundles for timing purposes. As the Sustainability Plan states, "A critical step in planning a deep, integrated energy-efficient retrofit is determining the ideal situations for performing [upgrades]."<sup>18</sup> For instance, end-of-life replacement offers opportunities to improve building efficiency and add value at minimal added cost.

Second, the bundled measures must be entered into energy models to evaluate their impact on Rockwell Hall's EUI. The analysis will include whole-building analysis such as Revit, as well as PassivHaus

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<sup>17</sup> Ibid.

<sup>18</sup> Ibid.

Planning Program (PHPP) simulations and WUFI hygrothermal durability analysis to identify moisture issues.

Third, our team will evaluate the bundled measures for their financial effect. The financial analysis will incorporate social and environmental impacts, as well as financial benefits. This integrated bottom line approach is expected to identify winning solutions that might be overlooked when economics are the only consideration.

Through these bundles, the Sustainability Plan seeks to create a high-level path to long-term very low or perhaps even net-zero-energy usage goals ultimately.

### **Implementation.**

The Sustainability Plan prescribes an integrated project delivery approach that brings together the Rockwell Hall Energy Team and Facilities Management with engineers, designers, and other experts to ensure achievement of project goals. Our approach includes third-party envelope commissioning – that is, technical verification and quality checks for building systems – to provide a baseline for performance and to ensure that design and building targets are met. It also includes comprehensive quality-control testing to ensure that high-performance design is implemented properly.

### **Post-Occupancy Evaluation.**

As each phase of the Sustainability Plan's implementation is completed, the Plan recommends that project stakeholders be trained and a monitoring and verification system be established to ensure the building meets projected performance goals. Ideally, the system will include the use of smart meters and power-quality analyzers, and will communicate building performance to Business School students and other building occupants through the use of wall displays, dashboards, and/or online energy management plans. In addition, the Plan recommends regular EUI performance reports for stakeholders.

### **Overcoming the Retrofit Obstacles**

Performance data related to deep energy retrofits of commercial buildings is scarce. However,



as a benchmark, residential deep-energy retrofits aim to reduce total energy consumption by at least 50 percent, according to Lawrence Berkeley National Laboratory.<sup>19</sup>

We find another benchmark in a recent study by New Buildings Institute (NBI).<sup>20</sup> From September 2010 to August 2011, the Northwest Energy Efficiency Alliance and NBI conducted a search for existing commercial buildings that had received two or more efficiency measures in the past 10 years demonstrating energy savings of more than 30 percent. From the resulting list of 50 buildings, the NBI selected nine best candidates for a deeper analysis of the measured energy performance, characteristics and motivations of the building efficiency projects. Of these nine low-energy buildings, seven achieved 50 percent less energy consumption than the national average and have an EUI of just 39 kBtu per square foot per year.

Given these and similar benchmarks, we project that the deep-energy retrofits detailed above will reduce energy consumption at Rockwell Hall by at least 30 percent, along with reduced EUI. These savings are expected to come via a “retrofit while you maintain” strategy that makes feasible minimal upfront cost and occupant disruption. Based on these projections, we can reject the null hypothesis stated in this paper’s introduction. The research and our strategy demonstrate that deep-energy retrofits are both feasible and impactful.

### **Experiential Learning: Conducting – and Applying – Field Research**

The Sustainability Plan for Rockwell Hall is based on strong secondary research and theories. However, one exciting prospect related to applying these theories to Duquesne University’s Business School building is the opportunity for students to conduct primary research that will further validate and contribute to the theory and practice of sustainable building design.

Through classwork, independent research, and efficiency-related efforts of the campus Net

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<sup>19</sup> "Deep Energy Retrofits." *Residential Building Systems Group*. Lawrence Berkeley National Laboratory, n.d. Web. 05 Nov. 2014.

<sup>20</sup> *A Search for Deep Energy Savings NEEA’s Study of Existing Building Energy Efficiency Renewals*. Meta Report. Vancouver, Wash.: New Buildings Institute, Aug. 2011. PDF. Accessed 3 Nov. 2014.

Impact chapters, students will be engaged in Rockwell Hall's deep energy retrofit. The process will present the opportunity for students – particularly those in the MBA Sustainability cohort – to gather, benchmark, and analyze data. For instance, students might use smart meters to track real-time energy usage against discrete conservation efforts. Such efforts might include reducing plug loads, increasing reliance on daylighting, or shutting down the elevators. As a leader in Duquesne's Net Impact student chapter, I hope to facilitate one or more such student-led efforts.

Field research is a key part of the Sustainability Plan for Rockwell Hall, and offers several important benefits. First, by conducting primary research, the theoretical material MBA Sustainability students and others learn about sustainable building becomes real and practical to them. Second, students gain insights into how independent variables such as building tightness, insulation, and energy efficiency affect dependent variables such as energy consumption, costs, occupant health, and productivity. Finally, students and faculty may use these insights to contribute to applied learning, longitudinal research, stakeholder engagement, and the business case for retrofitting existing buildings.

### **Positioning Rockwell Hall as a Model for Duquesne University and Beyond**

At the outset, we, as researchers, asked whether deep-energy retrofits are, in fact, too expensive and disruptive to be a viable option. The research to date shows they are not, and that retrofitting as you maintain offers a viable option. The project team envisions the Rockwell Hall deep-energy-retrofit as the first step in a campus-wide program that will position the University as a leader in sustainability and, with the support of secondary research and primary data collection from this field-based study, be a leading example for what can be done at millions of other existing commercial buildings. Students, faculty and Duquesne's Facilities Maintenance Department will also glean practical experience and lessons to build on.

To follow on Rockwell Hall's retrofit, the Sustainability Plan for Rockwell Hall suggests that the University establish a Campus Energy Team, similar to the Rockwell Hall Energy Team, to complete a

similar baseline analysis for all campus buildings. The Plan envisions an Energy Management Policy for Duquesne University to commit to University-wide targets and timelines. If, for example, Duquesne University reduced energy consumption 30 percent, based on an estimated average consumption of 14.37 B Btu at each of the campus' 40 buildings, Duquesne could save a total 17.2 T Btu.<sup>21</sup> Further, as the Plan states, "A Campus Energy Team with a comprehensive Energy Management Policy, backed up with documented EUI performance, will solidify Duquesne University's commitment to a sustainable campus."<sup>22</sup> Such a model will have lessons for other university and corporate campuses.

More significantly, by addressing the greatest obstacles to deep-energy retrofits of commercial buildings, and with the support of primary and secondary research, the "retrofit as you maintain" strategy will offer a model for the nation's 5.6 M existing commercial buildings. If those 5.6 M buildings reduced energy consumption by an average 30 percent through retrofits, commercial building owners would save \$98,078 M in energy costs per year, along with associated greenhouse gas emissions. In doing so, they would also improve occupant comfort and work performance and improve their buildings' climate resiliency.

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<sup>21</sup> According to the 2003 Commercial Buildings Energy Consumption Survey (CBECS), the average energy consumption for non-mall commercial buildings in Rockwell's size category (100,001 to 200,000 sq. ft.) is 14.37 B Btu. If retrofits reduced energy consumption by 30% at our 40 campus buildings (40 x 14.37 B), assuming similar average consumption, Duquesne could save a total 17.2 T Btu.

<sup>22</sup> Ibid.

**Global Health Disparities from a Catholic Social Teaching Perspective**

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## **Global Health Care Disparities from a Catholic Social Teaching Perspective**

### **I. Introduction**

In the encyclical, *Evangelium Vitae*, Pope John Paul II refers to Catholics as “the people of life and for life,”<sup>1</sup> as he concludes his teachings on issues of human sacredness. Within those concerns he accounts for the Catholic responsibility to assist the vulnerable which includes the sick and the poor of the world.<sup>2</sup> Perhaps the greatest concern for global health is the reconciliation of health inequalities which is an aspect referenced in the writing of John Paul II. Along with the Catholic responsibility to assist the sick and poor is the basic human right for all people to health at the highest possible level.<sup>3</sup> Global health disparity is defined by the dispersal of disease and lifespans, and the ranges between the poor and wealthy are significant.<sup>4</sup> This challenge equates to 20 million deaths per year and that hasn't shown much of a change in the last 20 years.<sup>5</sup> When discussing this global concern along with Catholic social responsibility, this paper will explore the ethical justification for a global right to health from a Catholic social teaching perspective. The health care situations of both developed and developing countries will be explored to establish a starting point for this ethical dilemma. The factors that are contributing to the disparities will be discussed based on the findings of the Commission on the Social Determinants of Health. Catholic theological concepts will be covered through the encyclicals related to Catholic Social Teachings starting with Pope Leo XIII in 1891 through Pope Francis in 2013. Health as a human right will be defined and its history will be examined through the constitution of the World Health Organization. The issue of health inequalities and the Catholic position will be viewed from four of the principles of The UNESCO Universal Declaration on Bioethics and Human Rights. The last section will cover the progress that has been made in improving the gap in health disparities which will include health governance and humanitarian assistance.

### **II. The State of Health Care Availability**

Health care equality is one of the greatest concerns globally. It is a vastly complex issue in that there are many aspects to the causes and the results are far-reaching. It is a problem that requires a universal approach to solve and in this universality are the Catholic Church and its mission for assisting with social issues. This section will give a background of the state of health in developed and developing nations along with causes for health disparities.

#### **A. Developed and Developing Countries**

There is a continuum that ranks countries in terms of their level of advancement from being in the process of developing as a “healthier” nation versus having met specific criteria to become a “developed” nation. Partnering developed and developing nations in teaching relationships for the purpose of increasing the number of people living in healthier conditions is part of a global plan. The group of developed countries consists of 76 nations<sup>6</sup> however within that group are 24 countries that are considered to be the most developed because they have reached a life expectancy of 80+ years and have had established systems for higher standards for health which are: clean water and sanitation, educational programs, and varying levels of health care with universal access.<sup>7</sup> The main contributor to higher levels of health is the quality of governance for healthcare and the prioritization of access to primary health, educational services, and sanitation and clean water initiatives.<sup>8</sup>

Over a third of the world's population lives in developing countries where there is inadequate food, clean water, and education. These 50 countries are in a process of improving as they are working on building the supports for furthering their economic situations and encouraging good health and lifespan. Nearly all of these nations have embraced the idea of universal education, however more attention is needed on the availability of basic health care services and clean water and sanitation which are closely linked to health care concerns. Through the support of the United Nations these countries have been able to overcome the barriers of poverty and rapid rates of population growth, and show their abilities to become self-sustaining.<sup>9</sup>



## **B. Causal Factors in Health Care Inequality**

In 2005, the World Health Organization launched a study to resolve the causes of the disparities in health among nations. A Commission on Social Determinants of Health issued a final report in 2008 of their findings along with their recommendations for closing this gap. The equity of health care is a problem among and within all countries whether developed or developing and the state of the political and economic systems have a substantial impact on the degree of disparity. The causal factors from this report were classified into three categories that were: 1) Daily living conditions, 2) Power, money, and resources, and 3) Knowledge, monitoring, and skills.<sup>10</sup>

The lack of data for some of the poorer countries has contributed to a deficiency in recognizing the extent of the problems. Without this knowledge they cannot put the proper systems into place and move the gap in health equality in a more positive direction. This area of knowledge also calls for an increased understanding by the policymakers and the health care professionals of these countries at greatest risk so they can match the policies and the plans to the problems. Education of the general public on prevention and contributors to good health are required so that all aspects of the societal structure are better comprehending the situation. This expansion of knowledge along with data for measuring and monitoring the causes of poor health will serve as a structure to position challenged countries to an overall healthier population and a brighter future for the next generation.<sup>11</sup>

## **IV. Catholic Social Teaching**

At the center of the Catholic and ethical debate is the respect for the dignity of the human.<sup>12</sup> The Vatican's perspective is that all life is sacred and within sacredness the right to health will be explored. To further support the improvement of health disparities among all people will be an understanding of the historic development of several encyclicals with the principles of Catholic Social Teaching.

### **A. Encyclicals for Social Justice**

The underlying principle in all of these encyclicals is the sanctity of life and human dignity which serve as the foundation for all Catholic social thought. Although some of these documents don't specifically address the issue of health disparities, they do state the church's position on the responsibility for doing good for all.

### ***Rerum Novarum, 1891***

Pope Leo XIII wrote the first noted encyclical, *On the Condition of Workers*, on social teaching in response to the changes brought about from the Industrial Revolution which created a class of people who became known as the "working poor." They were subjected to inadequate working conditions and were vulnerable in so far as being able to represent themselves to improve the situation. He supported unionization and expected the government to make special provisions for the working poor. The wealthy should exert kindness and share their fortune with those less fortunate such as the sick and the poor.<sup>13</sup>

### ***Populorum Progressio, 1967***

Pope Paul VI discussed the declining situation for the poor and the need for all people to come together to support this marginalized group in order to raise them up to a higher standard of life. This solidarity incorporated the theological basis for human dignity and values and the need for freedom from injustices for this vulnerable population. This message combined the development for the poor and those who have joined together to help them live in a more equitable environment.<sup>14</sup>

### ***Octogesima Adveniens, 1971***

In the second social justice encyclical written by Pope Paul VI, he was looking to renew the societal formations worldwide from an economic to a societal focus. He was seeking changes in both political and social arenas and was asking Christians to be aware of the issues but also to take action to improve the situations. He warned against becoming concerned with inconsequential issues rather than

aiding the poor, handicapped, aged, sick or other persons with life-challenging conditions and situations.<sup>15</sup>

### ***Sollicitudo Rei Socialis, 1987***

Pope John Paul II wrote *On Social Concern* as a review of the social concerns of the world since the issuance of *Populorum Progressio* by Paul VI two decades earlier. In this writing, greed and power are denounced for individuals and nations. Special preferences are to be given to the poor and the weak in a type of love that motivates actions to accept our social responsibility to the many people around the world who suffer from the need for food, shelter, and medical care.<sup>16</sup>

### ***Evangelium Vitae, 1995***

The Catholic encyclical of Pope John Paul II entitled *Evangelium Vitae* in 1995, further clarified the already existing position of personhood, dignity, and the protection of all human life. From conception to death, the respect for every person's right to life must be recognized and upheld.<sup>17</sup> Although this document is primarily used as a source against such concerns of abortion, murder, and euthanasia, it does discuss the social responsibility as Catholics to care for the sick and poor of the world.<sup>18</sup>

### ***Evangelii Gaudium, 2013***

Pope Francis called on the wealthy to share their resources with the people in need. He criticized the "idolatry of money," and implored the politicians to assure to the people they serve "dignified work, education, and healthcare."<sup>19</sup>

## **B. Principles of Catholic Social Teaching**

The discussions in all of the preceding encyclicals are vast but there are commonalities that can be condensed into basic ideologies of Catholicism that is translated into doing good for others. The Vatican addresses social teaching as directives for supporting a fair and unprejudiced society within all of the challenges that occur in the contemporary world. When taking all of the writings and teachings

that have been outlined in the encyclicals, there are seven principles that capture the Catholic position which are: 1) Life and Dignity of the Human Person, 2) Call to Family, Community, and Participation, 3) Rights and Responsibilities, 4) Option for the Poor and Vulnerable, 5) The Dignity of Work and the Rights of Workers, 6) Solidarity, and 7) Care for God's Creation.<sup>20</sup>

## **V. Introduction of the Right to Health**

The right to health was not recognized internationally until 1976 but it was after the Second World War that the issues of human rights were elevated and coupled with medical ethics. The detail of this international law will be covered in the next section before exploring the history behind the law.

### **A. Defining the Right to Health**

The right to health is founded in international law as a human right and is defined as the "highest attainable standard of health."<sup>21</sup> The main document that explains the details of this right is contained in the International Covenant on Economic, Social and Cultural Rights, which consists of two points. The first acknowledges the right to physical and mental health for all people and the second point lists the actions to be taken for this right for health to be achieved. These action steps include stipulations to address: a reduction in the stillborn rate and infant mortality, healthy child development, improvement of sanitation measures for industry and the environment, prevention and treatment of specific diseases, control of epidemics and endemics, and the development of structures for medical care and services for the occurrence of sickness.<sup>22</sup>

### **B. The History of the Right for Health**

Prior to the addition of the right to health in the International Covenant on Economic, Social and Cultural Rights of 1976 were two important documents that resulted from the aftermath of World War II: the Universal Declaration of Human Rights and the Constitution of the World Health Organization (WHO).<sup>23</sup> The Universal Declaration served as the resource for international rights issues for over fifty

years<sup>24</sup> and the WHO constitution was said to be the “Magna Carta of Health.”<sup>25</sup> Each established a starting point for the idea of health being a basic human right for all people everywhere.

At the end World War II, representatives of 50 countries assembled to formulate the United Nations. The United Nations Charter was drafted to have an organization aid in preventing war by arriving at peaceful solutions to problems among nations. A significant contribution of this charter was the provision for a Human Rights Commission. In 1947, WHO was established as an extension of the United Nations.<sup>26</sup> In the preamble of this constitution health is defined as a condition of “complete, physical, mental and social well-being and not merely the absence of disease or infirmity.”<sup>27</sup> The principles note the “highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, and political belief, economic or social condition.”<sup>28</sup>

## **VII. Principles of the Universal Declaration on Bioethics and Human Rights**

The UNESCO Universal Declaration on Bioethics and Human Rights evolved in 2005 from advancements in science and technology and from the ethical dilemmas connected to humans and their environment. There was a need to formulate this set of 15 principles to provide a foundation for a global answer for the protection of humans, their rights, and their environment.<sup>29</sup> Four principles that support the universal concern of health disparity will be discussed with the inclusion of a Catholic supporting perspective.

### **A. Human Dignity and Human Rights**

Human dignity and rights have provided a basis for other key declarations associated with biomedicine which made them a natural inclusion in the UNESCO Universal Declaration on Bioethics and Human Rights. Specifically, this principle states that the requirements of the individual should supersede the exclusive benefits to the society. However, health inequalities within societies are seen as the individual needs of each member, which can be referred to as “collective dignity.”<sup>30</sup> Human dignity and human rights for each person is foundational in Catholicism but the global need for reducing the divide

in healthcare is pursuing the dignity in health for all. Human dignity and rights serve as the basis for all of the other 14 principles of this declaration as well as the Vatican's teachings. Within Catholic social teaching, life and dignity for all human persons is sacred and serves as the substance for the moral direction that society should follow.<sup>31</sup>

In *Octogesima Adveniens*, Pope Paul VI called all Christians to action for the social injustices that has been done to the less fortunate. He reminded them of their freedom to choose to do good for others and the need to value that freedom. He speaks of inequality indirectly in noting that there are many people whose basic human needs are not being met while others who are more affluent are concerning themselves with frivolous problems.<sup>32</sup>

#### **B. Respect for Human Vulnerability and Personal Integrity**

Respecting and protecting the weak and defenseless as well as revering them as unique individual is the core of this article. Vulnerable persons have an undeniable level of helplessness which requires protection. Eventually this group expanded to include women, specific cultural sectors, and the disadvantaged as unprotected classes. Vulnerability is described as being developed for individuals or groups of individuals who are subject to vulnerability which includes: "disease, disability, other personal conditions, environmental conditions, and limited resources."<sup>33</sup>

Personal integrity which is being reliable, honest, and trustworthy, is closely related to human vulnerability. As a virtuous characteristic, it is based on core values, beliefs, and identity that lead to steadfast moral actions. Integrity is noted in the Convention of Human Rights and Biomedicine as a basic ethical principle that should be given to all people, much like human dignity, and serves as an element of a person's identity.<sup>34</sup>

Healthcare a right that is to be supported by this principle and health disparity is speaking to the very need to protect and assist the vulnerable populations. Catholic social thought teaches that the needs of the poor and vulnerable should become the priority when aiding others.<sup>35</sup> Pope Paul VI, in

*Populorum Progressio*, says to guard against indifference to others in need who have limited resources to change their situations.<sup>36</sup>

### **C. Equality, Justice and Equity**

Equality, justice and equity as a principle are connected to human dignity and rights. Justice is founded in law and ethically, is a perfect virtue because it provides a structure for normative ethics. The principle of equity is related to the standards of dignity and the related rights,<sup>37</sup> and the standards for the right to health evolved into international law in 1976. Justice necessitates equality for equals and the conditions for social justice and responsibility are not being met when assessing the health care needs of the developing countries.<sup>38</sup> The concerns surrounding health care equality are based in this principle in that and social justice is the foundation for Catholic social teaching. Pope Paul VI talks in *Populorum Progressio* of assisting persons in need through sharing of possessions and defining that in doing so is not to be seen as a gift but is the giving of a human right. Within a global context, all things in the world are given to all persons and not just to those who are wealthy.<sup>39</sup>

### **D. Social Responsibility and Health**

The availability for health care resources for the poor has declined over time, requiring this principle to expand its scope into living conditions and the environment. The two main areas addressed are: the governmental promotion of health and social development and asserting an appropriate level of healthcare as a basic human right that is not affected by discriminatory factors. The second of these areas encompasses five sections: access to health care, adequate nutrition and safe water, improved living conditions, elimination of discrimination, and a decline in illiteracy and poverty. Severe poverty is the cause for health inequalities in one sixth of the world's population according to WHO.<sup>40</sup> The UNESCO report on this principle includes social determinates to health, barriers to accessing health care services, and the ethical and legal aspects.<sup>41</sup>

The very existence of Catholic social teaching is for social responsibility and health is part of that overall responsibility of working for the good of all.<sup>42</sup> It is rooted in human dignity and John Paul II recognized in *Sollicitudo Rei Socialis* that it is necessary to help others live their lives in a way that is consistent with human dignity because all people are made in the image of God.<sup>43</sup> Living that life with dignity includes having access to those determinants of health in a just way which supports their right to health.

### **VIII. Progress for Universal Health Equity**

In seeking solutions to closing the health inequity difference there are two areas of concern which are the social policies that have an impact on health and the global and national economic provisions. They are interconnected with resulting health care imbalances.<sup>44</sup> As in Catholic Social Teaching, the Call to Family, Community, and Participation speaks to the structure of a society in both politics and economics.<sup>45</sup> If both the political and financial arrangements are not in the best interests of supporting human flourishing then human dignity is being compromised.

#### **A. Health Governance**

Good health governance is the key to attaining and maintaining universal health equity within nations. This requires that countries establish a system of responsibility and culpability in assuring that their national programs, policies, and budgets support and sustain this goal of healthcare access and its contributing factors. It is in the successes of the developed countries that can be replicated by the developing countries. By matching countries from each of the two factions is to teach the developing countries how to manage within their own borders to move along the continuum of development. In addition to the governmental commitments to actions of good governance is to also to include involvement by the citizenship in the decision-making as they work together to improve the conditions for all.<sup>46</sup> Pope Francis in *Evangelii Gaudium* called for more politicians who are truly disturbed by



poverty and the inequalities that result. He goes on to say that government has a duty to guarantee healthcare, education, and work to all citizens.<sup>47</sup>

## **B. Humanitarian Assistance**

The goals of the United Nations and the Catholic Church have been aligned in their vision of universality in helping all people everywhere to live a better life. These two organizations combined the human rights with the human dignity for the person similarly to the UNESCO Universal Declaration on Bioethics and Human Rights.

The history of contributions by the United Nations has been extensive which includes the issuance of major declarations all related to improved health on a universal scale. In 1948 the Universal Declaration of Human Rights was introduced which was covered earlier, the Declaration of the Right to Education (1966), the Declaration of the Right to Adequate Food (1974), and the United Nations World Health Organization Alma Ata Declaration (1978)<sup>48</sup> which endorsed the concept of universal primary health care and acted as a resource that could give international direction for advancing health promotion with a goal of "Health for All."<sup>49</sup>

Catholic Relief Services is the official provider of international humanitarian services from the U.S. It was created in 1943 and has outreach activities in approximately 100 countries that provide services annually to more than 100 million of the world's most vulnerable people. They are working to improve the very basic causes of health inequities which are poor water, unsanitary conditions and the need for primary education and primary health.<sup>50</sup> They have implemented community health programs in 26 countries that serve approximately 3.5 million vulnerable and underserved people with proven and effective approaches for continuation beyond the assistance of the Catholic Relief Services. The future goals for the community health initiatives are to continue to support the existing programs, to partner with the governments and other community groups to strengthen the governance and expand the

services provided, and to find additional creative and original ideas to encourage independence in these communities for continued funding and management.<sup>51</sup>

## **IX. Conclusion**

The concerns of global health disparities call all people to recognize their obligations. Catholicism strongly upholds the connection between “life ethics and social ethics”<sup>52</sup> which ties together the unanimous support for the universal right to health. Further support is the strong alignment of the United Nations and the principles in the Universal Declaration on Bioethics and Human Rights with the Catholic Church’s principles of social teaching. Recognizing this unique individuality and sacredness of every person steeped in Catholicism continues to resonate through the declarations and principles of the United Nations and follows through to the actions of WHO. This united vision of seeking the greater good for all globally while maintaining human dignity not only combines the bioethical concerns with human rights but also incorporates these elements of Catholic doctrine to form a triumvirate support for the global right to health. It has been clearly established that in order for inequalities in health to be improved there must be the promotion of primary health care services, prevention and management education in health care, and improved overall sanitation which includes clean water.<sup>53</sup> The work of the United Nations through the WHO and the many programs supported by the Catholic Church throughout the world show a commitment to achieving the right to health for all.

## **X. Endnotes**

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<sup>1</sup> Pope John Paul II, *Evangelium Vitae*, (1995): 6.

<sup>2</sup> Pope John Paul II, *Evangelium Vitae*, 3.

<sup>3</sup> Office of the United Nations High Commissioner for Human Rights, *The Right to Health*, (2008): 9.

<sup>4</sup> Lawrence O. Gostin, “A Framework Convention on Global Health. Health for All, Justice for All,” in the *Journal of the American Medical Association* (2012): 2087.

<sup>5</sup> Enku Kebede-Francis, *Global Health Disparities. Closing the gap through good governance*. (Sudbury, Massachusetts: Jones and Bartlett Learning, 2011), 84

<sup>6</sup> Kebede-Francis, 1-2.

<sup>7</sup> Kebede-Francis, 1-2.

- <sup>8</sup> Kebede-Francis, 30-32.
- <sup>9</sup> Kebede-Francis, 81-84.
- <sup>10</sup> World Health Organization, *Closing the gap in a generation. Healthy equity through action on the social determinants of health*, (2008): 1.
- <sup>11</sup> World Health Organization, *Closing the gap in a generation. Healthy equity through action on the social determinants of health*, 20-23.
- <sup>12</sup> Ted Peters, Karen Lebacqz, and Gaymon Bennett, *Sacred Cells?* (Lanham: Rowan and Littlefield Publishers, Inc., 2008), 217-218.
- <sup>13</sup> Leo XIII: *Rerum Novarum A Summary Article by Gerald Darring*, 1-5.
- <sup>14</sup> Pope Paul VI, *Populorum Progressio*, (1967).
- <sup>15</sup> Pope Paul VI, *Octogesima Adveniens*, (1971).
- <sup>16</sup> Pope John Paul II, *Sollicitudo Rei Socialis*, (1987).
- <sup>17</sup> Peters, 111-113.
- <sup>18</sup> Pope John Paul II, *Evangelium Vitae*, (1995): 1.
- <sup>19</sup> Naomi O'Leary, Pope Francis "Evangelii Gaudium" Calls for Renewal of Roman Catholic Church, Attacks "Idolatry of Money," *The Huffington Post* (December, 26, 2013).
- <sup>20</sup> United States Conference of Catholic Bishops, 1-2.
- <sup>21</sup> Office of the United Nations High Commissioner for Human Rights, *The Right to Health*, (2008): 9.
- <sup>22</sup> Office of the United Nations High Commissioner for Human Rights, *The Right to Health*, 9.
- <sup>23</sup> Jonathan Wolff, *The Human Right to Health* (New York: W.W. Norton & Company, 2012, 5-7.
- <sup>24</sup> Hunt, 205.
- <sup>25</sup> World Health Organization, *Chronicle of the World Health Organization*, 1947, 11.
- <sup>26</sup> Wolff, 2-4.
- <sup>27</sup> World Health Organization, *Constitution of the World Health Organization*, 1946, 1.
- <sup>28</sup> World Health Organization, 1946, 1.
- <sup>29</sup> Jan Helge Solbakk, "Vulnerability: A futile or useful principle in healthcare ethics?," in *The SAGE Handbook of Health Care Ethics*, eds. Ruth Chadwick, Henk ten Have, and Eric M. Meslin (Los Angeles: SAGE Publications, 2011), 228.,
- <sup>30</sup> Andorno, 91-96.
- <sup>31</sup> U.S. Conference on Catholic Bishops, 1.
- <sup>32</sup> Pope Paul VI, *Octogesima Adveniens*, 1971.
- <sup>33</sup> Solbakk, 228-229.
- <sup>34</sup> Neves, 158.
- <sup>35</sup> U. S. Conference of Catholic Bishops, 2.
- <sup>36</sup> Pope Paul VI, *Populorum Progressio*, 1967.
- <sup>37</sup> Gabriel d'Empaire, "Article 10: Equality, Justice, and Equity," in *The UNESCO Universal Declaration on Bioethics and Human Rights. Background, principles, and application*, eds. Henk A.M.J. ten Have and Michele S. Jean (Paris: UNESCO Publishing, 2009), 155-163.
- <sup>38</sup> d'Empaire, 155-163
- <sup>39</sup> Pope Paul VI, *Populorum Progressio*, 1967.
- <sup>40</sup> Adolfo Martinez-Palomo, "Article 14: Social Responsibility and Health," in *The UNESCO Universal Declaration on Bioethics and Human Rights. Background, principles, and application*, eds. Henk A.M.D. ten Have and Michele S. Jean (Paris: UNESCO Publishing, 2009), 219-222.
- <sup>41</sup> International Bioethics Committee of UNESCO: Report on Social Responsibility and Health 2010, 3-42.
- <sup>42</sup> Joyner, 190-192.
- <sup>43</sup> Pope John Paul II, *Sollicitudo Rei Socialis* 1987
- <sup>44</sup> World Health Organization (2008), 42.
- <sup>45</sup> U. S. Conference of Catholic Bishops (2005): 1.
- <sup>46</sup> Enku-Kebede-Francis, 351-361.
- <sup>47</sup> O'Leary, *Pope Francis* (2013).
- <sup>48</sup> Kebede-Francis, 32.
- <sup>49</sup> World Health Organization, *Social determinants of health. WHO called to return to the Declaration of Alma-Ata* (n.d.): 1.
- <sup>50</sup> Catholic Relief Services, *Giving Hope to A World of Need. Faith Counts* (2012): 1-2.
- <sup>51</sup> Catholic Relief Services, *Giving Hope to a World of Need* (2012): 1-2.

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<sup>52</sup> Pope Benedict XVI, *Caritas in Veritate*, 2009 and Pope John Paul II, *Evangelium Vitae*, 1995.

<sup>53</sup> Kebede-Francis, 31.

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# Stephanie Mullen | McNulty College and Graduate School of Liberal Arts

## **To Pay or Not to Pay? Variables Influencing Hostage Outcomes in Terrorist Kidnappings**

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### **Conditions for Release: Hostage Outcomes in Cases Where Terrorist Groups Kidnap for Ransom**

The tragic death of Americans James Foley and Steven Sotloff at the hands of the Islamic State of Iraq and Syria (ISIS) once again brought terrorist kidnappings to the forefront of the international stage. Despite a common misperception, terrorist kidnappings are a daily occurrence and terrorist groups from Al-Qaeda in the Middle East to FARC in Colombia continue to threaten societies throughout the world.

Terrorist groups around the world have a long history of using kidnapping as a means to an end. Kidnapping is just one tactic terrorist groups may use to spread their message, fight for political ends, or procure funding. Sometimes, those ends are political and capture the attention of the international community; other times, they are monetary and hostages are used to fund ongoing operations. Kidnapping for ransom, in particular, is a lucrative means of funding for terrorist groups. In 2010, it is reported that \$1.5 billion was paid to kidnappers for ransoms (Forest 2012, p. 322). Regardless of the motivation, however, terrorist kidnappings occur frequently in the world today. Understanding what influences hostage outcomes in these scenarios is imperative for understanding how terrorist groups operate and how to combat such groups.

While terrorist offensive operations form the basis of the terrorism literature, little is known about the factors influencing hostage outcomes in situations where terrorist groups ask for a ransom. Much of the research on terrorist operations focuses on the politically motivated or grand attacks that



dominate media coverage of terrorist groups. However, funding is an equally impressive and expansive topic. In regards to ransom, where funding is the primary motivation, significant research on this particular way of funding and operating has yet to be fully researched.

Past studies on terrorist kidnapping and hostage-taking scenarios point to trends that affect the entirety of terrorist kidnappings. Co-nationals, or fellow citizens, are more likely than foreigners to be targets of attacks (Yun and Roth 2008, Forest 2012, Yun 2007). Ideological and religious groups are most likely to use kidnappings as a tactic, though there is debate over which one uses it more (Forest 2012, Yun 2007). Additionally, the locations of the terrorist groups have an impact on the likelihood of kidnappings (There is some disagreement, however, over whether it is truly the location of the state or the domestic conditions of the state that matters for hostage outcomes (Yun 2007, Forest 2012)).

While the current literature gives an interesting overview of all terrorist kidnappings, they fail to address the differences in motives and how that affects outcomes. In cases where a ransom is clearly asked for, indicating a monetary interest, the hard questions have never been asked: Why do some hostages survive while others are killed? What factors influence this outcome? By focusing on terrorist kidnappings where a ransom is asked, the motive of the group is self-evident: the terrorist group is looking for a monetary reward. These types of kidnappings are not made for political gain or to draw attention to the group's motives, though there may certainly be multiple motives. This demand for monetary compensation for a human life differentiates them from the larger samples that other researchers have drawn from in the past. Because the motives are different, the conditions and variables affecting the hostage outcome may differ.

The topic of this research has very real implications and significance for the discussion on terrorism and extremism that dominates American policymaking. The War on Terrorism, air strikes against ISIS outposts, and drone strikes against terrorists in Yemen illustrate the importance of terrorist activities for American policymakers. This study aims to find patterns in terrorist activity in regards to

hostages taken for ransom, which in turn can inform policymakers on how to handle such situations in the future. Through the ability to predict hostage outcomes and recognize terrorist group patterns, the US government gains another advantage in the fight against terrorism.

*Methodology: Statistical Analysis*

In an effort to understand terrorist patterns and create a model for ransomed hostage situations in the future, six variables influencing hostage outcomes (whether a hostage is released or killed) are identified using a database of past kidnapping events. Once the sample is collected and split to reflect individual hostages, these six variables are coded by hand. The sample is collected from the University of Maryland's Global Terrorism Database (GTD) in which 1,004 individual hostage outcomes from 1970 – 2013 have been isolated and transferred into SPSS.

The independent variables are gender, co-national status (whether the target is a co-national in relation to the terrorist group), development status of target's country, type of target (private citizens or affiliated with the government), terrorist group identity (secular or religious), and terrorist group motivation (limited or unlimited by which I mean the group has a territorial claim or a global mission). The dependent variable is hostage outcome: target released or target killed. In the above, "target" refers to hostages.

One would expect with the rise of extremist groups and their brutal tactics that religiously motivated terrorist groups will be more likely to kill their victims. In addition, I expect that terrorist groups with unlimited motives have fewer ties to their domestic environment and co-nationals. Therefore, I test the following hypotheses:

H1: Religious groups are more likely to kill their hostages than secular groups.

H2: Groups with unlimited goals are more likely to kill their hostages than terrorist groups with limited goals.

*About GTD*

The Global Terrorism Database, hosted through the University of Maryland, is a collection of over 125,000 terrorist attacks and incidents from 1970 through 2013. Collected through publicly available and unclassified documents, the events chronicled in the GTD are methodically collected and transcribed. Each event listed in the GTD must satisfy the inclusion criteria set by the GTD. Each event must be intentional, must illustrate some level of violence or threat of violence, and the perpetrators must be sub-national actors. In addition, GTD defines terrorist attack as “the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation” (“The Codebook,” p.8).

For the purpose of this study, only attacks coded as a kidnapping by the GTD are included in the sample size. These events are differentiated from a hijacking or barricade incident. In kidnapping scenarios, hostages are taken from the location in which they are abducted to another, usually unknown, location. In contrast, hijacking incidents include the seizure of not only people but also a vehicle such as an aircraft or bus. Barricade hostage taking differs from kidnappings in that a barricade incident includes a target location where hostages are kept and not moved to a different location (“The Codebook,” p. 23). For reference, the Iranian Hostage Crisis is an example of a barricade hostage incident because hostages were kept inside the American embassy as opposed to being moved to an unknown location.

In addition, the GTD differentiates between kidnappings where a ransom was demanded, no ransom was demanded, or a ransom is unknown. For the purpose of this study, only kidnapping incidents where a ransom was demanded are used.

*Concept Definitions and Measurement (The Code Book)*

For this study, the dependent variable is coded by the GTD as hostages released or killed. Unknown outcomes and outcomes coded as combination (where the outcome is unknown or non-uniformed) are excluded from the sample.

I propose six independent variables, four of which will be used as control variables. The four control variables are: development, gender, co-national status, and target type. The two independent variables most pertinent to my hypothesis are terrorist group identity and terrorist group motive.

Development is coded using the United Nations' Development Programme's Development Index, which evaluates each country's development on a scale from 0.0 ("least developed") to 1.0 ("most developed") every year. The grade is influenced by a variety of factors including Gross Domestic Product (GDP), infant mortality rate, life expectancy, and literacy rate. A country whose index rating is between 0.0 and 0.6 on the year of the incident is coded as a 1 for "underdeveloped". A country whose index rating is between 0.61 and 0.8 on the year of the incident is coded as a 2 for "developing". A country whose index rating is between 0.81 and 1.0 on the year of the incident is coded as a 3 for "developed".

Using the information found in the GTD, co-national status is coded by looking at the incident report and the GTD database to determine the country where kidnapping occurred/where terrorist group is located and nationality of target. If they are the same, then that event is listed as "co-national status" (1 in SPSS), if the two countries are not the same, then they are "not co-nationals" (labeled a 0 in SPSS).

To code gender, the GTD incident report is used however not all cases identify the hostage by gender. If the hostage is "female", it is coded as 1, while "male" is coded as 2; no distinction is made for children. The individual is coded if readily available from name of target, listed as male or female, or references in summary report to "him" or "her." In addition, the cited sources GTD lists for that event, often news articles, are used to find gender markers.

Target type is coded as either "private" or "government" based on the coding from GTD. Those coded as 1 refers to private citizens. This coding is an agglomeration of GTD's original target type coding including tourists, private citizens, non-profit workers, and business workers. Those targets related to the government, such as diplomats, security forces, or police, are coded as a 2.

Group identity is coded as "secular" or "religious" given the nature of the terrorist group. Using the GTD's Terrorist Organization Profiles or the Terrorist Research and Analysis Consortium (TRAC), the incident is coded as 1 if the group is "secular", or does not identify by religion, while the incident is coded as 2 if the terrorist group is religiously motivated. When the group responsible for the kidnapping is "unknown," the data point is coded as 0.

Group motivation is coded as "limited" and "unlimited" based on the ultimate goals of the terrorist organization. If the ultimate goal of the terrorist group has defined boundaries within a specific region, the organization is coded as a 1 for "limited". A group whose ultimate goal is not bounded to a specific region, and identifies with a global ambition is coded as a 2 for "unlimited". To illustrate this differentiation, the PKK in Turkey are coded as "limited" because their ultimate political goal is for a Kurdish homeland. In contrast, Al-Qaeda is coded as a 2 because of its call for a global jihad and its ultimate goal of creating a global Islamic state. When the group responsible for the kidnapping is "unknown," the data point is coded as 0.

### *Preliminary Outcomes*

Using SPSS, crosstabs of the dataset reveal some interesting relationships between the six independent variables listed above and the dependent variables.

Co-nationals are more likely to be targeted and more likely to be killed by terrorist organizations looking for ransoms. About two-thirds of all hostages taken are co-nationals, meaning the hostage is of the same nationality as the terrorists. In addition, co-nationals are more likely to be killed. Foreign

## **"The Interactive Primer Model: Where High Tech and Old World Collide"**

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The Interactive Primer Model:  
Where High Tech and Old World Collide  
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**Abstract**

This paper serves as a brief introduction to the newly created Interactive Primer Model, a new pedagogical approach to curriculum development and instruction. The Interactive Primer Model consists of three distinct modules occurring in consecutive order. The first is the interactive primer itself (I), an online course module completed prior to attending class on site. The second is developmental instruction and lecture (II) and the third is any exploratory session (III). The Interactive Primer Model is a new hybrid learning approach that seeks to leverage the advantages of educational technology, the instructor's skills and experience, as well as the benefits of socially supported learning through exploratory learning.

In recent years, technology has enabled educators to create new and innovative learning experiences. These advances allow students to interact with the material they are studying to a degree never before possible (Nichols, 2008). The battle between institutions with fully online formats, brick and mortar programs, and flip-classroom advocates surges on; however, a middle ground does exist that can allow the learner to take advantage of the positive aspects of these experiences. During this presentation, a new model of learning will be proposed that seeks to utilize the methods of the past in a manner fitting of 21<sup>st</sup> century learners.

The Interactive Primer Model of Learning is based on the use of a primer learning experience, an interactive and LMS managed online learning module, which prepares learners for in-depth classroom instruction and experiential activity. Interactive learning modules studied have shown that "the constructivist approach to online module design, whereby the learner constructs knowledge through activity, appears to offer instructors and students a way of achieving learning outcomes (Slinger-Friedman & Patterson; 2013)."

The interactivity of the model includes game-based and scenario-based activities that incorporate core material allowing the student to engage the content in resource-intensive tasks. Using



well developed theoretical approaches to game construction, instructors can utilize these elements in a way that allows them to “adapt and respond to the needs of learners and [other] educators (Hendrix, Knutov, Auneau, Arnab, Dunwell, Petridis, Lamas, & de Freitas; 2013).” These notions are based upon “the long-standing instructional design thinking that it is not enough to develop a technology-based course simply because the technology of delivery exists (Bernard & Abrami, 2004)” but that the technology utilized should be “media that supports teaching and supports learning (Bernard & Abrami, 2004).”

Hartog and Toetsontwikkeling (2007) indicated that “the dominant instructional sources are publishers’ textbooks.” Within the Interactive Primer Model, the instructor has ultimate control over what is presented and how. This process has one significant advantage: the instructor can draft, edit, and revise until the primer reflects their vision of how the information should be relayed, the activities the learner engages in, and any other method of instruction that fits the instructor’s pedagogical practices.

This model is separate from existing pedagogy in that it does not seek to replace classroom instruction; rather it exposes the learner to the material being covered in the classroom so that each student has the opportunity to gain more from the expertise and experience of the instructor. As counselors, we value relationships and believe that experience, in the classroom and out, is the key to growth as a practitioner. The Interactive Primer Model of Learning proposes that we retain this focus while allowing learners to engage content in a way never before possible.

### **Model Components**

The Interactive Primer Model consists of three distinct modules occurring in consecutive order. The first is the interactive primer itself (I). The second is the brief review and lecture (II) and the third is the exploratory session (III). The following requirements are outlined using a 90 minute course design for illustrative purposes.

### **The Interactive Primer**

Unlike traditional hybrid or flip-classroom formats, the interactive primer is specifically designed to introduce core concepts and primary themes of learning in a brief but powerful virtual experience. This primer is used to develop the learner's base knowledge of a particular area, in addition to support provided by supplemental readings and text, without fully replacing direct instruction. As such, the interactive primer is specifically designed to promote retention of concepts, not to develop them or conceptualize them beyond what is necessary to facilitate understanding.

The interactive primer should be built using the following criteria:

- a) A maximum of 30 minutes (or 25%) of content
- b) At least one (1) gamified activity.
- c) At least one (1) element of interactivity.
- d) At least one (1) use of video, animation, or other movement-based media.
- e) Controlled user movement through content areas.
- f) Content designed to prepare the learner for higher level application and abstract conceptualization.

Once created, the interactive primer should be properly tested. This could include running the course in a test environment; ensuring that the Learning Management System, or LMS, is properly tracking activity, scores, and access; as well as testing for SCORM compliance. When testing is complete, the course should be released to students to be completed 2-3 days prior to the course meeting on site. Once implemented, the course should be consistently monitored and updated to fit changing curriculum as well as student needs.

**Developmental Lecture and Instruction**

The brief review and lecture should be comprised of 15-30 minutes of instruction (or up to 25% of the total time allotted for course activities). This time should focus on connecting concepts from the interactive primer to the higher level application and abstract concepts planned for the exploratory session. This differs from traditional instruction in that the focus is developing the content already provided to students in preparation for the exploratory session. Eison (2010) indicated the following in a recent publication on how to utilize active learning instructional strategies:

“Though a well-crafted and captivating lecture presentation would seem to be an especially time efficient way for an instructor to —cover course content, converging evidence from a wide variety of different types of sources indicates that listening to a classroom lecture is not an especially effective way to promote deep and lasting student learning.”

It is for this reason that the lecture portion of the classroom experience has been restructured to support the Interactive Primer and Exploratory component, covered in further detail in the next section. The aim here is to reduce lecture time and increase lecture effectiveness by targeting only instruction that increases the student’s level of understanding and prepares them for learning through exploration and activity.

**The Exploratory Session**

The exploratory session should consist of 30-45 minutes of application-based, interactive, and/or actionable learning activities (or up to 50% of the total time allotted for course activities). This session should focus on taking the elements covered in the first two sessions beyond conceptual learning, instead focusing on utilizing the information in a way that allows the learner to enact or otherwise manipulate the information learned. The guiding principle for the development of this segment should be based on the following Asian proverb: “I hear, and I forget. I see, and I remember. I do, and I understand.”

When concluding the Exploratory Session, it is recommended that feedback and assessment take place. The feedback portion could be a group discussion, survey, or individual meetings that aim at gathering student feedback and impressions of the course. This will assist the instructor in making necessary changes and modifications to the curriculum. The assessment portion can include objective or subjective assessments of learning. Although the Interactive Primer Model of Learning is based on experiential and technological integration, the measurements of student outcomes are still viable and should be utilized within this model.

### **Conclusion**

The Interactive Primer Model provides educators and instructors with the opportunity to fully utilize all the resources at their disposal, managing for the inherent weaknesses in “all or nothing” approaches. These resources include educational technology, the instructor’s own knowledge and experience, the benefits of peer interaction and group activity, assessments, feedback, collaboration, and much more.

Currently, the model is being revised and will be studied with students in higher education as well as individuals receiving ongoing training in mental health agencies. This preliminary examination of the model will be qualitative, including focus groups and individual interviews, completed by those who have taken part in a course session facilitated using the Interactive Primer Model.

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**Spinoza's Ethology**

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### *Spinoza's Ethology: A Summary*<sup>1</sup>

Most of you have probably never read or heard of the Seventeenth Century philosopher and lens grinder, Benedictus Spinoza, from the Netherlands. If you have heard of him, most likely you have heard that he is one of the most infamous heretics in history, the God fearing "devil incarnate," excommunicated in 1656.<sup>2</sup> Child prodigy, lover of science, philosophy, and languages, expert lens grinder for microscopes used by some of the world's most established scientists, and a dedicated friend of wisdom, Spinoza was born into a Jewish family studying to become a rabbi well into his adolescence. As compared to some of the intellectual, scientific, and religious limitations placed on freedom of thought, speech, and publication in past history, Spinoza's time period and Seventeenth Century Holland was a good time to attempt original philosophy and experiment with new methods of scientific investigation. For example, in Spinoza's lifetime and areas in which he lived the world witnessed the first laboratory of physics at Leiden University in the Netherlands.

Spinoza has been called many things beside the devil incarnate. He has also been called a dry mechanist who believes we are nothing but organic machines devoid of a soul, a dirty pantheist, an unoriginal philosopher with a logically problematic system, and an evil heretic whose works should never be read. Yet, he has also been called the "god intoxicated man" and one of the most original thinkers of the Seventeenth Century, as well as a philosopher of the Western canon with one of the most difficult systems to unpack. He was, of course, all and none of these things, but, by the young age of twenty four, he would be excommunicated by the Amsterdam Jewish community and unofficially excommunicated from the intellectual world at-large. I would like to summarize why Spinoza was one of the most original, rigorously systematic, and compassionate thinkers to have written philosophy. He was also an interesting and creative individual who believed that human concepts about "God" cannot be logically understood in any other way except as Nature and laws of Nature modified as dynamic expressions of thought (the mind as ideas) and extension (ratios of motion and rest between bodies where bodies are understood as more than merely physical matter).<sup>3</sup>

For Spinoza, all of Nature is one organic, eternal whole. All of the interactions of the universe, all of "substance," and all possible rational thoughts about a God, for example, however you decide to

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<sup>1</sup> The full title of my doctoral dissertation is "Spinoza's Ethology: Recognizing Dynamic Transitions Between Imagination, Reason, and Intuition" and will be defended with the Department of Philosophy, Duquesne University, in the Spring of 2015. This essay is the extended version of a paper read to a general audience at the 2<sup>nd</sup> Annual Duquesne University Graduate Research Symposium, November 7, 2014, Pittsburgh, Pennsylvania.

<sup>2</sup> For the most definitive and well researched biography on Spinoza see Steven Nadler's *Spinoza: A Life* (Cambridge University Press, 1999). Within the infamous *cherem*, we read the added warning, "'no one should communicate with him, not even in writing, nor accord him any favor nor stay with him under the same roof nor [come] within four cubits in his vicinity; nor shall he read any treatise composed or written by him (Nadler, 2006).'"

<sup>3</sup> See Edwin Curley's translation of Spinoza's *Ethics* with an introduction by Stuart Hampshire (Princeton University Press, 1994).



name it, can only be logically conceived as one unified substance. Spinoza used an intensely rigorous form of deduction called the geometric method which is modeled, at least in part, after Euclid's geometry. Yet, as we all know, "God" cannot be mathematized. "God, or Nature," as Spinoza writes, includes within its definition that Nature must be eternal, perfect, have infinite attributes and express itself in infinite ways.<sup>4</sup> Human expressions, as modifications of substance or *modes*, can only know *two* of these infinite attributes, *thought* and *extension*. Both of these attributes run parallel to each other in their expressions and actions simultaneously, as well as have their own respective laws of Nature. In fact, all natural phenomena can only be rationally comprehended as operating according to fixed and eternal laws, but the ways in which the attributes express their laws as modal modifications of substance can combine, rearrange, dissipate, and generate infinite and dynamic combinations. To try and logically prove, in the Seventeenth Century, that all of Nature is "God" and that God can only be defined as the unraveling and folding of combinations of laws of Nature could get you killed. But what Spinoza said next about our ideas and actions as natural phenomena which *are* God's direct expressions was even more dangerous. That is, his system was so logically rigorous that it threatened to unravel the various ways in which multiple theological and philosophical positions ruled mass mentality and belief.

Our thoughts can only be of three kinds according to Spinoza. We have ideas which are images, such as ideas composed of words, sense data, memory, and fantasy, but all of these kinds of knowledge are what Spinoza calls imaginative or partial knowledge. Such ideas are personal, for example, to each of our own thought processes and singular experiences. Your sense data is different from my sense data. There are also ideas of reason which Spinoza calls "common notions." These common notions are adequate knowledge which contain the true common properties of things of which we can all agree on and become aware of or learn. The third and last kind of knowledge we can have is intuitive knowledge. Intuitive knowledge includes efficient, creative, and powerfully applied imaginative and rational ideas together to create powerful effects. It can also include experimentation using both common notions and affirmatively powerful imaginative knowing as a method to discover new knowledge. These levels of knowledge create ideational registers of force within a field of effects. In other words, *some ideas are more powerful than others just as some actions are more effective than others*. The powerful effects of forceful uses of rationality and imaginative ideas affect us personally with force, and leads to our having more adequate knowledge and increasing degrees of joy and happiness. The catch is that imaginative ideas produce other imaginative ideas only, and rational ideas produce other rational ideas only. So, if you are stuck in your partially constructed imagination more often, you will have less rational series of ideas and, therefore, less power of true knowledge and effective action. Clearly, it is to our benefit on many levels to reflect on which type of knowledge we are using, focusing on, or creating. It works to our great benefit and increasing levels of joy and knowledge to learn *how* the laws of thought and extension operate. This type of learning increases our capacity and power to think well and act with more power and creativity. In other words, our mind does not arise from a physical brain or container which has ideas. The attribute of thought *is* ideas, and our adequate ideas include conceiving God (or Nature) as a thinking thing (as one of its infinite attributes). Further, because all of thought runs parallel with the motions of extension, and because both attributes operate according to their respective laws of Nature, we can find ways to intensify both through understanding how those laws operate or can be applied.<sup>5</sup>

We do not know what our bodies are capable of doing and experiencing until we do the action or have the experience. For Spinoza, the attribute of extension or *the collision of bodies in motion* includes both what occurs in our bodies internally and what occurs as we come up against other bodies

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<sup>4</sup> Spinoza, *Ethics*, 1D1-8, A1-7, p1-13, Ed Curley, trans., pp. 1-9 (Princeton University Press, 1994). The rest of this summary is a reference to all five books of the *Ethics*.

<sup>5</sup> *Ibid*, 2D1-7, A1-5, p1-11, pp. 31-38.

external to us (people, objects, weather patterns and related). Extension is explained as continuously shifting ratios of motion and rest for Spinoza. That is, extension involves eternally shifting ratios of motion in ways in which we can maintain our bodily homeostasis and integrity, but also, upon our finite death for example, our extension (bodily compartments) merely takes on a new type of ratio of motion and rest as an expression of Nature understood as the attribute of extension and its laws. A great example of the power of motion in extension as natural phenomena which abides by its own laws are when a group of individuals combine to form a larger, unified body of ideas and actions, and that larger unit then has more of a capacity to both survive as a group and to create powerful effects than any one individual of the group would have. This becomes a particularly forceful adequate series of ideas and efficient actions when the group uses its power rationally and creatively, for example.

For Spinoza, our natural tendency is to maintain homeostasis and bodily integrity, but this singular tendency also includes a desire to strive for continued existence and learning. In our tendency to strive for greater existence, which Spinoza calls our *conatus*, we experience increasing and decreasing levels of power and force continuously. In other words, it is impossible for any one individual as a combination of thought and extension who is a part of several larger bodies of interactions (states, storms, families, global weather patterns etc.) to continually enhance or increase their power to exist at all times. We cannot predict what external forces might overpower us, for example. Because we desire to thrive in our existence, and because we are rational and imaginatively creative expressions of natural phenomena, we also desire to continue to increase our power to exist with more force and joy when we can. Powerfully rational and imaginatively creative ideas which create powerful effects with others not only give us joy and pleasure, but they increase our overall capacities to think and act with more force. These types of effects increase our power to do more than merely survive. The more rational we become, the more we can find ways to experiment with knowledge, and the more knowledge of the common properties of singular things we gain, as well as the more bodily pleasure and joy we experience and learn about. This is what Spinoza calls the *intellectual love of God* (or Nature).

The more knowledge we have about natural phenomena as the expression of an eternal, perfect substance, the more power we have to create affirmative and joyous effects for all. Our experiences of our own adequate understanding in these ways becomes increasingly joyous and affects us in transformative ways. It lends itself to a level of peace of mind in the realm of the immanently sublime. When we combine the affirmative power of intuitive knowing with ideas we have about the affections of our bodies, that is, when we imagine and reason about what our bodies and minds are experiencing, additional powerful affects are created. Affects are the combination of affections of our bodies (from interacting *as* and with nature and other bodies) with the ideas we have about those affections. Because this is a combined experience of both thought and extension with force and motion, the stronger the affects we experience, the more joy we have and the more power we gain to affect others with our ideas and actions. For Spinoza, this is what human *ethics* consists of. It is more than just having adequate knowledge about natural phenomena. It is also about creating powerfully joyous, rationally imaginative, and rigorously applied effects with and for others. If we are stuck in our imagination too much, that is, if we are focusing on those series of images, memories, sense experiences, or partially formed (inadequate) ideas, and not on powerfully rational common notions which can be applied creatively, we lose our power to act and to think well. When this occurs, Spinoza writes that we experience sadness, distress, confusion, and what he calls overwhelming sad passions.

Here's where things start to get really interesting... I will avoid the highly nuanced and systematic ways Spinoza goes about providing evidence for his system using a deductively rigorous method of over 200 propositions and their demonstrations, a method which needs every single previous proposition in order for the next propositions to follow logically. Our time is limited today, but I can tell

you this: Not only is Spinoza's system incredibly rewarding to attempt on one's own and within a group setting of compassionate and informed interlocutors, but it can also be used to enhance such wonderful experiences as our use of creativity and simultaneous feelings of pleasure both individually and collectively with more power. In other words, we can use Spinoza's system found in the *Ethics* to become more creative in our endeavors and, while doing so, intensify our pleasurable experiences and types of knowledge. Who doesn't want to be more creative, a more intensely rational and imaginative thinker, experiment with more force in novel ways, and experience more qualitatively fulfilling rational pleasures and personal joy? The more we understand how to use the three types of knowledge with increasing and informed force, the better life will be, at least according to Spinoza... Because we *are* Nature, gaining more knowledge about natural phenomena is the best activity we can do, as that is what we have the most power to do as human beings.

I could talk more about God as infinite expressions of Nature modified in infinite ways, but for now I will summarize what Spinoza has done for and in my life the past decade. Believing in his system, that it will deliver what he writes it can deliver, saved my life on multiple occasions. If we were to invent a game, where our task is to search for answers to our questions (like a scavenger hunt among the cosmos with ever more interesting and complex clues), and we were to call it Planet Artist, where all players of the game take on different roles specific to their areas of knowledge, some using their knowledge solely for imaginative or playful purposes, some using rationally deductive processes to their utmost intensity as tasks we are to complete, some experimenting with creativity just to see what the novel can produce, some using mathematics or science, technology and language, music and philosophy, and some yet still incapable of controlling their passions completely, falling in and out of fantasy, only to be rescued by the reason and compassion of the rest of the players, rescued by the power of collective endeavor, what would such a game look like? What might the outcome be? In other words, can you imagine what might be possible and the various ways in which we could learn and play?

Spinoza's philosophy and its teachers have taught me, and continue to teach me each day, the complexities of natural phenomena and the beauty of being human. I have tried to incorporate this philosophy into my life as best as I can. I have failed often, but perhaps it takes practice and an increase in the capacities for intense conscious reflection in action regularly. Spinoza's system has taught me about ethics, politics, philosophy, education, physics, enjoyment, biology, creativity, and human psychology in all its increasingly complex and fascinatingly simple expressions. It has taught me about collective action, where collective action fails due to bias and fear, the nature of singular power, tolerance, love, and rational thought processes, all of which becomes a form of felt affectivity. I can rearrange my ideas to include the rational understanding of how to enhance my own creative thought and powerful action in ways which benefits all of Nature. Spinoza's philosophy has taught me how to live a better life, how to live well, even in my times of failure, and especially in those times when external influences were more powerful than I am or when external circumstances become incomprehensible to some around me (regardless of how well I reason about and attempt to explain such things). In understanding our passions (and the passions of others) we are transformed, and in our metamorphoses we learn how to use creativity to enhance the joy and the power of comprehension. That is, we learn how best to affect ourselves and others in ways which benefit all of Nature. We form larger bodies of rational collectives and ideas making a lasting impact, leaving traces and impressions which causally connect to other powerful causes and impressions. The human mind, as an expression of Nature, and the human body, as ever shifting ratios of motion and rest connected causally to other shifting ratios of motion, are a unified way for human beings to express Nature's power in its *infinity*. When you conceive of things in this way, it is not hard to understand what the power of God is and can become. In our expressions which we conceive of ourselves as causing with more force, creativity, joy, and rational understanding (which should remain continuous), it is not difficult to comprehend the mind and heart of

God expressed as a modification of itself in human form. I have used Spinoza's *proto-physics of force* to transform my own life, albeit slowly at times, with more speed at other times, to contribute to the power of Nature and to enhance my *conatus*. Spinoza's ethology uses the philosophical imagination to better understand the universal truths of natural phenomena.<sup>6</sup> This is a level of joy which we can reach that understands the reasons or causes for something. This is Spinoza's definition of *love*. It is a personal experience of joy coupled with an adequate understanding of the cause of that joy as a powerful affect. Our striving in existence in this way strengthens our character and resolve. For Spinoza, to reason well is virtuous and to play well with increasing creativity is just a lot of fun!

There are no real borders when we are all connected as one organic whole in continual expression of the same substance (Nature, or God). We *are* understanding and, therefore, we express the agreement between idea and object, that is, we express an identical agreement between our mind and the mind of God. Nature's essence *involves* its existence, and that existence, which we express continually in our own singular ways, is eternal, perfect, and of the necessity of laws of Nature. We are a force of Nature as a modal modification of that which is infinitely causally connected and powerful. We are comprehended as part of God's infinite idea, or rather, everything about us is just natural because that which includes laws of Nature of which we can express must and can be conceived as natural phenomena logically. We need other rational and imaginative ideas to thrive in our existence, we need other bodies as well. As social beings, we also need others, and, to survive with more power and joy, we need them to be acting rationally. We all thunder oneness and are one thunder. Now let me ask you, has any part of this explanation resonated with your intuition? Has any part of what I have expressed here today given you a feeling of joy? If so, do you feel the adequate truth I wonder?

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<sup>6</sup> See Genevieve Lloyd's *Spinoza and the Ethics* (Routledge, 1996, p. 21) and Stuart Hampshire's *Spinoza and Spinozism* (Clarendon Press, 2005) as excellent explanations of Spinoza's philosophy for all audiences. As one example, Lloyd writes, "The capacity for distance, detachment and irony – and for the intellectual play and transformation of ideas which those capacities make possible – are evident in the content and in the style of the *Ethics*."

**Revisiting Advance Directive Planning from a Holistic Perspective**

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## **Introduction**

Terminally ill and dying patients are faced with difficult decisions in a unique, stressful situation. Sometimes, if the patient is incapable of making decisions, then the family has to make these difficult decisions while dealing with the emotions of losing a loved one. Advance directives are intended to prepare individuals and their families for decisions in these difficult times. An AD can help promote the patient's autonomy throughout their death even if he cannot communicate. Thus, the individual is capable of maintaining his autonomy up until the moment of death

Current approaches to AD planning are inconsistent with the type of treatment patients are receiving. Patients are seen by a team of providers to care for the whole individual. In the meantime, when completing AD documents, patients are pushed toward only focusing on the clinical implications of treatments. Patients are often in situations where they are not prompted to ask the right questions in regards to their unique end of life experience. Advance directive planning should be a more holistic approach to fully respect human dignity through to a death event.

## **Current Approaches and Dilemmas to Advance Directive Planning**

Advance directive (AD) planning is an approach recommended for patients who are towards the end of their life, have a terminal illness, or a chronic degenerative illness. These documents can be beneficial for the patient, health provider, as well as the patient's family and friends. Ultimately, an AD is intended to respect autonomy when the patient can no longer make decisions. Current methods for AD planning in Pennsylvania have a heavy clinical emphasis with limited governmental support and clinical consistency. As a result, advance planning sometimes comes with as many risks as benefits.

## ***Intention of Advance Directives***

AD were originally intended to opt out of treatment options near end of life. At one point, patients needed to be ethically justified to deny treatment options because the health spectrum was so focused on maintaining life despite quality of life. AD's are useful for patients with chronic or terminal



illnesses as well as for those who might be incompetent to decision making. Now, there are many forms of advanced directives which address the patient's wishes for quality of life as well as directives for providers. Patients can even write a personal note about their wishes for end of life care and treatments.

Essentially, there are two parties involved in the AD; the patient and medical provider. From the patient perspective, an AD is intended to protect autonomous decision making through the end of life. As mentioned, patients can opt out of treatments and designate a surrogate decision maker. Additionally, patients can now express quality of life standards towards end of life.

The benefits of a document like this extended beyond just the patient's decision making but also relieve the families of difficult decisions. By filling out an AD, patients are allowing their voice to be heard when the person is physically incapable. Therefore, the surrogate decision maker becomes an advocate for what the patient has already stated in the AD. In cases when the AD is properly filled out and used, families are relieved of many difficult decisions such as withholding and/or withdrawing treatment. More importantly for the families, AD planning can relieve guilt or uncertainty which might come with hard decisions.

From the medical provider's perspective, an AD gives the provider an idea of the patient's treatment plan at end of life. All hospitals receiving federal funding are required to inquire and inform patients about AD planning.<sup>1</sup> If an AD is available, the hospital should obtain a copy and keep it with the patient's files. The intention then is for the provider to review the AD with the patient, if possible, to maintain appropriate care standards laid out by the patient. Ultimately, the provider has a better understanding of the potential treatment options for the patient which would be in accordance with the patient's wishes.

### *Current Advance Directives at UMPC Mercy Hospital*

Two types of AD's used at Mercy are the Five Wishes and Allegheny Bar Association. Both forms embody the original intention of AD's through different approaches. Ultimately though, the either AD has shortcomings from the approach taken.

The Five Wishes addresses questions about surrogate decision making, treatment options, comfort quality, personal preferences, and a message to the loved ones. The Five Wishes covers many aspects of an individual's quality of life from their medical options to even options after the time of death. The AD offers the individual choices to include, or not, religious or spiritual beliefs, cultural traditions, and care preferences. For this reason, the AD becomes a well rounded understanding of planning from appointing a power of attorney to burial sites and memorial services.

On the other hand, the Allegheny Bar Association (ABA) is more heavily focused on the clinical aspects of decision making. This AD addresses questions about health care power of attorney, treatment options, and organ donations. In addition to these topics, the ABA attempts to address other questions the individual might have while filling out the AD. For instance, there are presumed questions about what power a POA would have and when the POA's authority would begin or cease to exist.

The Allegheny Bar Association's AD maintains the harsh medical language compared to the low national health literacy rates. Using an unfamiliar language then to discuss AD planning could intimidate the individual or family member. This then runs the risk of individuals choosing undesired treatment options and then, more confusion during the time of need. In addition to being intimidating, this language can also force a patient into thinking medicine is only black and white. For instance, a patient might not want a ventilator if it meant that was the end treatment. However, the patient might want a ventilator if this option is a bridge to an acceptable quality of life.

As for the Five Wishes, it is both general and standard. This approach does not promote reflection about suffering endured during the end stages of life. Furthermore, some of the options presented are basic care measures. For instance, under “how to be treated,” there is an option about bed linens being changed after they are soiled if the patient is incontinent. This seems standard care and sanitation than an actual option for how to be treated at end of life. There is also a section which addresses the loved ones. This section digressed from the intention of the AD.

Overall then, the Five Wishes document appears to generally target individual’s personal needs. Meanwhile, the Allegheny Bar Associations AD is too clinically driven and risks intimidating the patient and/or surrogate. Thus, both AD’s are focused and allow for interpretation. However, neither AD truly prompts the patient to ask appropriate questions relevant to the specific patient.

### **Catholic Human Dignity and Its Implications for End-of-Life Planning**

AD planning is especially important as end of life care tends to draw ethical questions about treatment options and the dignity of the human being. Catholic theology teaches each life is sacred because it is part of God’s creation. Furthermore, humans have a unique status and are born with human dignity. Respect for human dignity promotes individuality. This is necessary to emphasize especially through end of life.

### ***Sacredness of Human Life***

Catholics determine humans have dignity because they were created by God in His image and likeness. This means they are both physically and spiritually similar to God.<sup>2</sup> Since God chose to create humans in His image and likeness, then each person deserves respect. Human value lies somewhere below God yet, above other forms of creation. Furthermore, having been chosen by God, human beings maintain both a co-creator authority over other animals as well as limited in their authority.<sup>3</sup>

By being created in God's image and likeness, human beings are given a co-creator position in God's work. For health care purposes then, this interpretation of Catholic tradition allows for creativity and flexibility. Additionally, not all individuals might have the same goals or quality of life standards. This helps protect individuals from vitalism which could attempt to extend life despite any quality of life considerations. For instance, especially in end of life care, medications and treatment can extend an individual's life yet, the days extended are uncomfortable or even painful. Instead, an individual can decide when their quality of life is no longer desirable and could allow life to take its natural path, potentially towards death.

The Catholic understanding of respect human dignity protects individuals from becoming too uncomfortable or experiencing an undignified death. Instead, the individual determines when the life living is worth any potential pains or discomforts. The individual is in a position to make decisions about quality of life at end of life when they have had time to become informed and reflect on realistic options. Then, the individual can compare these options to their personal values and goals to decide which are in coherence with the individual's standards. For most individuals in this position, critical reflection requires some type of higher level cognition and sometimes, extensive time.

The Catholic Ethical and Religious Directives (ERD's) support that despite the group of health providers an individual might encounter, especially in acute care facilities, this does not change the goals of an individual or the respect that is deserved. Therefore, even though these individuals might appear to be incompetent and/or incapable of experiencing life, their life is still valuable because it was a creation by God.<sup>4</sup>

ERD's are most significant to reference in light of medical technology which can develop a tension with the value of life and perspectives of human authority. The Church began to reemphasize the importance of the principle of divine sovereignty. This principle establishes human beings as co-

creators which fosters their creativity and therefore promotes natural law theories.<sup>5</sup> As a result of creativity, Catholic health care ethics integrate the individual as well as the institutions role in the decision making process. An integration will protect both human dignity while respecting autonomy.<sup>6</sup>

### *Holistic Approach to Advance Planning*

While there are various, justified applications of medical technologies, the holistic approach to health care, and advance planning, uses proportionalism to help decision making processes. An action is justified by the proportionalist method if the action, ends, and intention are morally just in and of their self. An action's good consequence is required to be at least equally as important as the evil of the action for the action to be considered right. Additionally, the proportionalist takes into account the doer's intentions of an action to determine the moral value of an action.<sup>7</sup>

In terms of end of life decisions, the action is justified by Catholic proportionalism and morally permissible if it is coherent with the individual's goals and values. The proportionalist method is distinct from traditional practices in that, it depends on more than an action's intrinsic value as suggested by the deontological theorists. This method emphasizes will and creativity to live justly and in accordance to Catholic principles. The proportionalist method which is deduced from natural law theory, attempts to strike a balance between being both a creature and co-creator. In other words, proportionalism attempts to balance autonomy and divinity.<sup>8</sup>

A more holistic approach should be considered when completing ADs in order to fully respect human dignity. The ERD's state that a person's AD should be considered in cooperation with the Catholic moral principles as well as the individual's personal intentions and values. This is becoming more complicated, the ERD's acknowledge, with a team based approach to health care. Individual health is now a dependent goal which involves both patient and professional(s) participation.<sup>9</sup>

The Catholic Bishops of the United States have highlighted the dependent aspects of AD completion on the national level.<sup>10</sup> The patient is required to visit a provider to fully understand their condition and future conditions in order that, the patient can make informed decisions about their care plan. Considering the nation's health literacy rates, this aspect of filling out ADs is important.<sup>11</sup> Collectively, with the patient's autonomy, realistic options can become clearer. The physician's presence can provoke questions from the patient requiring further advice from another type of professional.

For these reasons then, especially in a Catholic hospital, a holistic approach to AD planning is most appropriate. A holistic approach would be one which allows the individual ample time and communication with the necessary resources in order to digest prospective treatment options and their risks and/or benefits to the individual's personal values and goals. This approach gives both the patient and provider responsibility for the health care.

#### **Clinical Examples and Considerations for the Holistic Model**

Thus far, it has been argued that current methods for AD planning focus heavily on the clinical aspects. This approach limits the amount of influence an individual's values might have on their planning. Catholic ERD's address changes in the patient-provider relationship and acknowledge a presence of a team of providers available for patient care. However, the practical application of AD planning was more of an individual and time sensitive event. The goal of a more holistic AD is to develop a more informed decision making using constant communication.

#### **Clinical Examples and Considerations for the Holistic Model**

The first clinical example of a holistic model is in La Crosse, Wisconsin health network. News articles about La Crosse, Wisconsin highlight how the city "slashed end-of-life medical expenditures."<sup>12</sup> Gundersen Health System in La Crosse adopted the Respecting Choices: Advance Care Planning model. The model intended to develop communication about advance planning through a continued dialogue between the professional and patient.

Respecting Choices focuses on three points: comfort and dignity at end-of-life, patient participation in decisions about end-of-life, and proper documentation for patient records. Respecting Choices model is more than a clinically based directive for a provider or surrogate decision maker.<sup>13</sup> The La Crosse citizens do not plan only the treatment options they want at the end of life but *how* they want to die. Nurses direct questions to the patients about treatments which could potentially prolong life with significant high risk side effects. When phrased this way, the patients more often request to discontinue the treatments. Essentially, this is how the conversation begins.<sup>14</sup>

A second example of a holistic approach is from Mercy Hospital's Palliative Care team. The team exemplifies the multidisciplinary approach. The team consisted of three people, a nurse, doctor, and social worker. Each team member offered a different personality and character traits which helped develop an efficient and successful care team. The team focused on the patient's goals and emphasized this aspect. While in conversation, the team made the patient and family aware that the patient's goals were important. Furthermore, the team mentioned they were going to do their best to cohere the patient's goals with reality.

This team had a unique opportunity because of their smaller patient population. The smaller population allows for the providers to spend more time with the patients and their families. The time spent allowed the doctors to become more familiar with the individuals and thus, allowed for better care to be provided.

### ***Application of a Holistic Model***

In both examples above, there is an attempt to bring the individual's goals to a clinical reality. The holistic model for AD planning would fuse two examples (Mercy And La Crosse) with a basic communication framework. First, the model would be initiated before the patient enters the hospital and develop a routine conversation. Additionally, the model would include a team of providers to help

the individual see how certain choices might affect other decisions. Thus, one decision is not an isolated event.

The question to determine patient goals already differs from previous examples of AD. As mentioned, current advance care planning focuses on the treatments the patient might want. The question “what treatments” is already confusing to these patients. When asked, what the goals are, the patient is in a better position to converse about their desires in relation to their autonomy. Likewise, the providers are in a better position to make options available.

For this reason, holistic approach requires continuous communication. A continuous dialogue is necessary as situations are not static therefore, it should not be assumed that patient goals are either. Rather, an individual in the final stages of life is in a situation that constantly changes. With each change, the individual is capable of changing their goals. The goal is to bring coherence between the patient’s goals and reality while maintaining balance between autonomy and human dignity. Thus, with constant communication between the providers and the patient, both parties are better capable of predicting the potential realities which might be acceptable for the patient.

In order to unveil the patient’s wishes, a patient could be asked on a scale to rank the importance of different controllable factors. For instance, the patient could be asked to rank on a scale how important pain management, medical technology or drug dependency, financial burdens, religious or spiritual beliefs, living environment, and/or family input are to the decisions the patient is making at end of life. This approach would at least develop a basic framework for the health providers to use for treatment options when completing an AD. As mentioned, it would be important to continue to rank these factors as they could influence the patient’s decisions.

Ideally, the multidisciplinary aspect would be best suited for AD planning outside the hospital situation and followed up with when the patient is in the hospital. If a patient could meet with perhaps a



social worker, nurse, and their regular provider, then the patient could have a better understanding of what can be expected for maintaining their goals at end of life. This would be an ideal situation and not necessary to be completed in person or all at the same time. Additionally, by developing a dialogue with multiple professionals, the patient's communication and cognitive skills are more recognizable. This could be beneficial when the individual is perhaps falling in and out of communication capacities.

### **Conclusion**

A holistic approach to advance planning would help the patient envision the complete picture in end of life both clinically and personally. Continuous dialogue is helpful to create a patient centered conversation while, a multidisciplinary approach is important to bring awareness to various contributing factors. Current AD planning are too narrowly focused at opposite ends of the AD spectrum. For this reason, patients might have a difficult time truly understanding the reality of their situation at end of life. And thus, the patient might fail to find appropriate questions to make the proper decisions. For these reasons, the holistic approach then is most effective for living out the Catholic Church's teaching on human dignity. Catholic human dignity is better protected under the holistic approach as this approach considers experiences influences on end of life decisions. That being said, an advance directive with a focus on personal goals and values is an attempt to protect human dignity in these specific stages of life.

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## Endnotes

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- <sup>1</sup> Patient Self-Determination Act, 1991.
  - <sup>2</sup> Mackler, 2003, 3-4.
  - <sup>3</sup> David F. Kelly, Gerard Magill, and Henk ten Have, 2013, 11-13.
  - <sup>4</sup> United States Conference of Catholic Bishops, 2009.
  - <sup>5</sup> David F. Kelly, Gerard Magill, and Henk ten Have, 2013, 20-22.
  - <sup>6</sup> David F. Kelly, Gerard Magill, and Henk ten Have, 2013, 39-41.
  - <sup>7</sup> David F. Kelly, Gerard Magill, and Henk ten Have, 2013, 86-88.
  - <sup>8</sup> David F. Kelly, Gerard Magill, and Henk ten Have, 2013, 84-86.
  - <sup>9</sup> United States Conference of Catholic Bishops, 2009.
  - <sup>10</sup> Catholic Bishops of Pennsylvania, 2004.
  - <sup>11</sup> Glassman, 2013.
  - <sup>12</sup> Reihan Salam, 2014.
  - <sup>13</sup> Gunderson Health System.
  - <sup>14</sup> Joffe-Walt, 2014.



**Ressourcement Theology and the Supernatural Debate: Toward a  
Christological Ontology**

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**RESSOURCEMENT THEOLOGY AND THE SUPERNATURAL DEBATE:  
TOWARD A CHRISTOLOGICAL ONTOLOGY**

Human beings are tricky creatures. What kind of thing are we? What is the end or purpose of our existence? What is the thing or things that we *really* desire? Questions like these have long haunted Christian theology. Certainly they did in the twentieth century, when an emerging guild of mostly French theologians, known to history as the *Ressourcement* school—or pejoratively, *la nouvelle théologie* (the new theology)—proposed that the human desire to be supernaturally united with God is not something added by a gift of grace, but is essential to what it means to be human. The establishment theologians of the day, often called Neo-Thomists (because of their reliance on the work of the thirteenth century Dominican friar, Thomas Aquinas), wanted to say instead that human orientation toward supernatural union with God is always a matter of divine grace and is always mediated through the Church. This so-called “supernatural debate” became one of the most important and most rancorous theological debates of the twentieth century.

I would be remiss if I did not warn you that the supernatural debate gets very complicated, very quickly. In many ways it is a debate about the correct interpretation of Thomas Aquinas. Thomas had suggested that *hypothetically* one could imagine human beings who were created in a state of pure nature, and had a purely natural end, (even though he never implied that any actual human beings did). So this is a debate about hypothetical states of nature, and whether they are accurate descriptions of reality or mere abstractions. And both sides have to do some exegetical gymnastics to prove that Aquinas is on their side, that he would answer modern questions the way *they* would, not the way

their opponents would—questions that were not even on the radar for a medieval friar. If that does not complicated things enough, there was some pretty heavy-handed ecclestical bullying going on as well. So if this seems like a lot of theoretical hairsplitting, *it is*. But that is because there is a lot at stake here. As we will see, the implications of this debate are real, and they are far-reaching.

This debate has already been charted by a number of theologians, all its crevices peered into and its implications cataloged. In this essay, our aim is simply to notice where both sides in the debate share certain assumptions and points of departure. In the end, I will suggest that pushing back against some of these shared assumptions may create space for new avenues of creative engagement.

### **An Historical Diagnosis**

The question of pure nature first came up because people worried about the fate of unbaptized children. Theologians did not want to say that the unbaptized could achieve beatific vision, but neither did they have the heart to damn innocent children to eternal torment. So the pure nature hypothetical was put forth as part of this analogous scenario: What if Adam had died in his original state of innocence, before he sinned, but also before having been infused with sanctifying grace?<sup>1</sup> What *would* have been Adam's fate had he died in this state of 'pure nature'? And by extension, what would be the fate of those unbaptized children? It was generally accepted that they would be "without fault

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<sup>1</sup> Interestingly, Thomas Aquinas, unlike many of his contemporaries, did not think that there was an actual *temporal* gap between the creation of human beings in pure nature and the infusion of supernatural grace—Aquinas' Adam did not exist, even for a second, in a state of pure nature. See Jean-Pierre Torrell, "Nature and Grace in Thomas Aquinas" in *Surnaturel: A Controversy at the Heart of Twentieth-Century Thomistic Thought* (ed. S. T. Bonino; trans. R. Williams and M. Levering; Ave Maria, FL: Sapientia Press, 2009), 156-63.

and without grace,” and would therefore experience an afterlife “without punishment and without glory”—a sort of in-between state.<sup>2</sup>

Some Neo-Thomists elaborated on this hypothetical until the natural and the supernatural became two separate orders, hermetically sealed off from one another, each follows its own course toward its own appropriate end.<sup>3</sup> Human beings are born in a state of pure nature, Neo-Thomists say, and, as long as they remain outside of the Church, can be fully and naturally fulfilled by such human goods as raising a family or contributing to society. Only the grace of baptism can orient them toward supernatural union with God.

What is at stake here for *Ressourcement* theologians is that on this scheme the natural might be viewed as a wholly autonomous order. *Ressourcement* theologians emerged during the rise of fascism in Europe, and believed that many Catholics had uncritically accommodated the Vichy regime because the separation of the natural from the supernatural meant that the natural order could go its own way unaccountable to the gospel of Christ or to his Church.<sup>4</sup> The realm of pure nature had blossomed into a secular space, free from religion and from God.

The Neo-Thomists, on the other hand, were concerned to safeguard the gratuity of grace. If humans are naturally oriented toward supernatural union with God, and desire it naturally, then grace might in some sense be owed to them. There may be compulsion on

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<sup>2</sup> Henri De Lubac, *Augustinianism and Modern Theology* (trans. L. Shepherd; New York: Crossroad Publishing Company, 2000), 110. Recent popes have questioned the legitimacy of this state of limbo, at least with regard to unbaptized children, when in 2007, the International Theological Commission released a document entitled “The Hope of Salvation for Infants who Die without Being Baptized,” first commissioned by John Paul II and authorized for publication by Benedict XVI. ET available at <[http://www.vatican.va/roman\\_curia/congregations/cfaith/cti\\_documents/rc\\_con\\_cfaith\\_doc\\_20070419\\_un-baptised-infants\\_en.html](http://www.vatican.va/roman_curia/congregations/cfaith/cti_documents/rc_con_cfaith_doc_20070419_un-baptised-infants_en.html)>.

<sup>3</sup> Hans Boersma, *Nouvelle Théologie and Sacramental Ontology: A Return to Mystery* (Oxford: Oxford University Press, 2009), 91.

<sup>4</sup> John Milbank, *The Suspended Middle: Henri de Lubac and the Debate Concerning the Supernatural* (London: SCM Press, 2005), 89.



the part of God to grant the grace needed for humans to reach the end and fulfill the desire God gave them by nature. But this contradicts everything Christians proclaim about grace. Grace is not owed. Grace is a free gift, spilling over the abundant cup of God's joy.

### **Intrinsic or Elicited Desire?**

Even in their more vulnerable moments, when both sides can agree that every actually existent human being desires union with God, they still split hairs over whether this desire is *intrinsic* to human nature, or is *elicited* by something more proper to human nature. The Neo-Thomists say that our desire for union with God comes from first desiring a natural end proper to our humanity. Humans are intellectual creatures; we contemplate things. But to really know something, you have to know what caused it. So the *very natural* human search for understanding always points beyond itself to something higher. This is one thing Aquinas learned from Aristotle: the search for truth comes to an end only in knowing of the essence of the First Cause. So even though our desire for intellectual union with God is “natural” in the sense that every human being has this desire, the Neo-Thomists argue, it is not an essential feature of human nature. We have this desire only because it is elicited by a curiosity proper to human nature. As Lawrence Feingold puts it, the desire for union with God “is a *consequence* of rational nature.”<sup>5</sup>

David Braine, a contemporary *Ressourcement* theologian, counters that if the desire for union with God is not intrinsic, then “the traditional doctrine of original sin is

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<sup>5</sup> Lawrence Feingold, *The Natural Desire to See God According to St. Thomas Aquinas and His Interpreters* (Ave Maria, FL: Sapientia Press, 2010), 403, *italics mine*.

empty.”<sup>6</sup> In the classic understanding of original sin, not only are fallen human beings deprived, we “empirically do experience a sense of denervation.” It is “not like a whale’s not having legs,” Braine says “but like a horse’s not having legs.” We experience “a sense of lack of direction as if we had no ultimate end, or a sense that only some further providence of God for us, going beyond merely creating us, could give us a real meaning or direction.” If the Neo-Thomists are right that desire for supernatural union with God is not intrinsic to human nature, why would this be the case? Adam’s descendants may not be born in a state of grace, but, Braine asks: “Why should they feel this as a privation?...Why should we be dissatisfied with a lot which is quite natural to us?”<sup>7</sup>

### **Firing the Arrows of Misappropriated Teleology**

*Ressourcement* theologians and Neo-Thomists disagree, not only about the end or goal of human nature, but also about *teleology*—about how ends even work. They do so, I will argue, because both assume a classical teleological framework, which does not quite fit any Christian anthropology—neither their variation nor their opponents’.

In classical teleology, which traces its roots at least as far back as Aristotle, things move toward an end that is *intrinsic* to them: no one has to convince a caterpillar to build a cocoon. And they do so by their own capacities: an acorn does not need any special added power to grow into an oak tree. For Christian theology, the problem with this classical teleological framework is human beings: we are oriented toward an end that we cannot reach by nature. Everyone in the supernatural debate agrees on that point.

*Ressourcement* theologians think the desire for supernatural union with God is intrinsic to human nature, a gift or creation. The Neo-Thomists think it is a measure of grace added

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<sup>6</sup> David Braine, “The Debate Between Henri de Lubac and His Critics,” *Nova et Vetera* 6 (2008): 546.

<sup>7</sup> *Ibid.*, 546-7.

to nature. But they all agree that in some way or another humans are oriented toward union with God, which we cannot achieve by our own nature. Classical teleology is simply insufficient under these conditions. Still, both *Ressourcement* theologians and Neo-Thomists use the classical teleological framework to show that the other does not understand how teleology works.

Henri De Lubac says the Neo-Thomist idea that human beings, before they receive the grace of baptism, have some natural end other than union with God, “was born and developed in the intellectual context of a watered-down idea of what finality is.” It assumes, he says, that the end of human nature is “something fairly extrinsic: not a destiny inscribed in a man’s very nature, directing him from within, and which he could not ontologically escape, but a mere destination given him from outside when he was already in existence.”<sup>8</sup> As de Lubac *rightly* notes, in classical teleology ends cannot be tacked on after the fact like that. That is just not how finality works in classical teleology. A caterpillar’s orientation toward becoming a butterfly does not develop over time, or as the result of some external force. Becoming a butterfly fulfills the very nature of the caterpillar. If it has some other end, it is not a caterpillar at all. That is a principle of classical teleology: ends are constitutive of nature. And de Lubac says that for human beings “God’s call is constitutive.”<sup>9</sup> If God has called human beings into supernatural union with Godself—as clearly God has—then union with God is the only end by which human nature can be constituted and defined. It is nonsense to talk about any other end for humanity. This is why John Milbank thinks that, while Aquinas’ hypothetical purely natural creature has “higher animal functions such as building houses and planting

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<sup>8</sup> De Lubac, *The Mystery of the Supernatural* (trans. R. Sheed; New York: The Crossroad Publishing Company, 1998), 68-9.

<sup>9</sup> *Ibid.*, 55.

vines,” there is no indication that it should be considered the same kind of creature as human beings in the real world.<sup>10</sup> Human beings are not hypotheticals. So *Ressourcement* theologians argue that the Neo-Thomists misunderstand the way finality works, thinking that ends are separable from nature, and what they are left with is something less than human nature.

On the other hand, Steven Long *rightly* notes that in classical teleology one moves toward her end by her own capacities. An acorn does not need some special added power to become an oak tree. To become an oak tree is in the very nature of an acorn. If it is naturally unable to become an oak tree, it is not an acorn at all. Obviously human beings do not move toward union with God by our own capacities alone; we need grace to be united with God. Long accuses *Ressourcement* theologians of deliberately changing the philosophical definition of finality in hopes of defending Christian theology against the threat of naturalism.<sup>11</sup> He says that the *Ressourcement* view that human beings are moved toward an end for which they are naturally unfit means, ironically, that “no human person would be redeemed,” because being redeemed would result in the loss of human nature.<sup>12</sup> As such, Long alleges, de Lubac’s conception of grace “paradoxically completed the ontological evacuation of nature to which de Lubac was in part responding. Perhaps this is the clearest theological instance of ‘destroying a village in order to save it.’”<sup>13</sup> So the Neo-Thomists argue that *Ressourcement* theologians deliberately changed the classical

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<sup>10</sup> Milbank, *Suspended Middle*, 83. Milbank here refers to Thomas Aquinas, *Summa Contra Gentiles* III. 25 [5].

<sup>11</sup> Steven A. Long, *Natura Pura: On the Recovery of Nature in the Doctrine of Grace* (New York: Fordham University Press, 2010), 29.

<sup>12</sup> *Ibid.*, 34.

<sup>13</sup> *Ibid.*, 43.

philosophical definition of finality, such that things can have ends that lie beyond their natural capacities, and, as a result, they destroyed human nature.

See what happened? Both the *Ressourcement* theologians and the Neo-Thomists argued, from the premises of classical teleology, that the other misunderstood finality, and that, as a result, they diminished human nature. What neither seems to want to say is that maybe classical teleology is not suitable for Christian anthropology at all.

To my knowledge John Milbank is alone among *Ressourcement* theologians in rejecting the notion from classical Aristotelian teleology that one's proper end is necessarily attainable by her own capacities.<sup>14</sup> Instead, Milbank adopts a Proclean teleology, in which it is perfectly natural for a thing to be raised above its nature in order to reach an end beyond its own capacities.<sup>15</sup>

Two analogies—one from ecology, the other from art—elucidate the import of Milbank's divergent ontology. The first analogy is this: We might say that oceans are *naturally* tidal—tidal movement is essential to what it means to be an ocean—but there is nothing in saltwater to which tidal movement is proper. Even though it is so basic to marine ecology, tidal movement comes entirely from the external influence of the moon.<sup>16</sup>

For the second analogy we need a bit more theoretical framework. For Thomas Aquinas, intellect governs the material universe, like when humans manipulate raw materials to create art. So part of the purpose or nature of material objects is to be for the

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<sup>14</sup> Simon Oliver argues that even the classical teleology of Aristotle and Thomas Aquinas has room for external causation—or more precisely, for the cooperation of external and internal causes. See Simon Oliver, "Teleology Revived? Cooperation and the Ends of Nature," 26 (2013): 158-65. He may be right; but since both de Lubac and Long rely on this external/internal distinction to criticize the other side (see above), we will assume their interpretation of classical teleology for the purposes of this essay.

<sup>15</sup> Milbank, *Suspended Middle*, 101.

<sup>16</sup> *Ibid.*, 101.

instrumental use of intellect. In other words, when a human being uses a material object for artistic purposes, she is not destroying the material's nature; she is fulfilling it. Milbank says, "fully grown trees are natural, but so are tables."<sup>17</sup> And even though a tree could never become a table by itself—it has to be given the form of a table by some other nature—it fulfills its *natural* potential by becoming a table just as much as it would by becoming a full-grown tree.<sup>18</sup> Here is the analogy: Just as intellect governs the material universe, Milbank says, divine grace can be considered "the art of spirit governing." Just as human beings use material objects for art, "God can 'instrumentalize,' treat as his raw material," even the human spirit.<sup>19</sup> And just as human beings fulfill, not destroy, the proper potential of a tree by building a table, it is equally proper for God to elevate human beings beyond our natural capacities to supernatural union with Godself, and this does not destroy but fulfills our nature.<sup>20</sup>

So if we wanted to pin point where Milbank locates the human desire for union with God, it is not exactly *natural*, but it is not yet really *grace* either; it is a feature of divine creation, where we understand to be included in the idea of creation the notion that some things are brought to their proper fulfillment by the governance of a higher nature.<sup>21</sup> Technically speaking, a table is *not natural*, but it is a part of *creation*.

Milbank says this kind of teleology is the foundation of de Lubac's logic of the supernatural. Given de Lubac's arguments from classical Aristotelian teleology (above), I

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<sup>17</sup> *Ibid.*, 102. In Aristotelian teleology tables would be considered "artificial," rather than "natural," because trees do not have an *internal* principle of motion toward becoming tables, such as they have toward becoming full-grown trees. And as we will see shortly, even Milbank with his Proclean teleology will nuance this statement a bit, saying that tables are not *exactly* natural, but fall into a different category.

<sup>18</sup> *Ibid.*, 102.

<sup>19</sup> *Ibid.*, 100.

<sup>20</sup> *Ibid.*, 100.

<sup>21</sup> *Ibid.*, 103; Cf. p. 39 where he says "the natural desire for the supernatural cannot ever remain only a part of nature, yet it cannot ever yet really be grace."

am inclined to agree with David Jeffrey that, at least in this case, Milbank's de Lubac "sounds more like Milbank than like himself."<sup>22</sup> Nevertheless, Milbank's (and possibly de Lubac's) adoption of Proclean teleology provides a model for rejecting common points of departure in order to bypass the gridlock of the supernatural debate. By way of conclusion, I would like to suggest another common starting point that bears re-examination.

### **Conclusion: Toward a Christological Ontology**

Both *Ressourcement* theologians and Neo-Thomists begin by considering human nature on its own terms (whether is it "pure," what desires are proper to it, etc.) I submit that in theology this is never a very helpful place to begin. All our test subjects for the study of human nature are corruptions of the original design. Humans were created to reflect the glory of the Lord. But because every human being we have ever encountered is dulled by sin, to consider human nature on its own terms is, at best, to see through a glass darkly. Ironically, human beings provides bad data for thinking about human nature.

Of course, there is one exception: If Jesus Christ is both "fully God and fully human," then he can be said to represent the 'standard form' of both natures. Jesus reveals human nature in its fullness, as it was intended to be. I submit that a number of the tensions in the supernatural debate can be transcended by developing a Christological ontology, which begins, not with a consideration of human nature on its own terms, but with the revelation that in Jesus of Nazareth God became man, and then works through the implications of that revelation for human nature as well as for divine nature. It is not our goal in this essay to flesh out exactly what a Christological ontology might look

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<sup>22</sup> David Lyle Jeffrey, review of J. Milbank, *The Suspended Middle*, *JAAR* 75 (2007): 715.

like—though that is certainly fertile ground for further research. Rather, I conclude by showing that such an ontology can address the anxieties of both the *Ressourcement* theologians and the Neo-Thomists, and thereby creates space for meaningful dialogue and creative solutions.

*Ressourcement* theologians were concerned to ensure that nature could not be regarded as a closed system, fully definable on its own terms. To borrow an expression from one of their opponents, Steven Long, *Ressourcement* theologians hoped to recover the “theonomic character” of the natural order. They attempted to do so by insisting that human beings—and by extension the whole of the natural order, really—was naturally oriented toward the supernatural. For *Ressourcement* theology, nature is, in a sense, governed by the supernatural goal proper to it. For his part, Long—who is a contemporary commentator, so he has the advantage of some perspective gained from this debate—agrees it is important to recover the theonomic character of the natural order. In fact, he calls it “the greatest need of contemporary thought.”<sup>23</sup> He just thinks *Ressourcement* theologians went about it the wrong way. In Long’s estimation, recovering it will “require a vigorous return to metaphysics, natural theology, and ontology of nature.”<sup>24</sup> From my perspective, a focus on natural theology leads to exactly the same gridlock that resulted from a general consideration of human nature. Nature—all of nature—is marred by sin. To begin considerations there is to blunder the landing before even getting off the ground. That is not to say theology never gets around to talking about nature, but it cannot begin there. A Christological ontology affirms the theonomic character of the natural order—which both Long and the *Ressourcement*

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<sup>23</sup> Long, *Natura Pura*, 47.

<sup>24</sup> *Ibid.*, 47.



theologians hoped to do—because it views nature as that space in which God is always already incarnated. But it avoids judging human nature by its corruptions. Further, when human nature is examined through the lens of the incarnation, questions about what is proper to nature (the natural desire thesis), or whether it is well ordered (natural law), become less relevant to the task of subjecting the natural order to the demands of the gospel.

Neo-Thomist theologians worried that positing a natural desire for supernatural union with God would abolish the gratuity of grace: God would be obliged to grant the grace needed for humans to reach the end and fulfill the desire God gave them by nature. A Christological ontology, such as we are arguing for, could posit a natural desire for the supernatural in a way that guards the gratuity of grace, because on this ontology the supernatural character of human nature is not a feature of human nature as such, or even of creation (in Milbank’s sense), but is a result of the incarnation. That is to say, on a Christological ontology the supernatural character of human nature is always already a work of grace.<sup>25</sup>

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<sup>25</sup> The picture of *Ressourcement* theology in this essay is drawn primarily from Henri de Lubac and his commentators. It is only fair to note Hans Boersma’s assessment that, while theologians associated with the *Lyon* school, like de Lubac and Bouillard, “emphasized the sacramental link in its upward direction: nature pointed upward to the supernatural and made it present;” Balthasar and Chenu, from *Le Saulchoir*, “accentuated the sacramental connection in its downward direction: the Incarnation valued the created order and thereby gave it its sacramental character” See Boersma, *Nouvelle Théologie*, 88. Perhaps more time spent with *Le Saulchoir* theologians would have made this conclusion more obvious.

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# ABSTRACTS

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## **1 "The First Christian of Her Nation": Baptism of Pocahontas (1840), the U.S. Capitol, and Teaching National Identity**

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"The First Christian Ever of Her Nation:" Baptism of Pocahontas, the U.S. Capitol, and Teaching National Identity John Gadsby Chapman's painting Baptism of Pocahontas (1840) hangs in the Rotunda of the United States Capitol building. It is surrounded by paintings of significant themes and moments in American history, such as the signing of the Declaration of Independence; the messages that these paintings produce were meant to shape our identity as a new nation. Products of their time, these messages often included patriotism, history, honoring the Founding Fathers, or, in Baptism's case, between white settlers and Powhatan Indians, enforcing racial hierarchies. Chapman's portrayal of Pocahontas at the moment of her conversion to Christianity, and by extension, English way of life, shows the priorities of 19th Century Americans regarding Native Americans. Significantly, the Indian Removal Act had been in effect for almost 10 years at the time the painting was completed, and the country had not yet fulfilled its "manifest destiny." Arguably, Chapman also portrayed the Virginia colony's origin in a religious light, perhaps in hopes of defending Virginia against its ominous legacy of accepting the first African slaves—an issue starting to tear the country apart. This poster will delve into the politics behind the painting and will pose questions and issues that we as public historians must confront when presenting pieces or artifacts with divisive perspectives. The painting still hangs in the Rotunda of the U.S. Capitol and millions of visitors see and provide their own interpretation of it every year. Understanding its politics serves as an opportunity to learn about the country in the mid-19th Century and, by extension, the country's priorities as it attempted to create an identity, and interpretation by public historians to visitors should reflect this.

## **2 Activity and Gene Expression of Steroid Sulfatase During Differentiation of the Human MG-63 Preosteoblastic Cell Line**

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Estrogen is important in maintaining bone density. Postmenopausal women have low circulating levels of estrogen but high levels of estrone sulfate and dehydroepiandrosterone sulfate. Conversion of these precursors to estrogen may help maintain postmenopausal bone density. Steroid sulfatase (STS) converts sulfated steroids into their active forms. STS occurs in bone, but little is known about its regulation. We are investigating the activity and expression of STS in the human preosteoblastic cell line MG-63. MG-63 cells differentiate under the influence of osteogenic supplement, leading to extracellular mineralization. We studied STS in cells grown in medium alone (OS-) or grown with osteogenic supplement (OS+) over 21d. Cell proliferation was nearly exponential in OS- cells, but slowed in OS+ cells. STS activity and STS gene expression increased substantially over time in OS- cells, but showed only a small increase in OS+ cells.

Bone cell differentiation was assessed by alkaline phosphatase activity and osteocalcin gene expression. Alkaline phosphatase activity increased substantially in the OS+ cells and only slightly in the OS- cells. Osteocalcin gene expression was high in OS- cells throughout the time course, but was high only during d2-d11 in OS+ cells. STS inhibitor EMATE virtually eliminated steroid sulfatase activity throughout differentiation in OS- and OS+ cells. The estrogen receptor blocker ICI 182,780 had little effect on steroid sulfatase activity during differentiation in either OS- or OS+ cells despite the observation that mRNAs for both estrogen receptor alpha and beta are more highly expressed in OS- cells. The effect of individual components of osteogenic supplement on cell proliferation revealed that the glucocorticoid dexamethasone plays a crucial role in cell differentiation. Our data indicate that activity and expression of STS is higher during the early stages of bone differentiation. These results suggest that STS may play a role in bone development.

### **3 A Neuroethical Justification of Psychoactive Enhancements**

Michael Olusegun Afolabi

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Faculty Advisor: Henk ten Have, MD, PhD

Depressant and stimulant drugs influence the human brain/mind nexus by facilitating introspection, metacognition and decision making. As such, they offer an attractive means through which creative people may accomplish tasks faster. In spite of this capacity to improve “creative turnaround time”, the addictive and illicit nature of some of these drugs however raise ethical, social and legal concerns. Yet, the use of drugs in this context may be shown to largely cohere with the nature-nurture interaction which predominates the human experience. To be sure, such a description fits into a neurogenetic framework. On this note, this paper explores a neuroethical justification for the use of psychoactive drugs as biomedical enhancements. It shows that such a claim is reflected and founded in their capacity to foster extant skills including creativity-related behavior. Appraising the benefits and harms, the paper argues that the justification equally lies in a socially embedded framework. This is because society often values and overvalues certain skills over others based on the perceived relevance or contribution such skills may have on collective welfare. The derivation of socially useful values from psychoactive enhancements thus validates their use for creativity-related tasks. Since accessibility to controlled psychoactive drugs often constitutes a legal matter, the paper addresses the moral tensions raised by a neuroethical justification in relation to legal statutes. In this vein, it extricates and explicates the diverse hermeneutics underlying the harms of psychoactive enhancements. In the final analysis, the paper underscores the need for legal change vis-à-vis approving the selective use of psychoactive substances on utilitarian grounds. The legal change will however rest on the structure, tenor and tone of prevailing societal norms and values.

### **4 Allocortex is more vulnerable to loss of heat shock protein activity than neocortex**

Jessica Posimo

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The neocortex is less vulnerable to tau and alpha-synuclein inclusions in Alzheimer’s and Parkinson’s disease than the allocortex. One hypothesis to explain these regional differences is that protein-misfolding stress (proteotoxicity) travels through neuroanatomical circuits in a staggered fashion and that pathology is transmitted to allocortex first. An alternative hypothesis is that some regions are inherently more vulnerable than others. In order to establish whether cortical subregions differ in their vulnerability to proteotoxicity, we applied proteasome inhibitors to primary neuronal

cultures from neocortex and cultures from 3 allocortical subregions: entorhinal cortex, piriform cortex, and hippocampus. Neocortex was less vulnerable to proteasome inhibitors than cultures from any allocortical subregion. The proteasome inhibitor MG132 raised ubiquitinated proteins and decreased proteasome activity in allocortex more than neocortex. One of the major defenses against proteotoxicity is the heat shock protein family. Thus, we contrasted heat shock protein expression in neo- versus allocortex. Allocortical cultures were much more responsive to MG132 in heat shock protein induction, as might be expected from neurons that are more stressed. For example, MG132 raised Hsp70 and Hsp32 to higher levels in allocortex. Inhibition of Hsp70 activity with VER155008 or MAL3-101 and Hsp32 activity with tin protoporphyrin exacerbated the toxicity of MG132 in allocortex more than neocortex. These findings suggest that allocortex raises heat shock proteins to higher levels because it needs to rely on these defenses more. However, the allocortical defenses appear insufficient to render allocortex as resilient as neocortex. Finally, enhancing Hsp70 activity with 115-7c protected neocortex against MG132 but failed to protect allocortex. These findings suggest that Hsp70 molecules in allocortex may already be maximally activated or overwhelmed with misfolded, ubiquitinated proteins. Thus, neocortical neurons appear to be less vulnerable than allocortical neurons to loss of protein homeostasis, consistent with their greater resistance to inclusion formation in Parkinson's and Alzheimer's disease.

## **5 An Early Development Budget Impact Model for the use of Melatonin in the Treatment and Prevention of Osteoporosis**

Corry Bondi, Ph.D.

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In the U.S., there are approximately 9 million adults with osteoporosis (OP) and an additional 43 million at-risk. By 2030, this number is expected to increase to 68 million adults. The economic impact is estimated to be \$23 billion by 2025. Current drug therapies either decrease bone resorption (e.g., bisphosphonates) or stimulate bone formation (e.g., parathyroid hormone analog). Melatonin may be a potential treatment option because research has shown it impacts bone metabolism by promoting osteoblast differentiation and activity and by suppressing osteoclast differentiation and activity. As shown in the Melatonin Osteoporosis Prevention Study (MOPS; NCT01152580), melatonin improved bone health in perimenopausal women by renormalizing bone marker turnover. Also, it is well-tolerated and has a high safety profile. Given the chronic nature of OP, coupled with high treatment costs, economic evaluation of melatonin with existing treatments could be very useful for those who manage and plan healthcare budgets. The objective of this work was to determine the budgetary impact of the addition of melatonin to treat and prevent OP from a payer perspective. A 1-year budget impact model with a hypothetical plan population of 1 million was utilized for the analysis of OP and osteopenia. Whole sale acquisition costs of melatonin and comparators were taken from Red Book; market share and prevalence data were obtained from the literature. Sensitivity analysis was performed to assess if changes in market share and drug costs affected the results. All costs are in 2013 U.S. dollars. The introduction of melatonin produced a per member per month (PMPM) change of -\$0.11 for OP and a PMPM of -\$0.22 for osteopenia. In conclusion, the addition of melatonin to a formulary will provide substantial cost offsets to the payer in the treatment and prevention of OP under the assumption that the effectiveness of melatonin is equal to its comparators.

## **6 Analysis of a unique, conserved gene system regulating development-associated gene expression for *Streptomyces coelicolor***

Joseph Sallmen

*Streptomyces coelicolor* is a Gram positive, soil dwelling bacterium that exhibits a complex life cycle. Germination of a spore results in syncytial filament formation, which undergoes branching and tip extension to form a vegetative mycelium. Environmental signals and nutrient depletion coordinate the production of physiologically distinct aerial filament formation eventually resulting in the creation of chains of spores. Early genetic studies identified two classes of genes that resulted in developmental blocks, bald and white. The bald (*bld*) phenotype occurs when colonies cannot produce aerial hyphae and thus appear to have a smooth, lustrous appearance. White (*whi*) colonies exhibit incomplete sporulation or loss of production of the concurrently produced grey pigment. While some of the original mutants have been explored, the functions of many of the identified genes are not well understood. Of particular interest is a tripartite system of genes, with multiple homologues of each gene present in *S. coelicolor* chromosome and in other streptomycetes. These three genes encode a predicted helix-turn-helix protein (*WhiJ*-like proteins), a small, acidic protein of unknown function (*BldB*-like proteins), and an anti-sigma factor. In order to explore the roles of these genes in development, one such system involved in the regulation of spore-associated protein (*sap*) expression was analyzed. *sapR* and *sapS* are *whiJ* and *bldB*-like genes, respectively, that may regulate the expression of the *sapCED* spore coat operon. In order to investigate the potential roles of this gene system, single and double null mutants were isolated using recombineering. Spore coat proteins were extracted and analyzed on a Coomassie Blue stained SDS-PAGE. Analysis shows an increase in the production of spore-associated proteins in both single mutants and double mutants, suggesting a role for these proteins in developmentally-associated gene regulation. This was further confirmed by genetic complementation of the *sapR* and *sapS* mutants.

## **7 Analyzing the function of *Streptomyces coelicolor* ParH in the process of chromosome segregation and identification of a novel segregation component**

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**Background:** Chromosome segregation in bacteria is of central importance in microbial cell and molecular biology. In *Streptomyces coelicolor*, there are five known components of the partition (*par*) system needed for developmentally-associated genome segregation: the cis-acting centromere-like sites (*parS*) and four trans-acting proteins (*ParA*, *ParB*, *ParJ* and *Scy*). *parA* encodes a Walker-type ATPase that is essential for proper DNA segregation and the placement of the evenly spaced *ParB*-*parS* nucleoprotein complexes in aerial hyphae. The purpose of this study was to characterize the function of a second *ParA* homologue *ParH* and investigate interactions between *ParH* with known segregation, condensation, and cell division proteins and to screen a genomic library to find novel interacting proteins. **Methods:** A *parH* null mutant was isolated and strains containing *ParH*-EGFP, and *ParB*-EGFP in a *DparH* strain were constructed and analyzed by fluorescence microscopy. Site-directed mutagenesis of *parH* was used to change a conserved lysine residue (K99E) in the ATPase Walker A box. To determine if *ParH* interacts with known segregation, condensation and division proteins, an *E. coli* bacterial two-hybrid system based on adenylate cyclase was used. Plasmids carrying *parH*, *parH* variants, and target genes fused with both T25 and T18 fragments of *cyaA* and were screened on MacConkey indicator plates. A random genomic library of *S. coelicolor* M145 was constructed to screen for novel *ParH* interacting proteins. **Results/Conclusion:** In aerial hyphae of the  $\Delta$ *parH* mutant, »5% of spores are anucleate compared to 1% of spores in wild

type and 24% in *parA* null mutant. In predivisional aerial filaments, ParH-EGFP occasionally localized into a bright band or bands of fluorescence in apical compartments or as increased diffuse fluorescence toward the tip in these filaments. Different localization patterns of ParH-EGFP in aerial hyphae suggests that localization of ParH might be dynamic. This may suggest that evenly-spaced ParH bands are either localized over evenly-spaced ParB-*parS* complexes or ParH co-localizes with FtsZ at the evenly-spaced sites of cell division. As judged by two hybrid analyses, ParH interacts with itself and ParB. However, the Walker A motif K99E mutation in ParH and N-terminal in-frame deletion in ParH impaired the two-hybrid interaction between ParH and ParB. No evidence was obtained to indicate there is an interaction between ParH with ParA (heterodimer), ParJ, SMC, ScpA, ScpB, or FtsZ. By screening a random genomic library, the highly conserved actinobacterial signature protein HaaA (ParH and ParA-associated protein A) was found as a novel interacting partner of ParH. Interestingly, HaaA, also interacts strongly with ParA in bacterial two-hybrid system. Preliminary characterization indicates that a *haaA*-null mutant exhibits slight developmental defects. These data suggests that a previously unidentified protein that may play a role in developmental chromosome segregation of *S. coelicolor*.

## **8 Anti-viral immune response in the central nervous system induces Glial commitment in Neural Stem/Progenitor Cells**

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Anti-viral immune response in the central nervous system induces Glial commitment in Neural Stem/Progenitor Cells  
Apurva Kulkarni\* and Lauren A. O'Donnell. Graduate School of Pharmaceutical Sciences, Mylan School of Pharmacy Duquesne University, Pittsburgh PA 15282  
Viral infections in the central nervous system (CNS) are characterized by infiltration of lymphocytes into the brain parenchyma and release of pro-inflammatory cytokines. The effects of cytokines on neural cell function and survival varies between cell types, and may depend upon the expression of endogenous signaling molecules. Both inflammatory and developmentally-regulated cytokines alter the activity of neural stem/ progenitor cells (NSPCs), which are critical for CNS development and repair. Moreover, the proliferation and fate of NSPCs are affected during viral CNS infections. Interferon-gamma (IFN $\gamma$ ) is a cytokine that is released in response to a viral infection in the brain and is required for clearance of certain viruses from the CNS. IFN $\gamma$  signals via the Janus kinase/Signal transducer and activator of transcription (Jak/STAT) signaling pathway, which is also activated by developmental cytokines during cell fate decisions. The activation of JAK/STAT pathway could lead to decreased protein levels of G1/S phase cyclin/CDK complexes, leading to decreased hyperphosphorylated Rb (Y795) proteins and increased expression of CKIs (p21, p27) that could ultimately affect NSPC proliferation. Therefore, we will test the hypothesis that the IFN $\gamma$  influences NSPC proliferation and differentiation through Jak/STAT signaling. In preliminary studies, we found that IFN $\gamma$  activates STAT1 and STAT3 proteins, decreases NSPC cell cycle progression and proliferation. Through these studies, we will define the role of the inflammatory response in modulating NSPC activity during viral infections. These studies will also identify new targets for therapy that could salvage the CNS from harmful effects of an anti-viral immune response.



## **9 Baseline Water Chemistry Studies on the Allegheny River, Pennsylvania through the 3 Rivers QUEST program**

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As the most important natural resources in Pittsburgh, the Allegheny, Monongahela, and Ohio Rivers are great sources of drinking water. The Allegheny alone supplies water to over one million people, and yet its use is threatened by our economic and industrial activities. Clean water is essential for life and it is important that we make efforts to monitor and improve the quality of the water on which both people and the environment are reliant on.

Working with 3 Rivers QUEST, a comprehensive water quality monitoring and reporting program, sampling of all three rivers, their headwaters, and their tributaries has taken place over the past years, with the Iron Furnace Chapter of Trout Unlimited sampling sites on the Upper Allegheny, Duquesne University sampling the Lower Allegheny River, West Virginia University sampling the Monongahela River, and Wheeling Jesuit University sampling the Upper Ohio River. This research focuses on the data collected biweekly from 14 sites on the Lower Allegheny River and its tributaries by Duquesne University. Water temperature, pH, and specific conductance were taken with a multiparameter probe. Grab samples were collected to measure Total dissolved solids, alkalinity, several anions (Bromide, Chloride, Sulfate), and several dissolved metals (Magnesium, Calcium, Sodium, Manganese, Aluminum, Iron, Strontium) and are analyzed through a certified lab for consistency. Each chemical parameter serves as an indicator for specific types of pollution and several have established levels for safe drinking water quality.

The measured parameters are believed to be significant indicators of specific types of water pollution including abandoned mine drainage (AMD), deicing salt runoff, and brine water produced from the hydraulic fracturing process for natural gas extraction. Although not toxic by itself, Bromide is considered an indicator for brine water pollution and can create carcinogenic Trihalomethanes when exposed to chlorine at drinking water facilities. Sulfate, on the other hand, is considered an indicator of AMD and has a secondary drinking water standard of 500 mg/L due to its impact of the smell and taste of drinking water. Many of the sites chosen for continuous sampling are located near major coal fired power plants, brine treatment facilities, and AMD treatment facilities, which can have drastic effects on the ecosystem. Nearby USGS stations produce stream discharge measurements, thereby facilitating conversions of concentrations (in mg/L) to stream loading (in metric ton per day). Our biweekly water quality data will establish current baseline conditions along the Allegheny River and its major tributaries for comparison to past and future data.

## **10 Bullying of LGBTQ Students in Southwestern Pennsylvania**

Julie Buzgon

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Approximately 30% of all U.S. students report being bullied by peers sometime during their school careers (Nansel et al., 2001). Among those at greatest risk for being bullied, are youth who identify as having a minority sexual orientation (lesbian, gay, bisexual, transgendered or questioning). Many sexual minority students encounter discrimination and

victimization at school, and thus they perceive it to be an unsafe environment (Adams, Cox, & Dunstan, 2004). Particularly unsettling is that much of the victimization of sexual minority students occurs at such a low level that school-based professionals frequently do not detect these acts. An additional area of concern is the research indicating that few schools specifically address issues pertaining to sexual orientation in their anti-bullying policies (Adams et al., 2004). Therefore, in order to gauge the experiences of bullying of sexually-diverse children, a survey was constructed to measure the incidence and negative effects of bullying perpetrated against the gay, lesbian, bisexual, transgender, and questioning (LGBTQ) student population in southwestern Pennsylvania. More specifically, the current study examines the frequency and types of bullying LGBTQ students experience, the relationship between bullying victimization and LGBTQ students' peer and family relationships, academic behaviors, the perceived effectiveness of school anti-bullying policies, and the support that LGBTQ students feel they receive by their peers, families, and/or the school system regarding their sexual orientation, gender identity, or gender expression. The survey was administered to middle and high school students who receive services through the Persad organization, a human services organization that seeks to improve the well-being of the LGBTQ community. Descriptive and inferential statistics were utilized to report the results of students' perceptions regarding the bullying of LGBTQ students. Frequencies and means were examined to better understand the occurrence of bullying of LGBTQ children and the impact bullying has on these students social-emotional and academic functioning.

## **11 Bureau of Land Management: A Case Study of Public History**

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Like the National Park Service, the Bureau of Land Management (BLM) manages sites of great importance to the fields of prehistory, history, and natural history; however, BLM locations such as Cleveland- Lloyd Dinosaur Quarry (CLDQ) lack proper programming to engage the public. As Public Historians it is our duty to utilize public lands for interpretation, education, and outreach. Through these efforts, we will bridge the gap between BLM professionals and the community. As identified in the mission statement of the BLM, let us develop proper programming to "manage and conserve the public lands for the use and enjoyment of present and future generations under our mandate of multiple-use and sustained yield". CLDQ is home to the densest concentration of Jurassic dinosaur bones in the world. With such great importance, CLDQ was recognized as the first National Natural Landmark in 1965. Soon to follow was the on-site construction of the first ever BLM) Visitor's Center in 1968. Since its renovation in 2007, the site has suffered from scientific neglect and declining number of visitors. I propose by updating the Junior Explorer program, refocusing exhibits to include public participation, partnering with other institutions for community outreach, and the formation of onsite educational events for all ages, CLDQ can once again gain the recognition it deserves! In addition, an update of the BLM Interpretive Guideline is in need and we as publicly minded professionals are just the group to do it! Although with this document the BLM has proposed the use of interpretation throughout some sites, I urge the conversation for contemporary scholarship to be included in the guidelines. Thus, on a national scale, we can expand the knowledge and influence of public history among our beloved landscapes!

## **12 Characterization of serotonin receptor subtype 2C (5-HT<sub>2C</sub>) in pain and depression using novel compounds derived from marine cyanobacteria**

Neil Lax

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Faculty Advisor: Benedict J. Kolber, PhD

Chronic pain and major depressive disorder are widespread conditions in the United States. Interestingly, these conditions often occur comorbidly, with each individual disease amplifying the symptoms of the other. Many medications available on the market today for treating pain or depression target G-protein coupled receptors (GPCRs), implying that this class of receptors may be involved in the development of the comorbidity of these conditions. Our lab has sought to characterize a poorly understood GPCR, the serotonin 2C (5-HT<sub>2C</sub>) receptor, and the role that it plays in comorbid pain and depression. Our approach for targeting this receptor uses compounds isolated from filamentous marine cyanobacteria collected off of the coast of Panama in the Pacific Ocean. Compounds from this cyanobacterial collection show strong affinity for the 5-HT<sub>2C</sub> receptor. These compounds were screened for in vivo activity using a series of pain and depression behavioral assays. Compounds were delivered in male C57Bl/6J mice via intra-cerebroventricular (ICV) cannulas. Compounds were tested in naïve mice or in mice subjected to a model of comorbid pain and depression, the Spared Nerve Injury (SNI) surgery. SNI surgery involves ligating two of the three branches of the sciatic nerve, the tibial and common peroneal branches, while leaving the third branch, the sural branch, intact. SNI surgery induces mechanical hypersensitivity in the ipsilateral paw (modeling pain) and also induces depression-like behavior. We have found that ICV injections of the compound isolated from the marine cyanobacterium induce effects in several standard behavioral assays. Our results suggest that the 5-HT<sub>2C</sub> receptor may be a key target in the future development of compounds used to treat comorbid pain and depression.

## **13 Cognitive Correlates of Relational and Social Aggression in an Urban University Female Sample**

Daniel Wells

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Despite an increase in bullying research and intervention, almost one-third of adolescents still report experiencing bullying victimization (Robers, Zhang, Truman, & Snyder, 2012). Two types of aggressive behaviors that contribute to this rate of victimization are referred to as relational and social aggression. Relationally aggressive acts are those that are typically directed at another individual with whom one has an existing relationship, and when the aggressor has the specific aim of causing psychological harm to the victim. Socially aggressive acts, however, are completed in order to manipulate and/or damage the victim's social status or group membership, through either covert or overt means. While the pattern of behavior associated with relational and social aggression, as well as the aggressive individual's goals for completing these types of behaviors, has been studied, little is known about the underlying cognitive skills and processes that may be necessary in order to complete this type of aggression. This investigation examines whether certain cognitive skills, including verbal comprehension abilities, visual-spatial abilities, fluid reasoning, short term memory, long term memory, auditory processing, and processing speed are related to the use of relational and/or social aggression in an adolescent female sample. In order to determine the relationship between cognitive skills and aggressive behaviors, adolescent females attending an urban university in the mid-Atlantic region were recruited to

complete a short battery of assessments. Consenting subjects were administered the standard battery of the Woodcock-Johnson Test of Cognitive Abilities – Third Edition in order to ascertain each individual’s cognitive abilities. Subjects were also administered the Young Adult Social Behavior Scale; a self-report measure of healthy and maladaptive behaviors in friendships or relationships. Correlational and regression analyses were then completed to determine whether subjects’ cognitive abilities were related to, or could predict, subjects’ rate of self-reported behaviors consistent with relational and social aggression.

#### **14 Critical roles for interferon-gamma producing immune cells during neonatal central nervous system infections.**

Priya Ganesan

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Faculty Advisor: Dr. Lauren O'Donnell, PhD

Viral infections in the central nervous system (CNS) are associated with devastating neurological consequences (mental deficits, seizures, and death), particularly in newborns. Despite mounting both innate and adaptive immune responses, neonates are often unable to control viruses in the brain and suffer extensive neuronal loss, potentially due to deficits in anti-viral cytokine production. In order to study the response of the neonatal immune system to viral CNS infections, our laboratory uses a transgenic mouse model (NSE-CD46) of neuron-restricted measles virus (MV) infection. NSE-CD46 mice express the human isoform of CD46, a MV receptor, under the control of the neuron specific enolase (NSE) promoter, allowing for infection only in CNS neurons. Adult NSE-CD46+ mice clear MV from CNS neurons in an interferon gamma (IFNg)-dependent and T-cell dependent manner. In contrast to NSE-CD46+ adults, neonatal NSE-CD46+ mice succumb post-infection and show 100% mortality at 15 days post infection (dpi). Neonatal mice lacking IFNg (CD46+/IFNg-KO) succumb more rapidly than NSE-CD46+ neonates (100% mortality by 10 dpi) despite higher levels of CD4, CD8 T-cell and NK cell infiltration into the brain. Adult CD46+ and CD46+/IFNg-KO have a higher infiltration of CD4+ T-cell compared to neonates in their respective genotype. In CD46+/RAG-2-KO neonates, which lack T- and B-cells, show reduced mortality in comparison to other immunocompetent neonates, with 20% of the pups surviving the infection. CD46+/RAG-2-KO neonates also have lower viral RNA in the CNS than immunocompetent NSE-CD46+ and immunocompromised CD46+/IFNg-KO neonates. We hypothesize that MV control in CD46+/RAG2-KO neonates could be provided by IFNg-producing natural killer (NK) cells. Current experiments aim to define the role of NKs in the enhanced viral control observed in CD46+/RAG2-KO neonates and to identify relative levels of IFNg expression in adult and neonatal brains over the course of MV infection.

#### **15 Determination of API Content Uniformity and Water Content in Transdermal Drug Delivery Systems Using Near-infrared spectroscopy (NIRS)**

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Transdermal drug delivery systems (TDDS) deliver drugs through epidermis, bypassing the hepatic first-pass metabolism. This delivery route offers advantages such as avoidance of gastrointestinal side-effects, controlled release rates and improvement of bioavailability. By far, the methods used to establish patch quality involves repeated tests of the finished products for different physiochemical properties. Near infrared spectroscopy (NIRS) is a potential tool to help

characterize multiple patch attributes all at one time. However, the difficulty in measurement is low signal level caused by the low patch thickness and the significant interference due to physical variations. It is the objective of this study to develop NIR methods to facilitate the extraction of relevant information for quantifying drug content and water content in drug-in-matrix transdermal patches. The patches were prepared based on a three-component formulation. The active pharmaceutical ingredient was acetaminophen, and two polymers used were polyvinyl pyrrolidone (PVP) and hydroxyl propyl methylcellulose (HPMC). A central composite design was employed where the factors varied were the API content and the ratio between the two polymers. The humidity model was calibrated from data collected during real-time drying process. A test set was composed of samples equilibrated at high relative humidity environment. The resultant models were able to accurately determine drug uniformity and water content in transdermal patches. The fast NIR method would permit continuous quality control of chemical constituents as well as humidity levels in the production line.

## **16 DNA Barcoding as a Non-invasive Strategy for the Identification of Prey from the Feces of Louisiana Waterthrush (*Parkesia motacilla*)**

Brian Trevelline

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Diet studies provide ornithologists with vital information regarding the environmental needs of avian species, which may improve the outcome of conservation efforts. The molecular approach of DNA barcoding offers researchers an accurate and non-invasive alternative to the antiquated techniques often utilized in avian diet studies. For insectivorous taxa, the fecal sacs of developing nestlings contain residual DNA from digested prey, which can be identified via molecular techniques. In this study, we developed a non-invasive technique for analyzing the diet of the Louisiana Waterthrush from collections of nestling fecal sacs. The fecal sacs were collected from multiple Waterthrush nests within the Carnegie Museum of Natural History's Powdermill Nature Reserve near Rector, Pennsylvania. The fecal sacs were rich in undigested insect remains and residual DNA, which were amplified with insect-specific primers using Polymerase Chain Reaction (PCR). Due to environmental exposure, the DNA was highly degraded, and thus, necessitated the use of primers capable of amplifying short segments of DNA (157 bp) within the Cytochrome C Oxidase Subunit I (COI) gene. The resulting DNA amplicons were TA cloned, sequenced and identified using the Barcode of Life Database (BOLD). In our preliminary findings, we successfully identified three unique arthropod genera, all of which are known to naturally occur at our study site: Epeorus (Mayfly), Heptagenia (Mayfly) and Nigronia (Hellgrammite). In all cases, the amplicon obtained from fecal sac DNA matched the published sequences by greater than 95%.

## **17 Effect of reproductive condition on the hypothalamic-pituitary-adrenal axis of a terrestrial salamander**

Jessica Thomas

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In vertebrates, many stress responses are mediated by the hypothalamic-pituitary-adrenal (HPA) axis, of which corticotropin-releasing factor (CRF) and glucocorticoids (GCs) such as corticosterone (CORT) are components. The axis is sensitive to various factors and many species exhibit seasonal changes in both baseline and stress-induced GCs with

levels being elevated during the breeding season (Romero, 2002). Reproductive condition is thought to play a role in regulating the HPA axis. To examine this relationship, we conducted a field study using female red-legged salamanders (*Plethodon shermani*) which oviposit every other year, allowing comparison of reproductive and nonreproductive females under similar environmental conditions. We evaluated baseline and handling-induced levels of plasma CORT as well as the number and distribution of immunoreactive (IR) CRF neurons in both reproductive and nonreproductive females. In previous work, we identified five populations of CRF neurons in female *P. shermani*: subpallial amygdala, magnocellular preoptic area (POA), parvocellular ventral POA, hypothalamus, and locus coeruleus (LC). Of these populations, cells found in the POA, analogous to the mammalian paraventricular nucleus (PVN), are implicated in the HPA axis. We hypothesized that reproductive condition would modulate the HPA axis, with reproductive females having elevated baseline plasma CORT, blunted CORT responses to handling, and fewer CRF-IR neurons in the POA. We saw no differences in baseline plasma CORT, and neither reproductive nor nonreproductive females had CORT responses to handling. The total number of baseline CRF-IR neurons was significantly higher in nonreproductive compared to reproductive females, due in part to differences in the LC, an area of the brain involved in activation of the sympathetic nervous system (SNS). While no effect of reproductive condition on plasma CORT or CRF-IR neurons in the POA was observed, our results suggest that reproductive condition may affect CRF in its role as a neurotransmitter in the SNS.

## **18 Establishing skill-based core curriculum in the laboratory setting with a uniform approach**

Marie Panas

Nursing | School of Nursing

Faculty Advisor: Dr. Yvonne Weideman, DNP, MBA, RN, CNE

The medical field is constantly adapting to the newest technology and research. Staying current on best clinical practice can be challenging for adjunct clinical faculty who have years of practice. Nursing students need to learn skills and competencies that are founded on current evidence. In order to achieve this goal with the ever increasing graduating class size in the school of nursing, a uniform educational approach was initiated in the clinical laboratory setting. It included a curriculum change to incorporate Health Assessment and Fundamentals of Nursing Practice and Ethics into one laboratory class. The students are provided the core information in two separate lecture courses and then meet jointly for the laboratory component of the course. There are thirty-eight adjunct faculties instructing in the laboratory setting for these courses. To ensure that each instructor was able to teach the students the most current, evidence based clinical practices and to provide a uniform learning experience for the students; each instructor was provided with standardized teaching “keys”. As a graduate assistant, it has been my responsibility to organize the laboratory setting and provide the instructors with the key information required to maintain a uniform learning experience for the students. I also provide assignments to the students prior to coming to the laboratory in order that they are prepared to have a hands-on learning experience. This presentation will discuss the need for standardized clinical experiences, the implementation of the standardized approaches, and evaluation of its effectiveness.

## **19 Evaluating Polyglutamine Peptide Monomers and Dimers With Enhanced Sampling MD Simulations**

Riley Workman

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Faculty Advisor: Jeffry Madura, Ph.D.

Huntington's disease is a neurodegenerative disease characterized by mutations causing polyglutamine (polyQ) repeats

in proteins. Mutated proteins misfold, aggregate, and form amyloid-like fibrils in the neuron. Experimental techniques such as resonance Raman, circular dichroism, and ssNMR are used to analyze properties of polyQ systems, but lack the ability to monitor the molecular aggregation mechanism. In this work, polyQ peptide monomers and dimers are studied using molecular dynamics (MD) methods in order to better understand early stages of aggregation. We have characterized the monomeric conformational ensemble of D2Q10K2 peptides in aqueous and protein-globule environments using metadynamics MD simulations. Metadynamics enables exploration of the free energy conformational landscape for these peptides. The differences between peptide structure in these conditions may play a key role in nucleation. We've also begun investigation of the dimerization properties of polyQ peptides. Adaptive biasing force paired with MD is used to evaluate the dimerization free energies and conformations of D2Q10K2 peptides. Classical MD is used to simulate the favorable dimeric conformations in equilibrium, as to better understand the interactions and dynamics of these structures. Results from these simulations will be presented and discussed.

## **20 Genetic analyses of ftsK and ftsK-like genes for development-associated chromosome segregation in *Streptomyces coelicolor***

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Faculty Advisor: Joseph R. McCormick, Ph.D.

*Streptomyces coelicolor* is a gram-positive soil bacterium with a complex life cycle, which has been used to study development for many years. During morphological differentiation, aerial hyphae synchronously divide into chains of unicellular compartments metamorphosing into spores. Synchronous division involves faithful simultaneous segregation of the replicated linear genome into newly formed prespores. Among other proteins, the DNA translocase FtsK directs chromosome segregation by forming a hexameric ring structure around the DNA at the septa. In *S. coelicolor*, in addition to ftsK, there are two other potential ftsK-like coding genes that have not yet been examined for redundancy of function during development-associated segregation. The purpose of this study is to construct ftsK-like mutant strains using a PCR-directed mutagenesis (recombineering) approach for genetic and phenotypic analyses using DNA staining and fluorescent gene fusions. Mutants for one gene have been isolated and are currently being characterized. Once verified, double mutant strains for  $\Delta$ ftsK $\Delta$ ftsK-like deletion will be constructed. Another part of this project is to investigate whether segregation proteins interact with FtsK by employing a bacterial two-hybrid (BACTH) system. To explore potential interaction partners of FtsK, the 3' end of the ftsK encoding the cytoplasmic motor domain of FtsK was cloned into BACTH vectors and was analyzed for interaction with itself. Preliminary observations indicate interaction of FtsK with itself corresponding to the multimerization of its structure and weak interaction with two other segregation proteins ParA and ParJ. Analyses of the roles of FtsK and FtsK-like proteins can further elucidate the complexities of chromosome segregation in filamentous and sporulating bacteria.

## **21 Greater Trochanter-Ischial Impingement: A Potential Source of Posterior Hip Pain**

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Faculty Advisor: Benjamin Kivlan, MS, PT, SCS, OCS, CSCS

Purpose: Retro-trochanteric hip pain is poorly understood. Preliminary investigation has identified that greater trochanteric-ischial impingement can occur when the hip is in a flexed, abducted and externally rotated position. The

purpose of this study was to describe greater trochanteric-ischial impingement and the hip position where the impingement occurs. Subjects: Twenty-five hips from 14 embalmed cadavers (7male; 7 female) with a lifespan ranging between 46-91 years were used for this study. Methods: The pelvic region of each cadaver was skeletonized leaving the hip capsule and sciatic nerve. The hip capsule was then vented. From 90° of flexion, the hip was extended while maintaining a position of 30° abduction and 60° lateral rotation. A positive finding was defined when the greater trochanter came into contact with the ischium. When a positive finding was noted the degree of hip flexion was recorded. The procedure was repeated in 0° abduction. A FABER test was then performed on all specimens, looking for greater trochanteric-ischial impingement, as defined above. Each test was performed 3 times by two examiners to ensure intra- and inter-tester reliability. Results: A positive finding with Patrick-FABER test was noted in 96% (24/25) of hips. In 30° abduction a positive finding was noted in 92% (23/25) of hips at an average of 47° flexion (SD 10; range 20-60°). In 0° abduction a positive finding was noted in 32% (8/25) of hips at an average of 59° flexion (SD 6; range 52-70°). Conclusion: The greater trochanter can impinge on the ischium when the hip is extended from 90° flexion in a 60° externally rotated position. This impingement occurred more commonly when the hip was in 30° abduction compared to neutral abduction. The Patrick-FABER test reproduced impingement in almost all specimens.

## **22 Investigation of the role played by the RNA G-quadruplex structure in ALS/FTD pathology**

Damian McAninch

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Chemistry and Biochemistry | Bayer School of Natural and Environmental Sciences

Faculty Advisor: Mihaela Rita Mihailescu, Ph.D.

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disorder resulting in motor neuron loss in brain and spinal cord. Frontotemporal dementia (FTD) is one of the most common forms of young onset dementia and second most common form of dementia overall, after Alzheimer's, resulting in degeneration of temporal lobes along with personality changes and language impairment. ALS and FTD are now recognized as members of a broad continuum of neurodegenerative disorders, linked by similar pathology, mechanisms, and overlapping clinical symptoms. Two RNA-binding proteins of interest that link the two diseases are TAR DNA-binding protein 43 (TDP-43) and the fused in sarcoma/translocated in liposarcoma protein (FUS), which are the major protein components in over 90% of ALS and over 50% of FTD inclusions. We hypothesize that the G-quadruplex RNA structure might play an essential role in the pathogenic mechanisms of FUS in ALS and FTD. In this study, the G-quadruplex RNA binding properties of the wild type and C-terminal NLS mutant FUS protein implicated in ALS/FTD will be analyzed.

## **23 Investigation of Well Water Contamination Associated With Natural Gas Storage**

Renee Krynock

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Groundwater is an important resource in Pennsylvania, where more than three million residents obtain drinking water from private wells (the second highest number in the United States). Water quality monitoring is therefore vital as the oil and gas industry expands throughout the state. While hydraulic fracturing has received much attention, transportation (through trucks, rail, pipelines, etc.), storage, and processing should also be examined for groundwater impacts. Underground injection of natural gas is a common storage mechanism, wherein natural gas is injected into



subsurface reservoirs and stored under pressure for later use. This study examines private well water quality in Bedford County, Pennsylvania with several new natural gas storage wells, to investigate the possibility of aquifer contamination. Twenty-four homes were sampled, each in both the spring and fall of 2013. Over 50 parameters were analyzed, including pH, conductivity, heavy metals, and volatile organic compounds. A comparison of results from two seasons could shed light on possible impacts from natural gas storage activities.

## **24 Justification of the Use of PGD for choosing Savior Children**

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Faculty Advisor: Glory Smith

Is it ethical to use Pre-implantation Genetic Diagnosis to create babies to save others? This presentation will review the main ethical arguments that discuss the Use of PGD for choosing Savior Children. The main arguments will first discuss the Pre-implantation Genetic Diagnosis and the possible Recipients to the savior child. Then it will argue the normative debate on whether a savior child is ethical. Later, it will examine the normative debate over how to use the savior child after its birth. Lastly, it will assess the normative ethical criterion to justify Pre-implantation Genetic Diagnosis for choosing a savior child through the Principles of Double Effect. The presentation will argue that the practice is morally and ethically acceptable under the scientific, the ethical and the religious conditions. All previous arguments do not establish a sufficient ground to forbid parents to use Pre-implantation Genetic Diagnosis and tissue typing to save not only a sibling, but even any other loved ones.

## **25 Ligand Design Based on Tetradentate Tris(2-pyridylmethyl)amine (TPMA) Skeleton for Copper Catalyzed Atom Transfer Radical Polymerization (ATRP)**

Aman Kaur

Co-Authors: Kristen Schoder, Tom Ribelli, Krzysztof Matyjaszewski, Tomislav Pintauer, Ph.D.

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Faculty Advisor: Tomislav Pintauer, Ph.D.

Tetradentate ligand, tris(2-pyridylmethyl)amine (TPMA) has resulted in the formation of highly active and stable copper complexes used for catalyzing various radical processes such as atom transfer radical addition (ATRA), cyclization (ATRC) and polymerization (ATRP). These reactions are the fundamental organic transformations used to generate C-C bond via addition of the alkyl halides across alkene in the presence of the reducing agents. In pursuit to design even more active catalytic system to activate C-X (X= Cl, Br) bond for less active alkyl halides, three new ligands 1-(5-methoxy-4,6-dimethylpyridin-2-yl)-N,N-bis(pyridin-2-ylmethyl)methanamine (TPMA\*), bis(5-methoxy-4,6-dimethylpyridin-2-yl)-N-(pyridin-2-ylmethyl)methanamine (TPMA2\*), tris((5-methoxy-4,6-dimethylpyridin-2-yl)methyl)amine (TPMA3\*) with TPMA backbone were designed. These ligands have electron-donating groups such as methyl and methoxy are attached at 3,4,5 position on the pyridine rings. Using these ligands, six novel copper based catalytic systems were synthesized and characterized using IR, UV-Vis spectroscopy, cyclic voltammetry and single crystal X-ray crystallography.

## **26 Mechanisms underlying the effect of melatonin, strontium citrate, vitamin D3 and vitamin K2 on bone marrow stem cells and peripheral blood monocytes grown as co-cultures**

Sifat Maria

Co-Authors: Holly Lassila, Christine O'Neil, Mark Swanson, Paula Witt-Enderby, Ph.D.

The bone remodeling system preserves bone integrity by balancing the activities of bone-forming osteoblasts and bone-resorbing osteoclasts. Shifting of this equilibrium system towards osteoclastic bone resorption leads to osteopenia, osteoporosis and major fractures. A clinical trial, Melatonin-micronutrients Osteopenia Treatment Study (MOTS), was designed to assess the efficacy of a combination of bone tropic agents: melatonin, strontium citrate, vitamin D3 and vitamin K2 (MSDK) on bone health and quality of life in post-menopausal osteopenia. One aspect of this translational study examined the mechanisms underlying MSDK's effects on osteoblast and osteoclast differentiation using a novel co-culture system of human bone marrow stem cells (hMSCs) and human monocytes (hPBMCs). Using a treatment paradigm that closely mimics the in vivo condition, hMSC/hPBMC co-cultures were exposed to vehicle or MSDK in osteogenic (OS+) or growth medium (OS-) for 21 days. Co-cultures grown in OS+/MSDK medium demonstrated enhanced osteoblast differentiation with inhibited osteoclast differentiation. To identify potential mechanisms underlying MSDK's action, osteoprotegerin (OPG) and RANKL levels were measured in both hMSC/hPBMC co-cultures and in hMSC monocultures. Osteoblasts grown as a co-culture with osteoclasts and exposed to OS+/MSDK had decreased OPG: RANKL ratios; this was due to increases in OPG and decreases in RANKL. Ratios of secreted OPG: RANKL were also decreased however, this was due to increases in sRANKL only. Human MSCs grown as a monoculture and exposed to OS+/MSDK had increased ratios of OPG: RANKL, which was due to increased OPG levels only. In conclusion, our data reveal that MSDK has dual actions on bone cells in-vitro to enhance osteoblast differentiation while inhibiting osteoclast differentiation; and this occurs through a modulation of OPG and RANKL expression and release from the osteoblast. These findings also suggest that the presence of the osteoclast plays a significant role in MSDK-mediated modulation of OPG: RANKL ratios, especially on RANKL expression in differentiating osteoblasts.

## **27 Muscular Power Tests Predict Knee Joint Excursion but not Initial Contact Angle in NCAA-D1 Female Athletes**

Paul Cacolice

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Context: Existing methods to predict ACL injury risk from landing kinematics require sophisticated equipment and expertise. Utilization of field-based tests that predict landing kinematics would provide a practical means to identify sub-optimal landing kinematics. Objective: To develop a predictive model for sagittal plane tibiofemoral landing kinematics from the results of muscular power tests. Design: Descriptive laboratory study. Setting: University research laboratory. Patients or Other Participants: 29 female, NCAA-D1 college athletes (age= 19.03±1.09years; weight=66.56±13.47kg; height=171.16±7.92cm) participated. Interventions: Participants performed five unilateral, dominant lower extremity (LE) landings from a 35cm platform onto a forceplate (Bertec Corporation; Columbus, OH). LE three-dimensional kinematics during the landing task were captured with electromagnetic sensors (Ascension Technology; Milton, VT) interfaced with motion analysis software (Innovative Sports Training; Chicago, IL). Then in a randomized order, participants performed three standardized field-based tests of LE power: single limb triple hop (SLTH), countermovement vertical jump (CMVJ) and the Margaria-Kalamen (MK) test. The kinematic trials were signal averaged for each participant. Sagittal plane tibiofemoral joint angle at initial contact (IC) and excursion (EXC) values in the first 0.1s after ground contact were determined and entered into a statistical software package. Main Outcome

Measures: Multiple linear regression analyses produced one model predicting IC and one predicting EXC from the independent variables. Alpha levels were set a priori at  $P \leq .05$ . Results: A two variable (MK, SLTH) linear regression model that predicted EXC was significant ( $r^2 = .269$ ,  $P = .017$ ), however the model that predicted IC was not ( $P = .890$ ). Conclusions: A statistically significant amount of variance for EXC may be explained with select field power tests using a multiple linear regression model. The clinical meaningfulness however, is unclear. The field based power tests utilized in this study were not capable of predicting sagittal plane IC during the unilateral landing task.

## **28 On-Line Separation and Fluorescent Tagging of Bioactive Lipids Using Droplet-Based Microfluidics and Single Photon Counting Detection**

Andrew Davic

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Faculty Advisor: Michael Cascio, Ph.D.

Primary fatty acid amides (PFAMs), a subclass of fatty acyls, have been found in several specific tissues and biological fluids, and have been shown to exhibit a wide range of physiological effects. Endogenous PFAMs have been found in the nM range, requiring sensitive detection systems for quantitation at physiological concentrations. Mass spectrometry has been predominantly used as the optimal detection system; however, its limits of detection and quantitation fall on the periphery of biologically native PFAM concentration, thus, laser induced fluorescence (LIF) becomes an attractive detection system as it presents the ability to approach single molecule detection limits. Microfluidics enables both chemical reactions and detection to be performed on-chip at nL volumes. By utilizing droplet-based microfluidics, reaction efficiency and time are greatly improved, allowing primary fatty amines (PFAM derivatives) to be fluorescently tagged at physiological concentrations. PFAMs must be converted to their conjugate amines prior to fluorescent tagging due to the delocalization of electron density caused by the carbonyl group on the amide. Naphthalene dicarboxaldehyde (NDA) was used for fluorescent tagging reactions and subsequently tagged amine standards were serially diluted to show detection limits of five fmol/amine using reverse phase high performance liquid chromatography coupled to a fluorescence detector. The use of a microfluidic platform with LIF and single photon counting detection system has currently lowered detection limits to the low amol/droplet range. Droplet-based microfluidics acts as total analysis system enabling chemical separation, fluorescent tagging, and detection to all be performed on-line with little user interaction, thus increasing reproducibility and throughput. The optimized methodology will be used to determine endogenous concentrations of PFAMs extracted from biological samples. All work was supported by the National Institute of Health (2R15 NS038443)

## **29 Optogenetic Investigation of Bladder Pain Processing**

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Traditionally, sensory information from midline visceral organs like the intestines and urinary bladder was thought to be processed equally by the central nervous system. Recent studies however have suggested unequal processing of pain

information from these structures in the left and right central amygdala (CeA). Located in the left and right brain hemispheres respectively, the left and right CeA are homologous structures that are part of the brain's emotional processing system. It has been shown that pharmacological activation of the right CeA causes an increase in pain responses to bladder distension, however the contributions of the left CeA to this same process remain unknown. To learn more about this asymmetrical processing of visceral pain, we used optogenetics to activate the left or right CeA while performing bladder distension. Optogenetics is a novel technique in which animals are genetically engineered to express light-sensitive ion channels in a brain region of interest. Introduction of laser light into this brain region will then result in membrane depolarization and activation of ion channel-expressing cells. Reported here are the results of left CeA activation and right CeA activation in the context of highly-painful and relatively non-painful bladder distension. Additionally, the results of off-target activation are presented. Finally, using staining techniques, we identify the cells in each amygdala that may be depolarized following optogenetic activation.

### **30 Regulation of the 3' UTR in BDNF mRNA at the DNA level**

Brett DeMarco

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Faculty Advisor: Rita Mihailescu, Ph.D.

Brain-derived neurotrophic factor (BDNF) is part of the neurotrophic family of genes encoding for proteins known to promote survival of neurons in the peripheral and central nervous systems. The expression of the BDNF gene results in the production of two mRNAs with different lengths, one with a short 3' untranslated region (UTR) and the second with a long 3' -UTR, which are believed to serve different functionalities. The long 3' -UTR mRNA is found in both dendrites and soma, whereas the short 3' -UTR is only found in the soma, implying that the long 3' -UTR BDNF mRNA is involved in maintaining the neuroplasticity of the brain. A sequence of the BDNF mRNA 3' UTR has been analyzed for its potential to form the secondary structures G-quadruplex and i-motif which are suspected to play a role in regulation of 3' -UTR length.

### **31 Sacramental Character as "Being-in-Relation" in a Postmodern Context**

Daniel Levis

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Faculty Advisor: Maureen R. O'Brien, Ph.D

Edward Hahnenberg draws on the Cappadocian Trinitarian ontology of "Being-in-Relation" to describe the sacramental character of Orders. Because this tradition assumes that being is irreducible to substance and must be rooted in personhood, he is able to suggest that the ontological change of Ordination is a change in personhood. His concept of "ecclesial repositioning" in many ways enlivens the notion of sacramental character, yet it lacks adequate reflection on the permanence of an "indelible mark" so pervasive in Roman Catholic theology. This paper briefly examines the historical and theological context of the Cappadocian view of being. Secondly it summarizes Hahnenberg's appropriation of "Being-in-Relation" to describe the idea of "ecclesial repositioning," noting where it is in discontinuity

with the Western tradition. Lastly, as a moderating position, I turn to the postmodern notion of narrative. Lieven Boeve describes the necessity of a Christian narrative that is open to interruption. I suggest that when the individual's narrative is interrupted by the narrative of the Christian community through Ordination, the individual's narrative is forever changed. The newly formed relationships through the sacrament create an ontological change in the ordained. This interruption acts as a permanent modification in the person's narrative. In this narrative scheme, the ontological change is both rooted in personhood and indelible.

### **32 ScratchJr iPad-based Programming Language**

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Faculty Advisor: Joseph Kush, Ph.D.

Thinking, playing, and learning are the occupational activities for children to apply in their daily life. However, children often don't engage in these activities appropriately and adults don't always teach children proper engagement activities. What we do instead is ask them to memorize trivial facts about numbers, grammar, and the French Revolution. The question is that why don't we make them think, learn, and play (Papert, 2005). Teaching children programming is a new way to make them think, learn, and play. Also, develop their computational thinking and problem solving skills. In particular, in this century, computational thinking and problem solving via coding is the best way to solve science, technology, engineering and mathematics (STEM) problems, and that is also what students need. ScratchJr block-based programming language for iPad designed for young novice programmers, ages 5 to 7. The goal with ScratchJr is not simply to help young kids learn to code. The world of ScratchJr. is expanding opportunities for young novice programmers to imagine, create, and learn through coding. The ultimate goal is to help young novice programmers develop as creative thinkers, makers, and innovators. References Papert, S. (2005). Teaching children thinking. *Journal of structural learning*,4(3), 219-230.

### **33 Severely stressed astrocytes can still protect neighboring neurons**

Amanda Gleixner

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Protein misfolding stress or proteotoxicity and oxidative stress are hallmarks of neurodegenerative diseases and impact both neurons and glia, two major cell types in the brain. Astrocytes are exposed to proteotoxicity and oxidative stress in neurodegenerative disorders but, unlike neurons, do not appear to die in large numbers. Some studies also suggest that astrocytes within resistant brain regions increase their synthesis of the antioxidant glutathione in neurodegenerative disorders. These observations suggest that astrocytes may be able to adapt to severe proteotoxic and oxidative stress. In order to determine how astrocytes can defend themselves against severe proteotoxicity and oxidative stress, we treated primary cortical astrocytes with lethal concentrations of the proteasome inhibitor MG132 or the oxidative toxin paraquat and examined the survivors for potential stress adaptations. We found that astrocytes exposed to high concentrations of MG132 or paraquat were resistant to proteotoxic or oxidative insults applied as a second hit. The protection was so robust that severely stressed astrocytes were even protected against a third hit. MG132 induced a rise in glutathione and inhibition of glutathione synthesis rendered surviving astrocytes highly sensitive to a second MG132 hit. Severe stress also increased glutamate cysteine ligase, an enzyme that catalyzes glutathione synthesis. These data

suggest that glutathione defenses are essential for preventing proteotoxic cell death in stressed astrocytes. MG132 also raised ATP levels in this model, an adaptive response that may fuel the increase in glutathione synthesis. Finally, we discovered that severely stressed astrocytes can still protect neighboring neurons against MG132 in mixed astrocyte/neuron co-cultures. These findings demonstrate that astrocytes can survive severe stress in a glutathione-dependent manner and that stressed astrocytes retain their neurosupportive roles. The ability of astrocytes to adapt to severe proteotoxic and oxidative stress may therefore be reflected in the slow and protracted nature of neurodegenerative disorders.

### **34 Single Cell Detection of Circulating Melanoma Via Photoacoustic Flow Cytometry**

Jeff Mosley

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Faculty Advisor: John Viator, Ph.D.

Melanoma is estimated to kill 9,710 men and women in the United States this year alone. This form of skin cancer grows roots down into the surrounding tissue where metastatic cells split off and spread throughout the circulatory and lymphatic system creating secondary tumors anywhere in the human body. Current methods of detection include the tagging of fluorescent and magnetic nanoparticles, immunocytochemical staining with monoclonal antibodies against epithelial proteins and PCR based assays. These techniques are used in the enrichment and detection of circulating tumor cells (CTCs) but are faced with challenges such as lack of sensitivity, white blood cell contamination, sample loss in the enrichment process and signals that are compromised by cell contamination. In photoacoustic flow cytometry a sample of blood is spun down using centrifugation until the red blood cells, white blood cells and plasma have been separated into individual layers. The white blood cell layer is extracted from the sample and flowed through a detection chamber where it is irradiated with high frequency laser light. Due to the circulating melanoma cell's absorbance of light, the cell begins to contract and expand at such a rate that it emits an ultra-sonic acoustic wave. This wave is acquired by a transducer which converts the acoustic wave into a voltage and is effectively detected at a known point. Knowing where the CTC is, the volume it occupies, and the flow rate of the sample, researchers are able to isolate the cell for further diagnostic analysis. We have tested 9 stage IV melanoma patients to find 2-66 CTCs in 1ml samples. Using fluorescent tagging, we imaged the captured cells and verified their identity by targeting the MART 1 antigen that is a defined characteristic of melanoma. Photoacoustic flow cytometry can be used for the in vitro detection of a single circulating melanoma cells. Detection of these rare metastasis play a vital role in collecting data that can be used in the diagnosis of patients and development lifesaving therapies.

### **35 Stress And Disease: The Effects of Corticosterone on Chytrid Fungus Susceptibility in the Red-Legged Salamander *Plethodon shermani***

Christopher Fonner

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Faculty Advisor: Sarah Woodley, PhD

The fungal pathogen *Batrachochytrium dendrobatidis* (Bd) infects amphibian species and can cause the disease chytridiomycosis. Bd-associated population declines have been observed worldwide, and research into the mechanisms underlying Bd susceptibility is needed. It is thought that long-term exposure to environmental stressors can suppress immunity via release of the stress hormone corticosterone (CORT), thus increasing the virulence and lethality of Bd.

Therefore, we hypothesized that a repeated elevation of plasma CORT would increase Bd susceptibility and chytridiomycosis development in red-legged salamanders, tested in 2 separate experiments. For Experiment #1, plasma CORT was exogenously elevated in animals for 9 consecutive days using dermal patches, then animals were inoculated with either a high dose of Bd or sham inoculum. For Experiment #2, CORT was elevated for 7 consecutive days, then animals were inoculated with a low dose of Bd or sham inoculum, after which CORT was elevated for another 7 days. In Experiment #1, compared to sham-inoculated animals, Bd-treated animals showed greater body mass loss, skin sloughing, and mortality. Additionally, while Bd infection intensity increased throughout the study, there were no significant differences in infection loads between Bd-treated animals with elevated CORT and Bd-treated animals exposed to oil patches. In Experiment #2, Bd-treated animals showed no significant infection or disease development, compared to sham-inoculated animals. However, Bd-inoculated animals sloughed their skin significantly more than sham-inoculated animals, and Bd-treated animals with elevated CORT showed significantly more skin sloughing than Bd-treated animals exposed to oil patches. Overall, a long-term CORT elevation did not impact infection intensity or fatal chytridiomycosis development. Skin sloughing, possibly influenced by CORT, may have prevented Bd infection from occurring at the lower dosage.

### **36 Surface Modifications of Polymer Nanoparticles for Nitric Oxide Delivery**

Nina Reger

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Biofilms are often a result of the colonization of *Pseudomonas aeruginosa* bacteria. Recent studies have shown that high quantities of systemic nitric oxide, a highly reactive free radical, are effective at biofilm dispersal and inhibition through nitrosative stress. Here it is posited that small quantities of nitric oxide delivered directly to the site of infection could also be effective. The nanoparticles were synthesized from biocompatible poly-lactic-co-glycolic acid and polyvinyl alcohol polymers. A 16-phosphonohexadecanoic acid thin film was formed on the nanoparticle surface. Diffuse reflectance infrared Fourier transform spectroscopy and ultraviolet-visible spectroscopy was used to confirm film formation and monitor the subsequent attachment of cysteamine. Nitric oxide release was quantified using a nitrate/nitrite colorimetric assay. Particle size and charge were determined using a Zetasizer. Additional nitric oxide releasing molecules will be tethered to the formed thin films on the nanoparticle surface.

### **37 Surveying Five Pennsylvania State Threatened Darters Using Traditional and Environmental DNA (eDNA) Techniques**

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Faculty Advisor: Brady Porter, Ph.D.

Within the upper Ohio River system of Pennsylvania there are several species of state threatened fish called darters. Darters, which are small-bodied benthic fish (they live on the river bottom), are considered indicator species of habitat integrity and should be incorporated into models that predict the effects of urbanization (increased storm run-off and impervious surfaces). The U.S. Environmental Protection Agency determined that darters are indicator species for bioaccumulation of chemicals that are harmful to humans and biota. Darter populations in the upper Ohio River system

are disjunct because of previous water quality degradation, and the navigational lock and dam (L/D) system (and its maintenance, i.e. dredging). In addition, the conservation management of imperiled fish species is often hindered by the difficulty to obtain accurate survey data using traditional sampling methods. Electrified benthic trawling in large rivers can be challenging because it is labor intensive, potentially dangerous to personnel, and may harm the captured fish from abrasion due to rocks and debris entering the trawl. We focused our efforts on sampling below lock and dam installations on the lower sections of the Allegheny and Monongahela Rivers, and the upper Ohio River. Our five target species include the bluebreast darter (*Etheostoma camurum*), the Tippecanoe darter (*Etheostoma tippecanoe*), the spotted darter (*Etheostoma maculatum*), the gilt darter (*Percina evides*), and the river darter (*Percina shumardi*). Trawling surveys are being compared to a non-invasive environmental DNA (eDNA) method that uses water samples. eDNA is captured on filters, extracted, and amplified with species-specific primers using polymerase chain reaction (PCR). Each darter species is detected by a unique combination of a fluorescent color and sized PCR product during fragment analysis on an ABI 3130 genetic analyzer. This method shows promise as a new non-invasive technique for species detection within habitats that are traditionally difficult to survey.

### **38 Synthesis and characterization of substituted pyrazole ligands capable of hydrogen bonding for copper-catalyzed atom transfer radical cyclization**

Gabrielle Pros

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Atom transfer radical cyclization (ATRC) is a useful tool for the conversion of dialkenes to cyclic compounds. In order to achieve high yields for ATRC, the deactivation rate ( $k_d$ ) needs to be small relative to the deactivation rate for atom transfer radical addition (ATRA). A relatively successful catalyst for ATRC has been  $[Cu(TPMA)Br][Br]$  (TPMA= tris(2-pyridylmethyl)amine), but only modest yields have been achieved due to the high rate of deactivation. One potential way to decrease  $k_d$  is to create a ligand which can hydrogen bond to the halogen in the copper complex; however, synthesizing a TPMA-based ligand with hydrogen bonding capabilities requires an 11-step synthesis. Replacing pyridines with substituted pyrazoles reduces the synthesis to a four step process. Various ligands containing pyridine and substituted pyrazoles were synthesized, and were complexed to  $CuBr_2$ . Cyclic voltammetry and single crystal diffraction studies were also conducted.

### **39 Synthesis, Characterization, and Substitution of Quaternary Diamond-like Semiconductors**

Charles W. Sinagra III

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Quaternary diamond-like semiconductors (DLSs) are of great interest due to the tunable properties that arise from their flexible compositions. DLSs have shown to be promising materials in photovoltaics, non-linear optics, and thermoelectric applications. In this work, target compounds were synthesized via direct combination in an argon filled glove box and then heated at many different heating profiles with varying max temperatures and hold times. These compounds were then characterized by X-ray Powder Diffraction, Single Crystal Diffraction, and Optical Diffuse Reflectance UV-Vis-NIR spectroscopy. These methods provided experimental X-ray powder patterns, crystal structures, and band gap energies



that could be compared to literature references to prove if intended products were synthesized. Morphological and composition characterization including Scanning Electron Microscopy and Energy Dispersive Spectroscopy were also performed to determine the compounds homogeneity. Multiple synthesis techniques were explored to obtain phase purity. Substitution is being performed to optimize properties for potential applications.

#### **40 Technology for Math Class: An Analysis of Activities Designed by Pre-Service Math Teachers**

Ahmet Oguz Akcay

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Faculty Advisor: Melissa Boston, Ph.D.

We examined how pre-service teachers (PSTs) integrate SmartBoard, graphing calculator, and Internet sources into instructional activities for the middle school mathematics classroom. Data were collected from 26 pre-service teachers during a methods course entitled "Teaching Middle Level Mathematics," with a strong focus on the selection and implementation of cognitively challenging mathematical tasks. PSTs worked in 10 pairs/groups of 2-3 PSTs each, generating 30 technology activities (3 per group) for analysis in this study. Technology activities were rated on the level of cognitive demand (or type of thinking) of the technology-based instructional tasks, descriptions of how those tasks would be implemented during instruction, and the expected student response (or product), using the Instructional Quality Assessment in Mathematics rubrics. Results indicated that PSTs overwhelmingly selected or created technology-based instructional tasks with high-level cognitive demands (25/30; 83%), planned instructional activities to engage students in cognitively challenging mathematical work and thinking (26/30; 87%), and expected high-level student-responses and products (29/30; 97%). The results suggest that a methods course focused on cognitively challenging tasks and task implementation may have supported PSTs to incorporate technology into instruction in ways that support students' learning of mathematics.

#### **41 The effect of hippocampal and/or striatal injection of $\alpha$ -synuclein fibrils on novel object and novel place recognition in rats**

Negin Nouraei

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The effect of hippocampal and/or striatal injection of  $\alpha$ -synuclein fibrils on novel object and novel place recognition in rats Negin Nouraei, Rehana K. Leak, David A. Johnson Dementia is a common non-motor symptom of Parkinson's disease and cellular accumulations of  $\alpha$ -synuclein is a histological hallmark of that disorder. The impact of  $\alpha$ -synuclein pathology in specific telencephalic structures on cognitive function has not been elucidated in experimental models of Parkinson's disease. In the present study, male Sprague-Dawley rats were injected bilaterally in the hippocampus and/or dorsal striatum with  $\alpha$ -synuclein fibrils. Four to seven months later the animals were tested for declarative memory using novel object and novel place recognition paradigms. Pilot results demonstrate a significant impairment of performance in novel object recognition but not novel place recognition in animals injected in the dorsal striatum with  $\alpha$ -synuclein ( $P < 0.01$ ) and a trend toward impairment of novel place recognition but not object recognition in rats injected in the hippocampus ( $P = 0.06$ ). Histological examination of hippocampi injected with  $\alpha$ -synuclein fibrils revealed a significant loss of NeuN+ neurons in the CA1 sector by six months after infusion ( $P < 0.01$ ). These preliminary results

suggest that specific cognitive impairments in Parkinson's disease may be related to neuronal loss associated with  $\alpha$ -synucleinopathy in cortical and subcortical structures.

## **42 Towards Structural and Functional Determination of Human $\alpha$ 1 Glycine Receptor**

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Faculty Advisor: Dr. Michael Cascio, PhD

Glycine receptors (GlyR's) are inhibitory ligand-gated receptors in the nicotinicoid receptor superfamily. GlyR's mediate neurotransmission in CNS and are typically activated by glycine. GlyR is implicated in pain signaling to the brain. In order to better understand the silencing electrical activity of the brain and also the structure and function of GlyR in its open state, ivermectin (IVM) sensitive GlyR channels are developed as IVM is shown to stabilize GlyR in its non-desensitizing state. Double mutant F207A/A288G in  $\alpha$ 1 human GlyR has been shown to increase IVM sensitivity and reduce/remove sensitivity for glycine. We are developing photo crosslinking methodologies linked with mass spectrometric analysis on systematically generated single Cys mutations in GlyR with both Cysnull and IVM sensitive backgrounds to enable us to study state-dependent structure of GlyR in a desensitizing and a non-desensitizing manner. Distance constraints obtained from the above studies for the different states of GlyR can be used to update the computational models of GlyR and can help perform comparative studies between the different states of GlyR.

## **43 Utilizing chronic constriction injury in rats to study the immune response involved in neuropathic pain**

Andrea Stevens

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Worldwide chronic pain affects more than 1.5 billion people and approximately 60 million suffer from neuropathic pain (GIA, 2011). Neuropathic pain can be described as pain caused by a lesion or disease of the peripheral somatosensory system (IASP, 2014) and is a type of chronic pain characterized clinically by mechanical allodynia, hyperalgesia, spontaneous and ongoing pain and biologically by neuroinflammation. Neuroinflammation is caused by the production of a neuroimmune response at the site of injury, including an influx of immune and immune-like cells as well as the production of pro- and anti-inflammatory mediators. Following nerve injury, macrophages (both resident and hematogenously-derived) assist with debris removal, are also responsible for secreting inflammatory mediators, and increase the expression of other macrophage-derived factors such as prostaglandins. Using the chronic constriction injury model (CCI), our lab was able to emulate neuropathic pain and produce neuroinflammation in the associated PNS tissues. In addition, previous studies by Pollock and Janjic labs have employed the use of a novel perfluorocarbon nanoemulsion to monitor neuroinflammation in vivo (Vasudeva, 2014). The Near Infrared (NIR) labeled nanoparticles injected intravenously in the CCI rat are phagocytosed by inflammatory cells (monocytes and macrophages) in the bloodstream and carried to at the site of injury. We hypothesized that when the CCI rat is injected with an anti-inflammatory drug-loaded nanoemulsion, developed in Janjic lab (Patel, 2013; Janjic, 2014), the neuroimmune response would be reduced as well as the rats' pain behavior. In this way, CCI model is allowing us to study the neuropathic pain both in vivo and ex vivo setting focused on both the injury on the sciatic nerve and the cell biological response of the dorsal root ganglia. Vasudeva et al (2014) PLoS ONE 9(2): e90589. Patel et al (2013) PLoS ONE 8(2): e55802. Janjic et al (2014) Biomaterials 35(18).

#### **44 Well water quality in Butler County, Pennsylvania in areas with unconventional shale gas extraction (USGE) using hydraulic fracturing**

Scott Mayes

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Faculty Advisor: John Stolz, Ph.D.

The significant increase of unconventional shale gas extraction and hydraulic fracturing since 2006 in Pennsylvania has also seen an increase in number of claims of groundwater contamination to the PA Department of Environmental Protection (PA DEP). In order to determine if the two are connected, we have investigated the quality of well water by conducting a survey and water testing in several communities in Butler County, PA. File reviews of the PA DEP indicated that as of October 10, 2014, there has been 376 unconventional wells drilled in Butler County, and at least 78 violations cited. Starting in late 2011, when we initiated our study, 204 Butler County residents have participated in the survey. A total of 94 wells have been sampled, and a total of 185 water samples have been tested. Testing included in field measurements of pH, specific conductivity, and dissolved oxygen, lab testing of anions (chloride, bromide, nitrate, nitrite, phosphate, sulfate), as well as a suite of 34 cations. A subset of water wells was also tested for light hydrocarbons (methane, ethane, ethylene, propylene, propane, butane). This data was supplemented with information from PA DEP file reviews (e.g., well permits, completion reports, violations) and maps indicating legacy oil, gas, and coal activities (PA Spatial Data Access, PA Geospatial Data Clearinghouse) and GIS maps were created. The results of this study indicate that while there is high quality groundwater in Butler County, both legacy issues (e.g., abandoned coal mines, gas and oil wells) and new drilling activities could possibly be contributing to changes in water quality. The data have provided a better understanding of the quality of groundwater in Butler County and suggestions for protecting sources of drinking water in the future.

#### **45 Wish You Were Here? Exploring the “Dark Tourism” of Incarceration**

Lauren Van Zandt

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Faculty Advisor: Michael Cahall, Ph.D.

Dark Tourism can be defined as sites of individual or large-scale tragedy and death that offer visitors outlets for experiencing macabre, sacred and liminal experiences. This project examines both the motivations and experiences of visitors to two sites of incarceration, the Trans-Allegheny Lunatic Asylum in Weston, West Virginia and the West Virginia State Penitentiary in Moundsville, West Virginia. Both TALA and WVPen share similar institutional histories and function as loci for heritage tourism and supernatural experiences. Like most heritage tourism sites, TALA and WVPen attempt to maintain a balance between education (historical or philosophical narratives) and entertainment (supernatural

experiences). This project uses visitor experiences, in the form of TripAdvisor reviews, to examine the motivations behind and experiences of visiting “haunted” historic sites. This exploratory study analyzes the text of the reviews to understand how visitors understand the history and significance of these sites as well as what constitutes appropriate interpretive techniques and messages. The visitors’ experiences reveal both the narratives disseminated by these sites as well as the messages they take away. Interpretive activities at both TALA and WVPen encourage visitors to conceptualize these places as sites of entertainment rather than heritage or education. At both sites, history and location are the raw material used to create a visitor experience that focuses on the supernatural. Historical narratives give these sites authenticity that fuels more popular and lucrative supernatural-focused activities. Focusing on entertainment provides crucial financial support for the upkeep of these sites, but this focus squanders opportunities for education and contemplation on the significance of these sites for the issues of today.

#### **46 Revisiting Advance Directive Planning from a Holistic Perspective**

Christine Skrzat

Center for Healthcare Ethics | McAnulty College and Graduate School of Liberal Arts

Faculty Advisor: Glory Smith, Academic Advisor

End-of-life decision making has become more prominent in ethical debates as both the aging populations increases and medical technologies advance. These factors provoke questions concerning treatment options, quality of life, and the natural dying process. Such factors and concerns highlight the importance of accurate and authentic advanced directive planning. In this presentation, it will be argued that current advanced directive planning lacks an adequate framework to promote a fruitful conversation about end-of-life decisions. This will be supported by first presenting the intention of advanced directives. There will then be an assessment of the current advanced directive methods in light of this intention. Thereafter, an alternative approach will be presented which emphasizes the importance of a multidisciplinary holistic advanced directive. This approach is argued to achieve the true intentions of advanced directives by promoting decision making conversations unique to each individual. Successful advanced directive planning conversations should be initiated earlier, the focus of an annual appointment, and be considered from a multidisciplinary perspective.

#### **47 Losing Schools to the Economic Chasm**

Lisa Over

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Faculty Advisor: John C. Kern II, Ph.D.

The No Child Left Behind (NCLB) era of educational reform, which is now at the close of its 14th year, focuses on improving student learning by using research-based teaching techniques, making evidence-based decisions, hiring quality teachers, holding schools and school districts accountable for student performance, and allowing families to leave a “failing” school to attend one with a better report card. The goal of NCLB is to make sure each and every child reaches certain learning outcomes before he or she graduates high school. However, school performance measures show that fourteen years of NCLB funding and efforts has not reached every school and, consequently, not every child. Many schools are still “failing” as a result of numerous low performing students. The purpose of this study is to examine the amount of variance in the new Pennsylvania school performance data that is explained by IRS-based income values. Upon initial inspection of school performance, it appears that scores decrease as income decreases. If this correlation is true and a statistically and practically significant amount of variance in school performance can be explained by income, then income is an underlying problem that cannot be resolved by NCLB efforts alone. The problem

of low performing schools cannot be fixed until underlying issues are recognized and resolved. The goal of formally exposing income as a confounding variable in the school performance model is to bring a new awareness to the persistence of the economic chasm that separates school districts, schools, and people.

#### **48 Quality of Life of African Americans with Inflammatory Bowel Disease**

Patricia Scott

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Faculty Advisor: Lenore Resick, PhD, CRNP, FNP-BC, Noble J. Dick Endowed Chair in Community Outreach, Clinical Professor

The incidence of inflammatory bowel disease is increasing in industrialized countries. Over 70,000 new cases are being diagnosed every year within the United States, however, there are no national statistics regarding the prevalence of this disease within the African American population. There is a paucity of research regarding the lived experiences of African Americans with inflammatory bowel disease and how this affects their quality of life, which may signify the lack of culturally competent care received by this population and contribute to decreased patient health care outcomes within the United States health care system. The goal of this study is to explore the quality of life of African Americans with inflammatory bowel disease. These findings seek to assist health care workers in providing culturally competent care for increasing numbers of African Americans that will be seeking health care due to the Patient Protection and Affordable Care Act; and to improve patient health care outcomes of African Americans with inflammatory bowel disease, which is congruent with the missions of the National Institute of Health as well as the Institute of Medicine report which are focused on improving patient quality within the United States health care system.

#### **49 Censorship and the Archive: A Case Study in Power, Intent, and Editorial Theory**

\*Bryon Williams

English | McAnulty College and Graduate School of Liberal Arts

Faculty Advisor: Greg Barnhisel

This paper sets out to answer the question: How is it possible that the authoritative critical edition of a literary text could actually constitute a new version of the book—a version that, strictly speaking, the author never wrote and that his publishers never published? Using poet Robinson Jeffers's volume *The Double Axe* (1948) as a case study, this research focuses first on the work's multiple editors: the post-World War II commercial editors (at Random House) who affixed a disclaimer to the book to distance the publisher from the book's incendiary anti-war politics; the editors of "restored" versions of the 1970s, who discovered excised manuscript poems in the archives and who subsequently cast the poet as a victim of censorship, silenced by corporate and political guardians intolerant of dissent; and the scholarly editor who prepared a critical edition of the text at the end of the century and whose own archival research (in manuscripts, correspondence, and editorial negotiations) led him to conclusions strikingly different from those of earlier editors. The paper then studies in detail the numerous factors at work in the production and subsequent metamorphoses of a text, factors that the Jeffers case encompasses in microcosm: 1] the very nature of suppression, censorship, and the essential component of power, 2] the impact of different eras' political climates on the editorial decisions of the times, and 3] the ever-evolving editorial theories that underpin textual procedures and that have determinative implications on the interpretation of authorial intent. Archival and historical research is increasingly essential to the formation of authoritative editions of texts, and this study sheds new light on the dynamic interplay of theory, culture, and procedure in divergent interpretations of archival material.

## **50 Does Teacher Questioning Matter in Student Engagement?**

\*Elif Gokbel

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DILE | School of Education

Faculty Advisor: Melissa D. Boston, Ed.D

The primary objective of this study is to examine the relationship between the questions teacher asks during a mathematical discussion in class and responses provided by students. In this study, we look closely at the teacher-student dialogues and more specifically the ways in which students participate in relation to teacher questioning. Previous research has presented frameworks and questioning styles that teachers can use to make their own questioning more effective (Sorto, et al. 2009; Boaler & Humphreys, 2005; Nikki, 2003). This study aims to extend the literature to show how one can analyze questions and more importantly students' responses in context to better understand close connection between them. We examine whether a higher order teacher question indicates high-level student response in mathematical context and seek to understand what types of higher order teacher questions generate high-level student responses. The data were collected from 3 mathematics teachers in a large urban school district. Three lessons were analyzed from video recordings of 90-minute block class periods for: 1)types of questions teacher ask, 2)types of responses student provides, 3)number of words included a student response. Teacher-student dialogues were obtained from whole-class discussion part of the classroom hour. Frameworks used in the analysis include Boaler& Humphreys' (2005) questioning types, Wimer's categories of higher order and lower order questioning, and Boston's rubrics for high vs. low-level student responses. General teacher questions were asked during a mathematical discussion and 19 out of 40 were higher order questions. 84 percent of the identified higher order teacher questions generated high-level student responses. High-level questions were responded by up to 28 words while the number of words used on average were 6. The findings are important because some teacher questioning practices were more likely than other to yield longer student explanations leading students engage more during the discussion.

## **51 Global Health Disparities from a Catholic Social Teaching Perspective**

\*Shelley Kobuck

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Faculty Advisor: Henk tenHave, MD, PhD & Gerard Magill, PhD

In *Evangelium Vitae*, Pope John Paul II refers to Catholics as "the people of life and for life," as he concludes his teachings on issues of human sacredness. Within those concerns he accounts for the Catholic responsibility to assist the vulnerable which includes the sick and the poor of the world. Perhaps the greatest concern for global health is the reconciliation of health inequalities which is an aspect of what John Paul II was referring to in his writing. Along with the Catholic responsibility to assist the sick and poor is the basic human right for all people to health at the highest possible level. Global health disparity is defined by the dispersal of disease and lifespans and the ranges between the poor and wealthy are significant. This challenge equates to 20 million deaths per year and that hasn't shown much of a change in the last 20 years. When discussing this global challenge along with the directives for Catholic social responsibility which is seeking to realize a common good, this paper will explore the ethical justification for a global right to health from a Catholic perspective. The health care situations of both developed and developing countries will be outlined to establish a starting point for this ethical dilemma. The factors that are contributing to the disparities will be discussed based on the findings of the Commission on the Social Determinants of Health. Catholic theological concepts will be covered through the encyclicals related to Catholic Social Teachings. Health as a human right will be examined through the

constitution of the World Health Organization and the Universal Declaration of Human Rights of 1948. The issue of health inequalities and the Catholic position will be viewed from principles of The UNESCO Universal Declaration on Bioethics and Human Rights. The progress that has been made in improving the gap in health disparities will conclude the discussion which will include health governance and humanitarian assistance.

## **52 Limits of Political Correctness in Perfect Agreement, Blue Angel, and Japanese by Spring.**

\*Slan Butcher

English | McAnulty College and Graduate School of Liberal Arts

Faculty Advisor: Greg Barnhisel, Ph.D.

Exploding into the national consciousness in late 1990, political correctness (or PC) quickly assumed the status of “common sense.” Conservatives and liberals alike took PC as the most obvious way to understand the cause of an apparent crisis of censorship and declining academic standards on campuses. However, PC was a construction of radical conservatives, and served as a cover for widespread attacks on higher education meant to rescind the expanded access to colleges and universities since the Second World War. A key in disguising this assault was a campaign against affirmative action waged in the name of terms like “merit,” “fairness,” and “standards,” exemplified by Dinesh D’Souza’s *Illiberal Education* (1991), which itself became common sense. I analyze a trio of academic novels (which centre on the lives of faculty) that treat PC and take this common sense understanding of it as their starting point. Organised around the “victim” of the forces of PC whose oppression is held to be more real than that of women and minorities, Michael Downing’s *Perfect Agreement* (1997), Philip Roth’s *The Human Stain* (2000), and Ishmael Reed’s *Japanese by Spring* (1993) all dramatize the assault on affirmative action in the name of academic standards that galvanized the PC crisis’ most intense phase. Ultimately, however, the totalizing nature of this common sense proves limiting, and the novels are unable to escape the contradictions that increasingly come to the fore in their explorations of PC. Denied a way to realistically represent academe outside of PC, the novels cannot resolve the supposed tension between affirmative action and academic standards, opening up space for further assaults on higher education based on the same rhetoric the novels have demonstrated as so limiting.

## **53 Luke’s Last Supper Sayings (Luke 22:19-20): Scribal Interpolation, Parroted Tradition, or the Basis of Lukan Atonement Theology?**

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Faculty Advisor: William Wright IV, Ph.D.

Scholars have long observed the absence of atonement theology in Luke-Acts, and the guild has largely concluded Luke’s soteriology does not describe Jesus’ death as the means of acquiring salvation. Only twice does Luke explicitly identify Jesus’ death as the means of accomplishing salvation. In Acts 20:28, such a notion is affirmed in one of Paul’s statements, but this is likely more representative of Paul rather than the author of Luke-Acts. The only other relevant passage is the Last Supper discourse in Luke 22:19-20, which depicts Jesus’ death as the New Covenant sacrifice.

However, this passage is fraught with questions. Many reject its textual authenticity. Luke 22:19a-20 is absent from some of the manuscripts, and many prominent biblical scholars conclude that Luke 22:19a-20 is a later scribal interpolation. In fact, one argument against the authenticity of Luke 22:19a-20 is made precisely on the basis that it contravenes Luke's supposed deletion of atonement theology. However, other scholars who believe that Luke 22:19a-20 represents the original text still aver this passage is not representative of Lukan theology. According to Joel Green and others, the author blindly copied this saying into his text from tradition, but it is not his theology. My research has led me to challenge these widespread conclusions of Lukan scholarship. In this project, I will identify linguistic and ideological connections between Luke 22:19-20 and other portions of Luke-Acts in order to support the hypothesis that Luke 22:19-20 is neither scribal interpolation nor parroted tradition. Instead, based upon the Eucharistic allusions in the Emmaus episode (Luke 24:13-35) and the belief that Jesus ushered in the New Covenant era with the forgiveness of sins (Acts 13:13-52) one can conclude that Luke 22:19-20 is representative of the author's own theology and the original text.

#### **54 Ressourcement Theology and the Supernatural Debate: Toward a Christological Ontology**

\*Joseph Smith

Theology | McAnulty College and Graduate School of Liberal Arts

Faculty Advisor: Marie Baird, PhD

What is human nature? What sorts of things do we desire? What is our proper goal? Questions like these have always haunted theologians—not least in the twentieth century, when an emerging school of mostly French Catholic theologians—often called Ressourcement theologians, or, pejoratively, 'la nouvelle théologie'—proposed that the human desire to be supernaturally united with God is not a gift of grace, but is essential to human nature. The establishment theologians of the day envisaged a more purely natural human nature. For them, human orientation toward supernatural union with God is always a matter of divine grace and always mediated through the Church. In this essay, we will explore the landscape of this so-called "supernatural debate," which became one of the most important and most vicious theological disputes of the twentieth century. We will see that, while the terms of the debate are somewhat ethereal the abstract, the implications are real, and they are far-reaching. We will make note in particular of those places where both sides in this debate share certain assumptions and points of departure. And in the end, I will suggest that pushing back against precisely these shared assumptions may create space for new avenues of creative engagement.

#### **55 Shallow talk of Chinese higher education: Inequity within Chinese Higher Education Admission**

\*Zhe Ji

Department of Foundations and Leadership | School of Education

Graduate symposiums Abstract Shallow talk of Chinese higher education: Inequity within Chinese Higher Education Admission The number of Chinese students pursuing overseas academic degrees in the United States has skyrocketed in recent years. According to the Open Door Report (2013), Chinese students occupied the number one place of origin of international college students studying in the U.S. for four consecutive years from 2009 to 2013. In 2013, 235,597 Chinese college students came to the United States, which was an increase of 21 percent from the previous year. Chinese students continue to drive foreign student growth in the United States. A number of previous research studies have identified the pushing-pulling factors and features that influence Chinese students choices of study abroad destinations, especially the U.S. This research extends understanding by identifying the current inequitable Chinese



higher education system under sociocultural context in order to understand the specific phenomenon of Chinese students coming to the U.S. Additionally, this research will analyse the Chinese students per se by categorizing Chinese students into three classes under anthropological perspective in order to provide a profound understanding of current Chinese students rather than stereotypical impressions for all other stakeholders, foreigners, and audiences. (P.S. Oral presentation will focus on Chinese students who studying at Duquesne University, present Duquesne Chinese students as an instance).

## **56 Spinoza's Ethology**

\*Chris Rawls

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Faculty Advisor: Daniel Selcer, Ph.D., Graduate Student Advisor

For the past four years I have worked towards completing a theoretically challenging and highly nuanced doctorate on the philosophical system of Seventeenth Century lens grinder and philosopher Benedictus de Spinoza. Not only is Spinoza's primary text the Ethics considered one of the most difficult systems in the history of Western philosophy to fully understand, but Spinoza challenges anyone who reads his system to incorporate it into their own life and practice. He encourages this because his system explores not only important philosophical, systematic details using the geometric method, but also human psychology, the three types of knowledge we can have, Nature as a moving intensity composed of both eternal laws (as natural laws) and also that which has infinite ways of expressing itself as variations in power and intensity. It is also a system of ethics and incorporates the creative use of one's life as a combination of imagination, reason, and intuition. Where such a system becomes really powerful is when it creates original, caring, and efficient affects with others as a group effect. This is not an easy thing to do regularly by any means, but when accomplished has the power to enrich the lives of all involved individually. Spinoza's philosophical insights and proto-physics of force contribute to bettering humanity, and, as a result, it is a source of great tolerance, joy, enhanced creativity, and contemporary relevance. Needless-to-say, taking on such a system has been and remains littered with immense challenges for one's limits of rational systematizing on a singular level and daily interactions with a multitude of other personalities. In the end, studying Spinoza is an intellectual, yet immensely rewarding and practically applicable activity. Through working on this system deductively in our own ways we become transformed. Some questions I answer in my project according to the epistemological, ontological, and aesthetic philosophical system Spinoza offers us involve problems in how we error in reasoning and how we can turn to the use of imaginative ideas in order to strengthen the force of our understanding and our actions. To end I focus on the interdisciplinary ways in which such a system can be applied today.

## **57 Towards a model of trauma-informed correctional care**

\*Jayna Bonfini

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Faculty Advisor: Lisa Lopez Levers, Ph.D.

Treating clients with trauma histories often involves a system of individuals who participate in the task of helping clients to understand their trauma experiences and to integrate them into a meaning-making process as a way of healing or recovering. Yet, little emphasis has been placed on systemic approaches to trauma and this training failure has been and continues to be problematic (Pryce, Shackelford, & Pryce, 2007). It is exacerbated in a correctional setting where staff often has no training whatsoever in trauma, necessitating a trauma-informed training program for correctional staff. My

research explores how training correctional staff to be trauma-informed (e.g., recognition, interventions, treatment, policies, and procedures) can impact professional quality of life for correctional staff and improve organizational functioning at a facility in Pittsburgh, PA. Part of this process includes training existing staff, both clinical and non-clinical staff members, because a better understanding of trauma improves an institution's focus on safety, support of good coping skills, and reinforcement of treatment gains. The prevailing view in trauma-informed counseling is this: Unless traumatic experiences are addressed and the survivor honored and respected, the individual will seek maladaptive behaviors to cope with the psychological, emotional and often physical damages by engaging in risky behaviors. These risky behaviors may include masking feelings through substance use, engaging in burglary and/or prostitution to support a drug habit, and eventually become involved in the criminal justice system. Further, once individuals are justice-involved, under-reporting of trauma history is common, perhaps because of mistrust, guilt, shame, and self-blame. This sequence is likely to repeat unless treatment specific to the needs of the person with the trauma history are met and correctional staff are knowledgeable about the effects of trauma.

## **58 Benjamin and Contemporary Art: Communicating Truth in Experience**

\*Stephen Hallenbeck

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Faculty Advisor: Ronald Polansky, Ph.D

Contemporary art is in a difficult situation in its relationship to the public and even to those within the walls of academia. People often find themselves at a loss when attempting to interpret either the internal meaning of contemporary art pieces or the relevance of the pieces to a larger concept of knowledge, truth or experience. In this paper I will show that by using Benjamin's concept of truth, one is able to articulate the importance of contemporary painting as a source of "profane illumination", and as a medium in which experience is kept alive and transmitted. There are three components to this argument. Initially, I will present Benjamin's notion of truth and its relationship to contemporary painting. Benjamin spent his life writing about, and arguing for, a new definition of truth, one where truth is presented as a group of ideas resonating together to form a constellation that presents itself in the "now of knowability." I use Benjamin's writings on philosophy, art and literature to develop a precise theory of painting based on this definition of truth. The second component of my argument is an analysis of three modern paintings to illustrate exactly how the theoretical components of my argument are located within the works of art themselves. Finally, I respond to Benjamin's most well-known writing on the work of art, his critique of the effects on art by mechanical reproduction. I will argue that Benjamin is premature in his critique because art has, at least in some places, found a way to use mechanical reproduction to its advantage. I conclude by alluding to the possibility that this interpretation of contemporary art through the schematics of Benjamin's concept of truth could be extended as a lens for interpreting all periods of art.

## **59 Campus Buildings as Living Laboratories: Overcoming Challenges to Zero-Energy Retrofitting — A Case Study**

\*Gina Johnson

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Faculty Advisor: Robert Sroufe, Ph.D.

Net-zero-energy (NZE) buildings — those that produce as much energy as they consume on an annual basis — have many proven benefits, including utility bill savings, occupant comfort, resiliency, and reduction of greenhouse gas

emissions. It is a goal of particular urgency, as the building sector consumes nearly half of all energy produced in the United States. However, retrofitting the existing 5.6 million commercial U.S. buildings poses two key challenges: financing, and timing when to perform the upgrades with least disruption for occupants. Facing these very challenges in retrofitting Duquesne's Rockwell Hall, alumni, students, and faculty of the Palumbo Donahue School of Business are implementing a novel NZE strategy. Rather than delaying upgrades until a wholesale retrofit can be approved, financed, and performed, the strategy entails tackling net-zero upgrades piecemeal over time, as general-maintenance needs arise for the 56-year-old building. Building on five years of student Leadership in Energy and Environmental Design (LEED) competitions, and recent commitments to join the Pittsburgh 2030 Challenge, this pioneering field-based research has practical application and real-world significance. As a first step, alumni, students, faculty and local efficiency companies have completed a blower door test at Rockwell Hall that is believed to be among the first ever performed at a business school building. The air-leakage data gleaned from the test, along with data to come from the forthcoming installation of advanced metering infrastructure at Rockwell Hall, will provide benchmarks for a NZE plan created with Duquesne alumni. The team envisions the Rockwell Hall NZE project as the first step in a campus-wide program that will position the University as a leader in sustainability and, with the support of secondary research and primary data collection from this field-based study, be a leading example for what can be done with millions of other existing buildings.

## **60 Counseling implications for Muslim graduate international students: A Practical Approach**

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Many Muslim graduate international students want to study abroad, especially in the USA, because higher education in the United States has broad opportunities in many different fields. Therefore, increasing numbers of Muslim graduate international students are moving away from their home countries for the sake of studying abroad. Many studies show that international students struggle with many challenges such as language barriers, cultural barriers, etc. Common challenges associated with international students have been studied extensively, but relatively little is known about Muslim graduate international students. For this reason, it is believed that there is a need to explore Muslim graduate international students' common challenges in order to encourage the success of these students in their education. This presentation will focus on counselor strategies for assisting Muslim graduate international students, as well as ways to better understand and communicate with these students. This presentation also emphasizes the point that counselors can have a significant impact in every Muslim graduate international student's life. Finally, the importance of increasing awareness regarding the common challenges international Muslim graduate students face on their education will be highlighted.

## **61 Predicting viral cross-reactive epitopes in adalimumab, infliximab and etanercept: implication of therapy failure due to anti-drug antibodies**

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Patients' immune systems are exposed to vast array of viral antigens over their lifetime. The immune system recognizes viral epitopes and primes B cells to create preformed antibodies. If similarities exist between epitopes from biologic

protein products and viral epitopes from previous infections, the body may inactivate the biologic and decrease drug efficacy through epitope mimicry. The purpose of this study was to use a systematic computational analysis of human leukocyte antigen (HLA) ligands to yield possible similar sequences in influenza virus hemagglutinin (HA) and TNF $\alpha$  inhibitors. This could allow prediction of drug treatment failure in select patient populations.

## **62 "The Interactive Primer Model: Where High Tech and Old World Collide."**

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In recent years, technology has enabled educators to create new and innovative learning experiences. These advances allow students to interact with the material they are studying to a degree never before possible. The battle between institutions with online, brick and mortar, and flip-classroom advocates surges on; however, a middle ground does exist that can allow the learner to take advantage of the positive aspects of these experiences. During this presentation, a new model of learning will be proposed that seeks to utilize the methods of the past in a manner fitting of 21st century learners. The Interactive Primer Model of Learning is based on the use of a primer learning experience, an interactive and LMS managed online learning module, which prepares learners for in-depth classroom instruction and experiential activity. Interactive learning modules studied have shown that “the constructivist approach to online module design, whereby the learner constructs knowledge through activity, appears to offer instructors and students a way of achieving learning outcomes (Slinger-Friedman and Patterson).” The interactivity of the model includes game-based and scenario-based activities that incorporate core material allowing the student to engage the content in resource-intensive tasks. Using well developed theoretical approaches to game construction, instructors can utilize these elements in a way that allows them to “adapt and respond to the needs of learners and [other] educators (Hendrix, Knutov, Auneau, Arnab, Dunwell, Petridis, Lamerias, de Freitas).” This model is separate from existing pedagogy in that it does not seek to replace classroom instruction; rather it exposes the learner to the material being covered in the classroom so that each student has the opportunity to gain more from the expertise and experience of the instructor. The Interactive Primer of Learning proposes that we retain this focus while allowing learners to engage content in a way never before possible.

## **63 To Pay or Not to Pay? Variables Influencing Hostage Outcomes in Terrorist Kidnappings**

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The tragic death of Americans James Foley and Steven Sotloff at the hands of the Islamic State of Iraq and Syria (ISIS) once again brought terrorist kidnappings to the forefront of the American psyche. Terrorist groups have a long history of kidnapping citizens for multiple reasons, from political to monetary. Kidnapping for ransom is a lucrative means of funding for terrorist groups around the world, yet little is known about the factors influencing hostage outcomes in these situations. This study attempts to analyze the relationship between hostage and hostage-taker in situations where a terrorist group’s motivation for kidnapping is ransom; mainly asking: why are some hostages released while others are killed when taken by terrorist groups for ransom?

Using University of Maryland’s Global Terrorism Database, 1,004 individual hostage outcomes from 1970 – 2013 are collected and analyzed using SPSS statistical modeling. This research examines the variables influencing hostage

outcomes (whether a hostage is released or killed), looking at variables such as nationality and target type, in an effort to understand terrorist patterns and predict outcomes for hostage situations in the future.

#### **64 Normative data collection for the Standardized Touchscreen Assessment of Cognition**

Alicia Taylor

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The purpose of this research study is to collect normative data for the Standardized Touchscreen Assessment of Cognition (STAC). The STAC is a criterion-referenced test that assesses cognitive and linguistic functions and enables the examiner to receive both quantitative and qualitative information about a person's cognitive abilities. The STAC consists of theoretically validated tasks within the domains of attention, memory, visual and auditory memory, and executive functioning. The researchers will compare normative data on the STAC to participants' scores on the Cognitive Linguistic Quick Test (CLQT), a speech-language pathology assessment, and the Cognitive Assessment of Minnesota (CAM), an occupational therapy assessment. The CLQT and CAM both include paper and pencil tasks while the STAC is self-administered on the iPad. The researchers plan to administer the three tests to 100 neurotypical adults between the ages of 18 to 85 years old. To date, data for 33 participants has been collected and data analysis is underway. Each participant completed a demographic form and scored within the normal range on the Mini Mental Status Exam (MMSE). The participants were administered the STAC, CLQT, and CAM in a randomized order. The data from each participant is entered into the computer and will be analyzed using IBM's SPSS Statistics 22 software program. The overall scores on the STAC will be correlated with the scores achieved on the CAM and CLQT. The clinical implications and future research directions will be discussed.

#### **65 Transport and Conformational Change: Reset of the Dopamine Transporter**

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Neurotransmitter transporter proteins play a critical role in the synaptic cleft. Responsible for the reuptake of neurotransmitters from the synaptic cleft, these proteins aid in terminating the action of neurotransmitters. The dopamine transporter (DAT), a member of the monoamine transporter family, is responsible for the reuptake of dopamine and displays ion dependence to drive transport. Experimental research indicates the need for a single potassium ion (K<sup>+</sup>) to drive the reset of the serotonin transporter, another member of this protein family. There is currently no experimental evidence suggesting that K<sup>+</sup> plays a similar role in DAT; however computational work has shown K<sup>+</sup> coordinating with the intracellular side of DAT. Our work aims to elucidate the reset mechanism of DAT computationally by examining the interactions of K<sup>+</sup> with the protein and changes in conformation. Using a novel dual bilayer system and molecular dynamics, we can simulate these proteins as they would function in vivo. Initial findings confirm entry of K<sup>+</sup> to the binding pocket of DAT, suggesting its accessibility to the intracellular side of the membrane, as well as the possibility for dependence on K<sup>+</sup> to allow conformational reset.