TEXAS ★ STATE UNDERGRADUATE RESEARCH JOURNAL

Volume I, Issue II

The Texas State Undergraduate Research Journal

A peer-reviewed journal for multidisciplinary research

Volume I, Issue II
December 2013

Editor-in-Chief
Thomas Kloss

Editorial Board
Jason Brazil, Copy Editor
Ciara Knight, Graphic Designer
Matthew Parrott, Technical Adviser/Copy Editor
Trey Weller, Reviewing Editor

John Hood, Journal Adviser

Copyright Notice

Authors who publish with this journal agree to the following terms:

1. By agreeing to the terms of this license, you (the author or copyright owner) grant to Texas State University the non-exclusive right to reproduce and/or distribute your submission worldwide in electronic or any medium for non-commercial, academic purposes.

2. You agree that Texas State University may, without changing the content, add metadata for indexing purposes and convert the submission to any medium or format for the purpose of preservation.

3. You agree that the Alkek Library may keep more than one copy of this submission for purposes of security, backup, and preservation.

4. You represent that the submission is your original work and that you have the right to grant the rights contained in this license. You also represent that your submission does not, to the best of your knowledge, infringe upon the copyright, patent or trade secret of any third party.

5. If the submission contains material for which you do not hold copyright and that exceeds fair use, you represent that you have obtained the unrestricted permission of the copyright owner to grant Texas State University the rights required by this license, and that you have identified and acknowledged such third party owned material clearly within the content of your submission.

6. You also represent and warrant that the submission contains no libelous or other unlawful matter and makes no improper invasion of the privacy of any other person.

7. If the submission is based upon work that has been sponsored or supported by an organization other than Texas State University, you represent that you have fulfilled any right of review or other obligations required by such contract or agreement.

8. You understand that once the submission is deposited in the repository, it remains there in perpetuity. However, authors retain the right to update the work or remove it from public view.

9. You agree to hold Texas State University and its agents harmless for any liability arising from any breach of the above warranties or any claim of intellectual property infringement arising from the exercise of these non-exclusive granted rights. Texas State University will clearly identify your name(s) as the author(s) or owner(s) of the submission, and will not make any alteration, other than as allowed by this license, to your submission. You will retain your existing rights to your work and may submit the work to publishers or other repositories without permission from Texas State University.

Table of Contents

Editor's Introduction v

About the Editorial Board vii

Challenges and Opportunities:
Undergraduate Research at Texas State University 1
Jason Brazil and Matthew Parrott

Antibody Titer Variance Due to Freezing of Patient Specimens 6
Jennifer Rivers (Primary Author) and Julianna Jones

Esther's Narrative Transformation in Dickens' Bleak House 15
Elissa Erin Myers

Superstition or Sanctioned Solemnities? Representations
of Rituals in Anglo-Saxon Literature 21
Madeline Barnes

Editor's Introduction

When I assumed the position of TXSTUR Editor-in-Chief, I realized that it was a way of giving back to the Honors College, and the entire university, while taking advantage of the opportunities they had offered me. As we close out our first year of publication, I see just how much we've grown in a single semester, from a veteran two person team to a board of people I am proud to work with. I hope to see us continue to grow as a team, as individuals, and as a boon to the Honors College and Texas State as a whole.

My journey in the Honors College, as well as TXSTUR, has consisted largely of the same characters, to all of whom I owe thanks. Dean Galloway was not only of great assistance to me, but set me on the path to research by recommending Professor Laura Ellis-Lai's portraiture class. There I learned about and pursued in-depth research. Dr. Jon Lasser, head of the institutional review board (IRB), was kind enough to let me sit in on an instructional seminar when I was getting approval for my research. Dr. Craig Hanks, professor of philosophy and former chair of the IRB, was and continues to be incredibly helpful. Dr. Hanks and professor Ellis-Lai have also been generous enough to donate their time to TXSTUR, as you will see in our first article.

I also owe a debt of gratitude to my advisor, John Hood, who has been integral to the production of this issue. Finally, I would like to thank two people who are no longer present at Texas State. The first is Texas State alumnus Rachel Barnett, my predecessor and founder of TXSTUR, who selected me to replace her. The second is Texas State alumnus Christopher Pursch, my adviser during my stint at San Antonio Community college, who always encouraged my academic ambition, and influenced my choice to apply to Texas State.

This time around we have articles covering the opportunities and challenges of undergraduate research, the effect of freezing on antibody concentration, Dickens' Bleak House, and a macroscopic look at Anglo-Saxon literature and "superstition." Whether your interests lie in hard science or sociological phenomena, there's something here for everyone.

While we hope the thoughts and opinions expressed herein inspire discussion and introspection, neither the Honors College nor the TXSTUR staff necessarily endorse, subscribe to, or advocate these views.

All of us here at TXSTUR hope you enjoy reading the following works as much as we did, and would like to encourage you to either submit your own research or support undergraduate research in any way you can.

With my best wishes,

Thomas Kloss, TXSTUR Editor-in-Chief

About the Editorial Board

Editor-in-Chief

Thomas Kloss is the Editor-in-Chief of TXSTUR. Majoring in Psychology and English, he hopes to provide excellent undergraduates a platform for their research, and as a result, contribute to the academic environment of Texas State University.

Copy Editor

Jason Brazil is a copy editor for TXSTUR. A Junior double majoring in Philosophy and Communication Studies, he has a strong love of research in all its forms, but especially that which pertains to human communication. In his free time, Brazil enjoys reading, hiking and playing the guitar.

Graphic Designer

Ciara Knight is the graphic designer for TXSTUR. A Terry Scholar and Communication Design major, Knight hopes to effectively contribute her skills to the creation of advertising materials for the journal, as well as its layout for online publication.

Technical Adviser/Copy Editor

Matthew Parrott is the technical adviser, as well as a copy editor for TXSTUR. He has a B.A. in English and is earning a M.A. in Literature.

Reviewing Editor

Trey Weller is the reviewing editor for TXSTUR. He is an English major at Texas State University, and he hopes to teach in the future.

TEXAS STATE
UNDERGRADUATE RESEARCH JOURNAL

Challenges and Opportunities: Undergraduate Research at Texas State University

Jason Brazil and Matthew Parrott

Texas State University offers many opportunities for its undergraduate students to conduct research, and the list is growing! Conducting independent research can help these high-achieving individuals delve into a topic in greater depth than what an undergraduate lecture course could practically allow and engage with the scholars and mentors from other backgrounds and other time periods. In addition, it can give greater insight and meaning to one's own work as a student, not to mention the fact that it can be a very distinguishing credential! However, there are still many challenges for undergraduate students at Texas State University who want to conduct meaningful research and reap the benefits that the University has to offer.

Not enough can be said about the importance of undergraduate classes and the professors who teach them, for their contribution in laying the foundation for the careers and futures of undergraduate students. Many instructors assign research projects to their students, giving them the valuable opportunity to create original work. A prime example is Laura Ellis-Lai, lecturer for the English department, who often teaches ENG 1320. In an interview for TXSTUR, she explains the type of research she assigns for her undergraduate ENG 1320 course, "I teach students how to do a research project, which is usually a five page paper. I usually assign a family history research project where students interview a family member about a particular part or phase of their life and then students do historical research to contextualize the interviews" (Ellis-Lai). However, admittedly, due to the large undergraduate student population, opportunities for in-depth research projects are regrettably limited, albeit purely out of necessity. For some lecture-based classes, classroom sizes can range up to the hundreds. In classes like these, in-depth research projects are impractical both from an administrative and instructional point of view. As Laura Ellis-Lai explains, from an instructor's perspective, the problem is that: "I imagine responding to that many complex research papers would be really hard to do" (Ellis-Lai). In addition, instructional methodologies that incorporate research projects typically involve one on one interaction between instructors and students to gauge student progress and stimulate students academically when they fall behind in their work or get caught in one way of thinking. In this way, the teacher-student relationship corrects for the bias of the student that may exist due to misunderstanding or inexperience. Unfortunately, in large lecture-style classes this personal and benefic interaction is a statistical improbability. Dr. Craig Hanks, who has been in the Department of Philosophy for 15 years, explains that the size of undergraduate classrooms is also a problem from the perspective of the student.

> [One] challenge of undergraduate research is [that], when you're an undergraduate, you have much less time in any interdisciplinary practice and...a less general sort of background in disciplines or across disciplines... [Another challenge] is actually having structures in place that do more than just allow but encourage faculty to take the time to mentor, supervise, or create opportunities for undergraduate students. That becomes a very big challenge when you have graduate programs around. You have lots of attention going to the graduate students in terms of the research. (Hanks)

To meet these limitations of undergraduate courses, Texas State University has made significant attempts to give its student body opportunities for undergraduate research by contributing financial support to undergraduate research programs and organizing special student showcase events, such as Senior Design Day and Capstone courses offered through various departments. In addition to organizing these events, the University also organizes the S.U.R.F. grant (Student Undergraduate Research Fund), which contributed over $19,000 to "equipment, tools, supplies or [required] services" for independent undergraduate research projects in an effort to "inspire and support independent undergraduate research by Texas State Students" (Honors College). "The S.U.R.F. provides many opportunities for those interested in research," says Ashleigh Gauntner, currently a second year graduate student in the Department of Communication Disorders, who won a S.U.R.F. grant in the fall of 2011. The grant helped her complete her research study, Mothers' Knowledge of Prelinguistic Communication Development: Promoting the Early Diagnosis of Autism Spectrum Disorder, which she presented at the Honors College Thesis Forum in the Spring of 2012 and the American Speech-Language-Hearing Association Convention in 2013. Her faculty advisor for the S.U.R.F. study and co-author of the poster was Dr. Alisha Richmond. "My hope is that this study will play a strong role in the common practices of many professionals to help children with disorders receive services to allow for earlier identification and a better prognosis" (Gauntner). It can clearly be seen that there are opportunities for both academic merit and social benefit in undergraduate research. S.U.R.F grants can help to take some pressure of the student so they can focus on their independent studies, and they are just the start of potential financial aid for those students who are willing to make an effort to contribute to their field.

Another solution to large and impersonal undergraduate classrooms is the Honors College, which offers smaller, more specialized courses. The Honors College mission is as follows: "Our courses are small in size and seminar-style... Honors also offers contract courses and independent study as well as the Honors thesis, which allow students to design their own curriculum"

(Honors). In an interview for TXSTUR, Dr. Hanks told TXSTUR's Editor-in-chief Thomas Kloss, "[the Honors College is] a resource that many students don't quite understand…It can be [helpful] to work in a conversation-, discussion-based course with just a few people, and they're able to really critically work out ideas in a community that way" (Hanks). While the Honors College is a very viable solution for a wide variety of students, Hanks expresses some concern that undergraduate students will not take advantage of the program. He says, "Lots of people who could meet the criteria [of the Honors College] never join. So there will be people who could be researchers through Honors, who just don't because the necessary circumstances don't exist" (Hanks).

Though solutions exist, many times students are not aware of the resources available to them. That is why it is so important for educators and administrators to educate students on the potential of undergraduate research and its benefits. Mike Blanda, the Vice President for Research and Federal Relations, states the main benefits of research:

> Independent research provides an opportunity for students to decide whether they truly have a passion for a particular subject and the preparation to pursue it. Independent research teaches students how to formulate a question or conceive an original idea then follow it up with an appropriate design, methodology and data collection. These efforts are usually accompanied by a high degree of failure through trial and error so independent research requires a person to cultivate a lot of personal resolve. Finally, employers in all fields, but especially ones dependent on high tech, want employment ready job candidates and research provides that extra experience and learning in cutting edge technologies. (Blanda).

With so many good qualities and outcomes that can be expressed through undergraduate research, there is no reason for students not to take an interest in it. The earlier one starts engaging in a professional and academically rigorous discipline like research, the better prepared they will be for their career and personal lives. By creating a collaborative and academic atmosphere that fosters research, students and teachers alike can bolster the ranks of undergraduates who are willing to take the next step in their academic and professional development. The opportunities are there; all the curious student has to do is grab them.

Bibliography

1. Ellis-Lai, Laura. Personal interview. Dec. 2013.

2. Gauntner, Ashleigh. E-mail.

3. Hanks, Craig. Personal interview. Dec. 2013.

4. Honors College: Texas State University. Honors College, 2013. Web. 7 Dec. 2013.

TEXAS STATE
UNDERGRADUATE RESEARCH JOURNAL

Antibody Titer Variance Due to Freezing of Patient Specimens

Jennifer Rivers (Primary Author) and Julianna Jones
Faculty Supervisor: Thomas Patterson

ABSTRACT

In clinical and research laboratories, it is often necessary to analyze stored, frozen serum or plasma specimens, on multiple occasions, over extended periods of time. Although this is common practice, data is limited regarding effects of multiple freeze-thaw cycles on antibody integrity. Freeze-thawing combines several protein stress factors, which can induce partial unfolding and subsequent aggregation. Here, the researchers investigated the effects of 12 freeze/thaw cycles on 4 antibodies within the IgG class: anti-Jka, anti-Fya, anti-E, and anti-c. To perform titrations, serial dilution tubes were set up ranging from 1 to 512. Titrations were performed after 37°C incubation, the titer was documented, and titer scores were calculated. Across 12 freeze/thaw cycles, the anti Jka and anti-c titers and scores declined, the anti-E titer and score declined but varied greatly in the run, and the anti-Fya titer and score varied throughout. Chi square testing showed no significant variation in any of the antibody titers or scores. Spearman correlation analysis returned negative correlation on all tests, insignificant results on anti-Jka, anti-Fya, and anti-E titer and score correlations, and significant results on anti-c titer and score correlations. Further study is needed to appropriately interpret these findings for applicability and utility in clinical antibody evaluation.

Keywords: antibody titer, serial dilution, freeze/thaw cycling, chi square test, Spearman correlation

Abbreviations: Ig(A,E,D,G,M) – immune globulin (Class A,E,D,G,M); MMR – measles, mumps, and rubella; SDS-PAGE – sodium dodecyl sulfate polyacrylamide gel electrophoresis; ul – microliter

I. Introduction:

In clinical and research laboratories, it is often necessary to analyze stored frozen serum or plasma specimens, on multiple occasions, over an extended period of time. For example, in blood banking it is important to determine antibody levels over time in order to monitor mothers at risk of delivering infants with hemolytic disease of the fetus and newborn (HDFN).[1] To do so, patient serum/plasma specimens for antibody titers are frozen and used again to run the past titer in parallel with a current one.[1] As a result of this process, these specimens undergo a series of freeze-thaw cycles. Although this is common practice, there is limited data available regarding the effects of multiple freeze-thaw cycles on antibody integrity.[2] For that reason, it is important to investigate what effect, if any, repeated freezing and thawing of specimens has on antibody titers.

Antibodies are large Y shaped proteins composed of two regions: the variable region that defines antigen binding properties, and the constant region, which interacts with immune molecules. They are divided into five different classes based on their constant regions: IgA, IgD, IgE, IgM, and IgG.[1,3] Proteins have been reported to remain stable in storage at less than -20°C for extended periods of time, but are theoretically at risk of degradation when exposed to repetitive freeze-thaw cycles. [2,3,4,5] When exposed to varying temperatures, proteins have been found to undergo structural changes. In the case of antibodies, they show structural instability via denaturation and aggregation.[3,4] Freeze-thawing combines several stress factors for a protein which can induce partial unfolding and subsequent aggregation. This may result in reduction of protein activity. Due to reversibility, however, aggregation does not seem to be considered a major issue. [3,4,5]

Past investigations on the effects of freezing and thawing specimens utilizing enzyme linked immunoassays (EIAs) demonstrated variation in values, but found no significant effect on antibody levels. [2,6,7] In the investigation of freeze-thaw cycles on measles, mumps and rubella antibodies, direct comparison of baseline and final EIA values showed no evidence for change in actual antibody level. They believed that any variations or trends observed were due to instrument drift only.[2] In another study, heating and freeze-thaw cycling of sera was titered and cell fusion supernatants were screened by protein blots of SDS- PAGE. The study found that mouse monoclonal immunoglobulin G (IgG) was inactivated by heating, but not by repetitive freezing and thawing.[8] In this study researchers investigated the effects of 12 freeze thaw cycles on four different antibodies within the IgG class. The researchers performed titrations after each freeze-thaw cycle and analyzed the difference in titer value and titer score.

II. Methods:

Four previously frozen samples known to be positive for blood antigen antibodies were acquired from The Blood and Tissue Center of Central Texas. Specimens had been labeled solely with the identified antibody, and no patient identifiers were collected. The patient samples were frozen upon receipt at -20˚C. For each titer, samples were thawed at room temperature. Once baseline titers had been completed and results documented, the samples were refrozen at -20˚C. The titration procedures were then repeated with each specimen after each subsequent freeze/thaw cycle, for a total of 12 cycles.

To perform the titrations, serial dilution tubes were labeled from 1 to 512, and an extra tube was set aside, just in case the titration required further dilution. One hundred microliters of saline was added to tubes 2 through 512. Next, 200ul of patient sample was added to tube 1, and then 100ul of the sample from tube 1 was carried to the tube 2 and mixed. Then, 100ul of the tube 2 sample mixture was transferred to tube 4, and so on, continuing on in standard serial dilution procedure. One hundred microliters of the tube 512 dilution was set aside in the extra tube. Once the dilution was carried out, panel cells positive for each antibody were added to their respective set of tubes. The panel cells were selected from a 16 panel cell set based on presence of corresponding antigens to the sample antibodies. Two drops of low-ionic enhancement solution were then added to each tube following the addition of panel cells. After the tubes were well mixed, they were incubated between 36°C and 38°C for 15 minutes. Following incubation, the tubes were all washed three times by hand with saline, using 60-second centrifugation intervals. After the wash, one drop of AHG was added to each tube. The tubes were mixed and centrifuged for 15 seconds. All centrifugation times were determined based on previous calibration of the centrifuge used, to achieve optimal agglutination. All negative reactions were tested with IgG coated reagent cells. The reagent cells were added, the tubes mixed, and then centrifuged for 15 seconds. Positive agglutination observed following addition of IgG coated reagent cells indicated an acceptable negative reaction, otherwise the titer was considered invalid and performed again.

To analyze data collected from this study, a titer and a titer score were calculated. The 'score' was based on the graded agglutination reactions observed (4+=12, 3+=10, 2+=8, 1+=5). Weak reactions were considered to be negative and did not contribute to the titer score. Each numerical assignment was summed for the antibody titration to give the overall score. The titer score calculation provided further information about the strength of reactivity of each antibody, per each freeze/thaw cycle. Complete disappearance of titer agglutination would be considered indicative of loss of antibody reactivity. Any decrease in titer score, titer, or titer endpoint would be analyzed for significance. Data were examined using the chi square test and the Spearman

correlation to look for any significant differences that occurred in the titer or titer score results over the course of the study. The significance level for this research was set at p=.05. Chi square testing was conducted utilizing a numerical designation of '0' for no titer or a lack of agglutination, and a numerical designation of '1' for the presence of a titer, or positive agglutination. The expected value for all titers was positive agglutination, or '1', in all freeze/thaw cycles. Chi square testing was performed using Excel and by comparing the test statistic to the chi square table obtained from the Penn State website to determine the significance score. The Spearman correlation was performed using SPSS statistical analysis software.

III. Results:

Antibody titers and titer score results for baseline (0) and all freeze/thaw cycles is shown in Table 1. The titer score data was very similar in variation and fluctuation to the titer data, illustrating consistency in measurements and technique. Over the course of the 12 freeze/thaw cycles, the anti-Jka and anti-c titers and scores declined, the anti-E titer and score declined but showed a greater variation in the run, and the anti-Fya titer and score varied throughout, with a slight increase apparent by the end of the study. The anti- Jka titer and score became undetectable by freeze/thaw cycle 11, and remained undetectable through freeze/thaw cycle 12. This is the only titer and score that were lost.

Table 1: Titers and Titer Scores of 4 Antibodies over 12 Freeze/Thaw Cycles.

Raw data shows variations in warm antibody titers scores over the course of the research analysis. Data exhibited a general downward trend for anti-Jka and anti-c, a less striking decline in anti-E, and marked variation in anti-Fya results.

Cycles	Anti-Jka Titer	Titer Score
0	2	10
1	1	5
2	1	5
3	1	5
4	2	10
5	2	10
6	2	10
7	1	5
8	2	10
9	2	10
10	4	15
11	0	0
12	0	0

Cycles	Anti-c Titer	Titer Score
0	4	15
1	2	16
2	2	10
3	2	10
4	2	10
5	2	10
6	2	10
7	1	5
8	1	5
9	1	5
10	2	10
11	2	10
12	1	5

Cycles	Anti-Fya Titer	Titer Score
0	16	37
1	32	42
2	64	50
3	32	39
4	32	33
5	64	46
6	64	46
7	64	50
8	32	39
9	32	42
10	32	42
11	16	37
12	32	39

Cycles	Anti-E Titer	Titer Score
0	8	26
1	4	21
2	4	21
3	2	13
4	4	18
5	4	18
6	4	15
7	8	20
8	4	15
9	8	23
10	2	10
11	4	18
12	2	10

Figures 1 and 2 show the graphical representation of the titer and titer score variation, respectively, in all antibodies studied over the 12 freeze/thaw cycles.

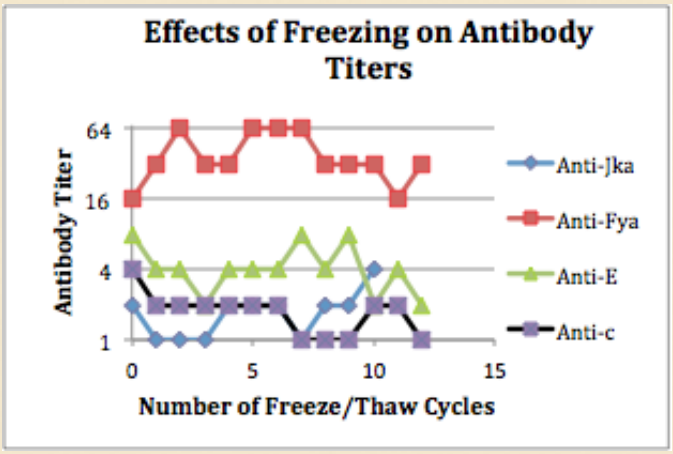

Figure 1: The Effects of Freezing on Antibody Titers.
Anti-Fya. Data is graphed logarithmically to account for the serial dilutions used in this study. Variation in the data is apparent throughout the 12 freeze/thaw cycles. X=0 is the baseline titer result.

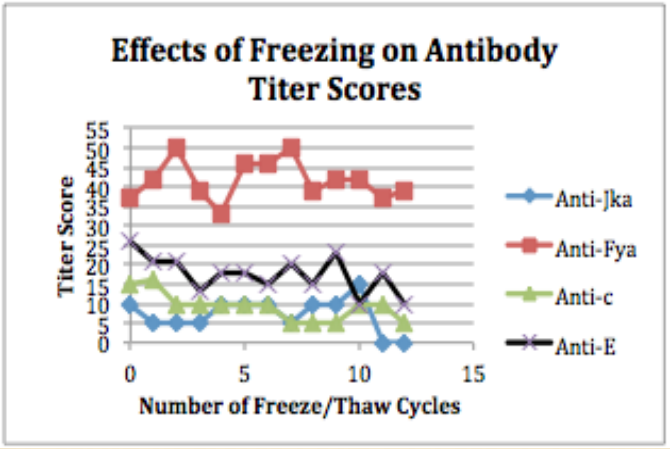

Figure 2: The Effects of Freezing on Antibody Titer Scores.
Variation in the data is apparent throughout the 12 freeze/thaw cycles, and maintains a high degree of similarity with the antibody titer data. X=0 is the baseline titer score result.

Statistical analysis by the chi square test showed no significant variation of any of the antibody titers after 12 freeze/thaw cycles, as shown in Table 2. The same data was obtained from chi square analysis of titer scores; no significant variation in the data was discovered.

Table 2: Chi Square Analysis of Antibody Titer and Score Variation over 12 Freeze/Thaw Cycles.

Analysis showed no significant difference in titers or titer scores through 12 freeze/thaw cycles.

Chi Square Analysis of Antibody Titers and Titer Scores

Cycles	Expected - All	Anti-Jka	Anti-Fya	Anti-E	Anti-c
0	1	1	1	1	1
1	1	1	1	1	1
2	1	1	1	1	1
3	1	1	1	1	1
4	1	1	1	1	1
5	1	1	1	1	1
6	1	1	1	1	1
7	1	1	1	1	1
8	1	1	1	1	1
9	1	1	1	1	1
10	1	1	1	1	1
11	1	0	1	1	1
12	1	0	1	1	1
Chi Square Statistic		0.999405815	1	1	1

Significance Level = .05

Chi Square Significance: All Antibodies .50>p>.30 **Accept Null Hypothesis**

The titer and titer score data for each antibody was also analyzed by Spearman's correlation, as shown in Tables 3 and 4, respectively. All titers and titer scores demonstrated negative correlation coefficients of varying strengths.

Table 3: Spearman's Correlation of Antibody Titer and Number of Freeze/Thaw Cycles.

All data show negative correlation coefficients. Anti-Fya, anti-E, and anti-Jka titer results were returned with insignificant variation, while the anti-c titer results were determined to show a significant variation at the 95% confidence level.

			FreezeThaw
Spearman's Rho	JkaTiter	Correlation Coefficient	-.112
		Sig. (2-tailed)	.716
		N	13
	FyaTiter	Correlation Coefficient	-.106
		Sig. (2-tailed)	.729
		N	13
	ETiter	Correlation Coefficient	-.272
		Sig. (2-tailed)	.368
		N	13
	cTiter	Correlation Coefficient	-.632*
		Sig. (2-tailed)	.021
		N	13

Table 4: Spearman's Correlation of Antibody Titer Scores and Number of Freeze/Thaw Cycles.

All data show negative correlation coefficients. Anti-Fya, anti-E, and anti-Jka titer score results showed insignificant variation, while the anti-c titer score results were determined to show a significant variation at the 99% confidence level.

			FreezeThaw
Spearman's Rho	JkaScore	Correlation Coefficient	-.112
		Sig. (2-tailed)	.716
		N	13
	FyaScore	Correlation Coefficient	-.064
		Sig. (2-tailed)	.835
		N	13
	EScore	Correlation Coefficient	-.546
		Sig. (2-tailed)	.053
		N	13
	cScore	Correlation Coefficient	-.698**
		Sig. (2-tailed)	.008
		N	13

The Spearman's correlation for anti-Jka, anti-E, and anti-Fya returned no significant relationship between the titer and number of freeze/thaw cycles, or the titer score and number of freeze/thaw cycles. The Spearman's correlation data for anti-c, however, returned a significant difference between both the titer and the number of freeze/thaw cycles and the titer score and the number of freeze/thaw cycles. The p-value for the titer data correlation was .021, and the p-value for the titer score data correlation was .008.

IV. Discussion:

The results obtained in this study show that there is a certain measure of variability among titer results when specimens are repeatedly frozen and thawed. The results obtained are somewhat equivocal; while significant results were observed for one of the antibodies tested using the Spearman's correlation, insignificant results were observed for the other three. No significant results were observed when the data was analyzed with the chi square test. Further study should be done to appropriately interpret these findings. It may not be safe to assume that most antibodies would not show significant variation in titer results after repeated freezing/thawing, even though that is largely what was described here. Careful consideration should be taken when freezing and thawing patient specimens repeatedly, and, when possible, specimens should be aliquoted and frozen and thawed as few times as possible. In the clinical laboratory, antibody titers tend to vary from one run to the next, so some amount of variation was to be expected.

As with most research, there were certain limitations that may have affected the outcome of this study. The small sample size is one limitation that should be adjusted in the future to allow for broader, more encompassing results. Additional freeze/thaw cycles may be recommended as well. Another possible source of error is the innate variation present in clinical antibody titers. The same technologist may run the same patient titer twice and obtain differing results, so this variance is expected. How often this expected variation results in significant differences would be another topic worthy of investigation, as random probability may play a role in the results observed in this study. Also, as the samples utilized in this research were obtained from the Blood and Tissue Center with no patient information, it is unknown how many times the samples may have been frozen and thawed prior to being dedicated to this project. The baseline measure was taken to account for this variable by providing a starting point for our analysis, in lieu of previous data. Finally, a common limitation in most scientific studies is the subjectivity and performance variation between individuals conducting the research. These variables were controlled by performing procedures together whenever possible to ensure procedures were conducted consistently, assigning one person the task of reading tube reactions, and collaborating on any questionable ranking of agglutination. Despite these attempts at control, personal variation and human error remain perpetual limitations in manual scientific research.

In all laboratory disciplines, continued education and research is critical to ensure that the safest, most modern, and most effective methods are used to treat patients. Overall, the results obtained from this study appear to be insignificant, yet should be considered inconclusive until further research is done to confirm that assumption. What can be said with certainty is that antibodies are important proteins that are often temperature sensitive, so proper care should be taken when handling and storing any specimen requiring antibody evaluation.

V. Acknowledgements:

The authors would like to extend special thanks to Thomas Patterson for his guidance and supervision over the course of this project, as well as his help in securing samples and reagents. Great appreciation goes to The Blood and Tissue Center of Central Texas for their cooperation in providing patient specimens with antibody identification, and to the Clinical Laboratory Science department at Texas State University for providing the laboratory, tools, and supplies required to be successful.

Bibliography

1. Roback, J (ed): Technical Manual, 16th ed. American Association of Blood Banks. Bethesda, MD. 2008; 633.

2. Pinsky NA, Huddleston JM, Jacobson RM, et al. Effect of multiple freeze-thaw cycles on detection of measles, mumps, and rubella virus antibodies. Clin and Diag Lab Immun. 2003; 10: 19-21.

3. Wang W, Singh S, Zeng D, et al. Antibody structure, instability, and formulation. J of Pharm Science. 2007; 96: 1-25.

4. Hawe A, Kasper JC, Friess W. Structural properties of monoclonal antibody aggregates induced by freeze-thawing and thermal stress. Europ j of Pharm Sciences. 2009; 38: 79-88.

5. Lazar KL, Patapoff TW, Sharma VK. Cold denaturation of monoclonal antibodies. Landes Bioscience. 2010; 2: 45-52.

6. Boadella M, Gortazar C. Effect of haemolysis and repeated freeze-thawing cycles on wild boar serum antibody testing by ELISA. Research Notes. 2011; 498: 1-4.

7. Neumann EJ, Bonistalli KN. Effect of blood sample handling post-collection on *Erysipelothrix rhusiopathiae* antibody titers. The Vet J. 2009; 180: 325-329.

8. Haskell DW, Anderson JV, Guy CL. Brief communications: Antigen binding of a mouse monoclonal IgG is inactivated by heating but not by freeze/thaw cycling. Cryobiology. 1993; 30: 532-53.

TEXAS ★ STATE
UNDERGRADUATE RESEARCH JOURNAL

Esther's Narrative Transformation in Dickens' Bleak House

Elissa Erin Myers

ABSTRACT

Critics have often dismissed Esther Summerson, one of the narrators of Charles Dickens' Bleak House, as being insipid, nothing more or less than a straightforward model of Victorian womanhood (Moseley 37). However, these critics tend to overlook Esther's clever maintenance of narrative technique, sustained through the constant tension between what Esther reveals and what she keeps secret. Esther begins the narrative by maintaining constant frankness, and insists that she is always candid so as not to sacrifice narrative accuracy. Indeed, Esther is very faithful in her reportage, even down to reporting personal feelings that she might not otherwise wish to reveal. However, she is not initially always candid about her thoughts about others, but holds back considerably due to her extreme tact, a feminine virtue in the Victorian era. Esther's brush with smallpox may be seen as the source of her change as a character, and also as a narrator.

Keywords: Dickens, Bleak House, narration, female characters

Critics have often dismissed Esther Summerson, one of the narrators of Charles Dickens's Bleak House, as being insipid, nothing more or less than a straightforward model of Victorian womanhood (Moseley 37). However, these critics tend to overlook Esther's clever maintenance of narrative technique, sustained through the constant tension between what Esther reveals and what she keeps secret. Esther begins the narrative by maintaining constant frankness, and insists that she is always candid, so as not to sacrifice narrative accuracy. Indeed, Esther is very faithful in her reportage, even down to reporting personal feelings that she might not otherwise wish to reveal. However, she is not initially always candid about her thoughts about others, but holds back considerably due to her extreme tact, a feminine virtue in the Victorian era. Esther's brush with smallpox may be seen as the source of her change as a character, and also as a narrator.

After this brush with disease, Esther's narrative selectivity becomes bolder in several ways. Esther makes frequent ironic comments about characters she does not like, points which do not contribute directly to the plot, and therefore are not strictly necessary. She also begins to keep secrets from the reader about her own feelings, when she does not see them as necessary to be reported, prioritizing her own feelings over the feminine virtue of candidness. Because this effect is heightened as the novel goes on, it is possible to look at the novel's progress as Esther's progress from utter selflessness to self-realization, her quest to claim, through the narrative of Bleak House, the narrative of her own life. Thus, I argue that, while Esther is certainly a product of the gender norms of her time, the way in which she narrates renders her more powerful than many female narrators of her time.

After this brush with disease, Esther's narrative selectivity becomes bolder in several ways. Esther makes frequent ironic comments about characters she does not like, points which do not contribute directly to the plot, and therefore are not strictly necessary. She also begins to keep secrets from the reader about her own feelings when she does not see them as necessary to be reported, prioritizing her own feelings over the feminine virtue of candidness. Because this effect is heightened as the novel goes on, it is possible to look at the novel's progress as Esther's progress from utter selflessness to self-realization, her quest to claim through the narrative of Bleak House, the narrative of her own life. Thus, I argue that, while Esther is certainly a product of the gender norms of her time, the way in which she narrates renders her more powerful than many female narrators of her time.

Toward the beginning of the novel, Esther herself can be seen as utterly selfless. As a child, Ms. Barbary told Esther that it would have been better if she had not been born (74). Her father is named "Nemo," meaning "nobody." Ms. Barbary claims to have taught Esther "submission, self-denial, and diligent work," values which definitely creep into her narrative style (75).

Toward the beginning of Esther's narrative, she famously says, "I have a great deal of difficulty in beginning to write my portion of these pages, for I know I am not clever" (73). Esther does not believe she is capable of deeper analysis, of seeing the facts, and judging what is and what is not important to the narrative. Because Esther has no confidence in herself as a person, her narrative style in the first half of the novel is necessarily weak, as well.

As far as Esther's narration in the former part of the novel, she places candidness at a great premium, averring that she keeps no secrets from the reader. Her role is that of a reporter, who has no right to provide subjective commentary, but also one who has no right to keep secrets that might harm the accuracy of the narrative. Esther says, "I write down these opinions, not because I believe that this or any other thing was so; but only because I did think so, and I want to be quite candid about all I thought and did" (244). Esther also characterizes herself as "having a silent way of watching all that passed before me, and thinking I should like to understand it better" (73). In the beginning of the novel, Esther is a watcher, rather than a doer.

Though Esther is candid about her feelings in the beginning, she is often not candid about her opinions of others, going so far as not articulating her feelings clearly to herself. At first, she makes fairly tame comments about those of whom she disapproves, though it is clear she is merely attempting to maintain tact. When Esther meets Harold Skimpole, she says,

> If I felt at all confused at that early time, in endeavoring to reconcile anything he said with anything I had thought about the duties and accountabilities of life (which I am far from sure of), I was confused by not exactly understanding why he was free of them. That he was free of them, I scarcely doubted; he was so very clear about it himself (118).

I argue that Esther's reticence to speak ill of people is a naïveté of communication rather than one of feeling. Though it is clear that she does think ill of Mr. Skimpole, she is not sure enough of the verity of her own impressions to articulate them in stronger terms, and certainly not to articulate them aloud to any of the other characters.

A significant transformation follows Esther's recovery from smallpox, a transformation that strengthens her character, and thus, strengthens her certainty in her own ability to narrate; whereas Esther is, earlier in the novel, able to easily remember her duty by simply jangling her keys, she later has significant difficulties in achieving this process of self-effacement (127). Worried about her appearance, Esther spends quite a bit of time in solitude, even postponing seeing Ada in order to adjust to her new appearance. Esther says, "I hope it was not a poor thing in me to wish to be a little more used to my altered self, before I met the eyes of the dear girl I longed so ardently to see,

but it is the truth. I did" (453). Esther, in this case, pays attention to what she needs in order to be comfortable with herself, rather than to the call of Ada's needs. Esther also remembers Woodcourt at this time. She sees it as a positive thing that she was never engaged to him, so that her physical appearance can never become a trap to him. However, she does express a hope that they will meet again one day, and that he will find her "better far than he thought me when I found some favor in his eyes, at the journey's end" (460). Thus, one can see Esther's illness as a time of transition for her, in which she progresses from viewing herself as a typical woman whose physical beauty marks out a typical course for her – one of duty and of marriage – to viewing herself as an individual who may yield, at least in part, to the discovery of her own self, a discovery which Esther believes will make her a better person.

After this process of transformation, Esther is markedly more selective about the details she presents to the reader. After Esther's illness, she comments only selectively on the emotional pain she undergoes. As Esther's moments of solitude suggest, she does undergo pain. However, she does not feel as she does earlier in the novel – that the reader has a right to her pain. Her times of solitude are marked by the absence of feeling in her narration. Esther says of her preparation for the first time that she would see her own face again after the illness that "I said my prayers, and thought a little more" (461). There are several times when Esther simply refuses to comment. For example, after first meeting her mother, Esther says that "what more the letter told me, needs not be repeated here. It has its own time and places in my story" (468). After the death of Esther's mother, Lady Dedlock, though she does discuss the kindness of those around her, she does not discuss her own feelings about the death. She merely says, "I proceed to other passages of my narrative" (701). These omissions of Esther's feelings indicate that Esther no longer feels she must report her every feeling, but that she need only report what is strictly necessary for accuracy.

Esther's narration also becomes more selective in that she begins to trust her own opinions about others, and to glean pleasure from making observations about others. She begins not only to think things about others, but to begin to express them, and indeed to act on them, signifying a growth in agency. Her relationship with Skimpole continues to evolve, as she first realizes and articulates the depth of his treachery, and then confronts him about it. Esther characterizes Skimpole's taking a bribe from him in exchange for his inducing Jo to move on, saying to Bucket that she saw this as "very treacherous on the part of Mr. Skimpole toward my guardian, and as passing the usual bounds of his childish innocence" (673). When one compares this quote to Esther's much earlier judgment of Skimpole, the fact that she has undergone a significant transformation becomes apparent. She is no longer masking her disapproval in the guise of roundabout statements of confusion; rather, she states her disap-

proval in no uncertain terms.

Thus, Esther, in keeping more secrets about her own feelings from the reader than at the beginning of the narrative, and in articulating and acting on more of her inner disapproval of others, shows growth as a character. Before her disease, Esther's interest in candidness, a valuable trait in a woman, forced her to reveal inner emotions which she might not otherwise have revealed. Likewise, her lack of confidence in herself as a narrator caused her not to always articulate her disapproval of others around her, much less act on it. After Esther's disfiguring illness, however, the freedom she gains to be herself, rather than to fulfill a feminine role is striking. Though Esther as a character makes many choices which render her more active, her power can be most readily seen through her stronger, clearer choices as a female narrator, who has become, through her weakness, undeniably stronger.

Bibliography

1. Dickens, Charles. *Bleak House*. Ed. Patricia Ingham. Petersborough, Ontario: Broadview P, 2011.

2. Moseley, Merritt. "The Ontology of Esther's Narrative in *Bleak House*" South Atlantic Review 50.2, (May 1985): 35-46. JSTOR. 3 Oct 2012. Web.

TEXAS STATE
UNDERGRADUATE RESEARCH JOURNAL

Superstition or Sanctioned Solemnities? Representations of Rituals in Anglo-Saxon Literature

Madeline Barnes

ABSTRACT

Anglo-Saxon literature expresses a period of transition between the traditions of the pagan, tribal peoples of Britain and early medieval Christianity. This literature, therefore, contains an amalgamation of pagan and Christian rituals, many of which are surprisingly similar on several levels. Modern readers often attempt to label the rituals as magical or religious, but this paper argues that, rather than defining the rituals according to modern terms, the labels that the authors give to the rituals should be examined. The survey of literature is examined through comparison of rituals that were deemed magical or Christian by the authors, primarily found in penitentials and saint's legends. The analysis reveals insights into the authors' views of their own religions and what makes rituals viable and sanctified as well as their evaluations of the rituals of "others."

Keywords: ritual, magic, Anglo-Saxon, Penitentials, St. Leoba, Bede

In his penitential, Burchard of Worms asks, "Hast thou done what some women are wont to do?" He explains that some women tend to "take off their clothes and anoint their whole naked body with honey," roll around in wheat, make bread with that wheat, and feed it to their husbands so "they may become feeble and pine away" (Burchard of Worms 341). Information such as this is hard to encounter without immediately questioning if women really did this, and, if so, how often. Some may wonder if it works, or if the wheat would need to be organic. One question, though, brings forth an opportunity to look at these rituals in a different way. If this transformation of bread is condemned as magic, what does that make the ritual of transubstantiation? This question should not be answered with modern views of what makes something magical rather than religious. Instead, the question should be posed to the literature, allowing the author's given information to explain the his or her views. Examining descriptions of religious rituals and magic in Anglo-Saxon literature, particularly through comparison, without trying to define them with modern labels provides opportunities to learn more about the worldviews of the author. When it comes to referring to a medieval ritual or practice as magical, "as opposed to scientific or religious," the labeling "depends on the perspective of the person using the label" (Jolly 4). Therefore, looking at why the author describes an event as magical or Christian gives more insight into the literature than defining the event in modern terms.

Anglo-Saxon penitentials contain several descriptions of rituals similar to the one above, which provide a good starting point for an examination of magic in Anglo-Saxon text because the author's intention is quite obvious. According to their genre, the authors of penitentials tend to condemn things that they regard as magical rituals. The way the descriptions are presented, though, provides more insight into the author's feelings than their condemnation of the rituals. For example, Burchard gives a description of what "many women, turning back to Satan, believe and affirm to be true" (Burchard of Worms 339). According to him, they believe they can, "without visible weapons," slay baptized Christians, "cook and eat their flesh and in place of their hearts put straw or wood. . .and when they are eaten make them alive again and give an interval of life" (339). Here Burchard condemns not the ritual, but the belief in this magic. He writes that such a belief is deserving of a forty day plus seven years long penance, but does not mention what the penance would be for someone who practices the ritual (339). This implies that Burchard either does not believe that the ritual is still practiced, or believes that no such magic is possible but the belief remains problematic.

Burchard's beliefs can be contrasted with an entry in "The Confessional of Egbert," which says that "if a woman works witchcraft and enchantment and [uses] magical philters, she shall fast. . . [with] the extent of her wickedness being considered," adding that if she kills anyone by her philters, she shall fast

for seven years" (Egbert 246). Egbert condemns the use of this magic, even noting the possibility of murder as a result of the ritual. In further contrast to Burchard, Egbert does not, in this entry, condemn the belief in the witch's magic. One explanation is that Burchard cannot imagine even a new Christian convert committing such a heinous crime as cannibalism, so the penance would not be needed, or maybe that the person would be tried in a jury outside of the church for the crime separately from their penance for the belief. As for Egbert, the penance he describes is for killing someone with the potion the woman believed to be magical. It is possible in this scenario that Egbert does not believe in the witchcraft but instead believes that the poisons could cause death by their own natural effects. Neither Burchard nor Egbert, however, would interpret these rituals as miracles because the rituals include an attempt to harm someone.

While the rituals described in the Penitentials are often examples of magic that results in harm, Anglo-Saxon literature does not only represent magic as harmful. For instance, a ritual is described that involves woman putting a chalice of wine and the Eucharist in the hands of an infant who has died before being baptized and then dip the hands in wax before his burial (Burchard 340). The ritual is condemned by Burchard, even with its Christian elements and good intentions. But what specifically is offensive or against doctrine? The agency of the woman preforming the ritual is not likely the culprit because a similar agency can be found in saint's lives. For instance, Saint Eugenia "smeared [a sick woman] with hallowed oil and marked her with the sign of the cross," healing the woman and drawing out a poison that was affecting her (Ælfric 71). This event is clearly similar in ritualistic elements, as seen in the oil and sign of the cross as well as human agency. The two events are also similar because they are done with good intentions: assisting a baby who was not able to be baptized and healing a person. However, through comparison, one difference between the two events that presumably stands out to Anglo-Saxon Christians is revealed: The ritual condemned by Burchard involves the Eucharist, which is something untrained hands are not meant to act upon. Eugenia's ritual, however, involves a version of the sacrament of anointing the sick. Unlike dealing with the Eucharist, lay people anointing the sick were sanctioned by Pope Innocent I, creating "what we call today a sacramental" (Toner). Especially when contrasted, the details in these rituals give insight into why the authors classify them as either magic or Christian miracles.

"The Life of St. Leoba" contains ritual elements even more intricate than those seen in Saint Eugenia's story. The most intricate ritual is when Leoba and her sisters were instructed to "stand with their arms extended in the shape of the cross until each of them had sung through the whole Psalter, three times each day" and to then "go round the monastic buildings. . .with the crucifix at their head" (" The Life of Saint Leoba" 111). This event, however, is different

from the rituals in the Penitentials and even from Saint Eugenia's healing ritual. The result of the precession the sisters enacted is only seen after Leoba asks God to "deliver [them] from [their] charge" (111). A reason that Christian legend does not consider this event to be magic could be the lack of human agency. The ritual is similar to those considered magical by Anglo-Saxon audiences, with detailed steps enacted by a group of women in procession; in fact, it shares some elements with a ritual seen in "The Corrector of Burchard of Worms," in which young girls gather, select a leader (which could be tied to Leoba's role in her procession), and enact a pagan agricultural practice, ending with them returning to their village in procession (Burchard of Worms 341). There are very obvious differences between these events, and their similarity should not be overstated. However, the elements that these rituals have in common are compelling enough to examine why Leoba's ritual is not seen as magical. The main difference between the two, as well as what influences the steps in each of the rituals, is the human agency. Leoba's ritual is a preface to a request for God to enact his will, while the ritual seen in the penitential is a method for humans to intervene with the natural process. Furthermore, Leoba's precession took place on already holy grounds, while the agricultural ritual was an attempt to influence and act upon the earth. Agency is clearly a large part of the intent of the ritual, and can determine whether the author views it as magic or as a devout request for God's influence.

In contrast, Bede's Ecclesiastical History of the English People contains several examples of saints who create miracles but do not enact them with a ritual first. For example, Bede writes that Saint Alban caused a river to dry up so he could cross it simply by "rais[ing] his eyes to heaven in prayer" (Bede 53). Not only does Alban achieve this without a ritual, but he influences natural forces. Still, though, there is an element of God retaining the agency of the miracle; it is explicitly stated that Alban prays for the river to be cleared, making the miracle an example of God's power through Alban. Compare this with Bede's account of Saint Oswald's life, though, and a different story is revealed. One of Oswald's miracles is that the dust that had contact with "the water in which [his] bones had been washed" developed "the saving power to expel devils from the bodies of those who were possessed" (Bede 160-161). This is enacted when a man who is "suddenly possessed by the devil" cannot be saved by exorcism, but is cured "as soon as [a] maid carrying the casket" containing Oswald's dust "approached the porch of the house." The man stated that, when the casket was carried to that porch, "all the evil spirits who were tormenting [him] went away" (161-162). This miracle is written as if it is entirely done through Oswald; there is no mention of prayers. In fact, an exorcism failed while Oswald's spirit prevailed. These miracles from saints are difficult to distinguish from magic, and the saints are difficult to differentiate from witches or magicians. However, to the Anglo-Saxon mind, the actions of both Oswald and

Alban have one large difference from the women enacting the Christian infant ritual. The actions here are no longer by human agency, but have moved to a supernatural saintly agency. This is actually made clearer in these last two examples from Bede's Ecclesiastical History because there is no ritual, so the few actions the saints take in their miracles are emphasized. To Anglo-Saxon Christians, Oswald and Alban are not mere human magicians. Rather, their holy lives have allowed God to act through them, and the resulting miracles therefore retain God as the source of the power.

When reading Anglo-Saxon literature, it is important not to apply modern labels of magic or religion, or even science. If the author's designation of a ritual is examined with the right questions, namely why he or she considers one event an attempt at magic and another a miracle, more insight into the other elements of the author's worldview can be revealed. When magic and religion seem similar, it is best not to blame it on the lack of scientific knowledge of the people. This merely eliminates an opportunity to answer the "why" questions. Instead, the magic and miracles should be contrasted to find why they were used as examples, or what makes them different at their core. Practicing the early medieval mindset helps to eliminate a progressivist view of history, creating a focus on why views on these rituals existed in the first place rather than what caused them to become closer to modern views.

Bibliography

1. Ælfric. "Eugenia." *Women Saints' Lives in Old English Prose*. Ed. and trans. Leslie A. Donovan. Cambridge: D.D. Brewer, 1999. The Library of Medieval Women. 67-77. Print.

2. Bede. *Ecclesiastical History of the English People*. Trans. Leo Sherley-Price. Rev. ed. R. E. Latham. New York: Penguin, 1990. Print.

3. Burchard of Worms. "Selections from the Corrector and Physician of Burchard of Worms." *Medieval Handbooks of Penance: A Translation of the Principal Libri Poenitentiales and Selections from Related Documents.* Ed. John T. McNeill and Helena M. Gamer. New York: Columbia University Press, 1990. 321-345. Print.

4. Egbert. "Selections from the So-called Confessional of Egbert." *Medieval Handbooks of Penance: A Translation of the Principal Libri Poenitentiales and Selections from Related Documents*. Ed. John T. McNeill and Helena M. Gamer. New York: Columbia University Press, 1990. 243-248. Print.

5. Jolly, Karen, Catharina Raudvere, and Edward Peters. *Witchcraft and Magic in Europe: The Middle Ages*. Ed. Bengt Ankarloo and Stuart Clark. Philadelphia: University of Pennsylvania Press, 2002. Print.

6. "The Life of Saint Leoba." *Medieval Women's Visionary Literature*. Trans. C.H. Talbot. Ed. Elizabeth Petroff. New York: Oxford U.P., 1985. 106.114. Print.

7. Toner, Patrick. "Extreme Unction." *The Catholic Encyclopedia*. New York: Robert Appleton Company, 1909. Web. 8 Oct. 2013.