APPENDIX A:

NMR AND MS DATA
A.1: $^1$H NMR of 2-nitrobenzyl-11-mercaptoundecanoate (photolabile compound), Chapter 4, Section 4.1.
A.2: $^{13}$C NMR of 2-nitrobenzyl-11-mercaptoundecanoate (photolabile compound), Chapter 4, Section 4.1.
A.3: MS (ESI) of 2-nitrobenzyl-11-mercaptoundecanoate (photolabile compound), Chapter 4, Section 4.1.

![Mass Spectrogram Image]

- \((M + Na)^+\) calc. 376.47
- \((M + 4Na)^+\) calc. 445.44

![Chemical Structure Image]
A.4: $^1$H NMR of 4-mercapto-1-(1,4,7-trioxa-10-azacyclododecan-10-yl)butan-1-one, Chapter 6, Section 6.7.
A.5: Expanded $^1$H NMR of 4-mercapto-1-(1,4,7-trioxa-10-azacyclododecan-10-yl)butan-1-one, Chapter 6, Section 6.7.
A.6: $^{13}$C NMR of 4-mercapto-1-(1,4,7-trioxa-10-azacyclododecan-10-yl)butan-1-one,  
*Chapter 6, Section 6.7.*
A.7: Expanded $^{13}$C NMR of 4-mercapto-1-(1,4,7-trioxa-10-azacyclododecan-10-yl)butan-1-one.

Chapter 6, Section 6.7.
A.8: $^1$H NMR of 4-mercapto-1-(1,4,7,10-tetraoxa-13-azacyclopentadecan-13-yl)butan-1-one, Chapter 6, Section 6.7.
A.9: Expanded $^1$H NMR of 4-mercapto-1-(1,4,7,10-tetraoxa-13-azacyclopentadecan-13-yl)butan-1-one, Chapter 6, Section 6.7.
A.10: $^{13}$C NMR of 4-mercapto-1-(1,4,7,10-tetraoxa-13-azacyclopentadecan-13-yl)butan-1-one, 
*Chapter 6, Section 6.7.*
A.11: Expanded $^{13}$C NMR of 4-mercapto-1-(1,4,7,10-tetraoxa-13-azacyclopentadecan-13-yl)butan-1-one, Chapter 6, Section 6.7.
A.12: $^1$H NMR of 4-mercapto-1-(1,4,7,10,13-pentaoxa-16-azacyclooctadecan-16-yl)butan-1-one, Chapter 6, Section 6.7.
A.13: Expanded $^1$H NMR of 4-mercapto-1-(1,4,7,10,13-pentaoxa-16-azacyclooctadecan-16-yl)butan-1-one, Chapter 6, Section 6.7.
A.14: $^{13}$C NMR of 4-mercapto-1-(1,4,7,10,13-pentaoxa-16-azacyclooctadecan-16-yl)butan-1-one, Chapter 6, Section 6.7.
A.15: Expanded $^{13}$C NMR of 4-mercapto-1-(1,4,7,10,13-pentaoxa-16-azacyclooctadecan-16-yl)butan-1-one, *Chapter 6, Section 6.7.*
A.16: $^1$H NMR of 2-nitrobenzyl-undec-10-enoate, *Chapter 4, Section 4.12.*
A.17: $^{13}$C NMR of 2-nitrobenzyl-undec-10-enoate, Chapter 4, Section 4.12.
A.18: MS (ESI) of 2-nitrobenzyl-undec-10-enoate, Chapter 4, Section 4.12.
A.19: $^1$H NMR of 2-nitrobenzyl-(11-trichlorosilyl)-undecanoate, Chapter 4, Section 4.12.
A.20: $^{13}$C NMR of 2-nitrobenzyl-(11-trichlorosilyl)-undecanoate, Chapter 4, Section 4.12.
A.21: $^1$H NMR of 11-(2-nitrobenzyloxy)-11-oxoundecanoic acid, Chapter 4, Section 4.12.
A.22: $^{13}$C NMR of 11-(2-nitrobenzyloxy)-11-oxoundecanoic acid, Chapter 4, Section 4.12.
A.23: MS (ESI) of 11-(2-nitrobenzyloxy)-11-oxoundecanoic acid, Chapter 4, Section 4.12.
A.24: $^1$H NMR of s-acetyl-3-mercaptopropanol, Chapter 6, Section 6.13.
A.25: Expanded $^1$H NMR of s-acetyl-3-mercaptopropanol, *Chapter 6, Section 6.13.*
A.26: $^{13}$C NMR of s-acetyl-3-mercaptopropanol, *Chapter 6, Section 6.13.*
A.27: $^1$H NMR of s-3-oxopropyl ethanethioate, Chapter 6, Section 6.13.
A.28: Expanded $^1$H NMR of s-3-oxopropyl ethanethioate, Chapter 6, Section 6.13.
A.29: $^{13}$C NMR of s-3-oxopropyl ethanethioate, *Chapter 6, Section 6.13.*

[Diagram of the NMR spectrum showing the chemical shifts and peaks for the molecule.]

[Structural formula of the s-3-oxopropyl ethanethioate molecule with carbon atoms labeled 1 to 6.]
A.30: $^1$H NMR of tert-butyl 1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.31: Expanded $^1$H NMR of tert-butyl 1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.32: $^{13}$C NMR of tert-butyl 1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate,
*Chapter 6, Section 6.14.*
A.33: Expanded $^{13}$C NMR of tert-butyl 1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.34: \(^1\)H NMR of tert-butyl 16-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.35: Expanded $^1$H NMR of tert-butyl 16-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.36: Expanded $^1$H NMR of tert-butyl 16-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.37: $^{13}$C NMR of tert-butyl 16-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-
diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.38: Expanded $^{13}$C NMR of tert-butyl 16-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.39: Expanded $^{13}$C NMR of tert-butyl 16-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane-7-carboxylate, Chapter 6, Section 6.14.
A.40: $^1$H NMR of 7-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane, 
Chapter 6, Section 6.14.
A.41: Expanded $^1$H NMR of 7-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane, Chapter 6, Section 6.14.
A.42: Expanded $^1$H NMR of 7-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane, Chapter 6, Section 6.14.
A.43: $^{13}$C NMR of 7-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane, Chapter 6, Section 6.14.
A.44: Expanded $^{13}$C NMR of 7-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane, Chapter 6, Section 6.14.
A.45: Expanded $^{13}$C NMR of 7-(anthracen-9-ylmethyl)-1,4,10,13-tetraoxa-7,16-diazacyclooctadecane, Chapter 6, Section 6.14.
APPENDIX B:

CURRICULUM VITAE
**Peter F. Driscoll – Curriculum Vitae**

**Education**

Worcester Polytechnic Institute  
Ph.D. in Chemistry, December 2009  
Thesis Title: “Bioanalytical Applications of Chemically Modified Surfaces”  
Advisor: W. G. McGimpsey  
GPA: 3.9/4.0

Connecticut College  
Bachelor of Arts in Chemistry, 2001

**Experience**

- Utilized innovative surface modification techniques to functionalize metals, glass, and polymers  
- Synthesized and fully characterized self-assembled monolayers for applications including controllable surface wettability, nanoscale surface patterning, photovoltaics, and ion sensing  
- Designed and built microfluidic sensor devices capable of electrochemical analyte detection  
- Integral in maintaining supplies, equipment, instruments, and computers in the research lab as well as supervising and assisting undergraduate students with independent research projects

Teaching Assistant, Worcester Polytechnic Institute (2006-2009)  
- Taught organic and general chemistry laboratory sections of 18-24 students  
- Responsible for lab preparation, grading, and instrument maintenance

- Developed new electrolytes and separators for rechargeable Lithium-ion batteries  
- Fabricated Li-ion cells to test and analyze electrolyte, separator, anode, and cathode behavior  
- Designed and tested overcharge proof safety systems on large capacity Li-ion cells

Research Assistant, Connecticut College (1999-2001)  
- Developed new synthetic routes to microporous manganese oxides with different pore sizes for applications in ion storage and exchange

**Skills**

**Laboratory**
- Experienced in common surface modification and characterization techniques  
- Skilled in general organic synthetic and purification methods  
- Proficient in manipulation of air-sensitive compounds using glove box/Schlenk line techniques  
- Knowledgeable with a variety of analytical laboratory skills and procedures

**Instrumental**
- NMR (1H, 13C, 19F, COSY), MS, GC, IR, UV/Vis, AA, SEM, Fluorescence  
- Electrochemistry including; Cyclic Voltammetry, Impedance Spectroscopy, and Potentiometry  
- Surface characterization techniques such as; Contact Angle Goniometry, Ellipsometry, Surface Plasmon Resonance, Quartz Crystal Gravimetry, and Grazing Incidence IR

**Computer**
- Proficient with Windows operating systems and MS office (Word, Excel, PowerPoint)  
- Familiar with a variety of instrument specific software and able to learn new programs quickly
AWARDS
American Institute of Chemists Award for Outstanding Graduate Student in Chemistry (2009)
Backlin Scholarship, Worcester Polytechnic Institute (2009)
Keck Undergraduate Research Grant (2000)

AFFILIATIONS
American Chemical Society, Member (2000 to present)
American Association for the Advancement of Science (2007 to present)

PUBLICATIONS


PRESENTATION ABSTRACTS


