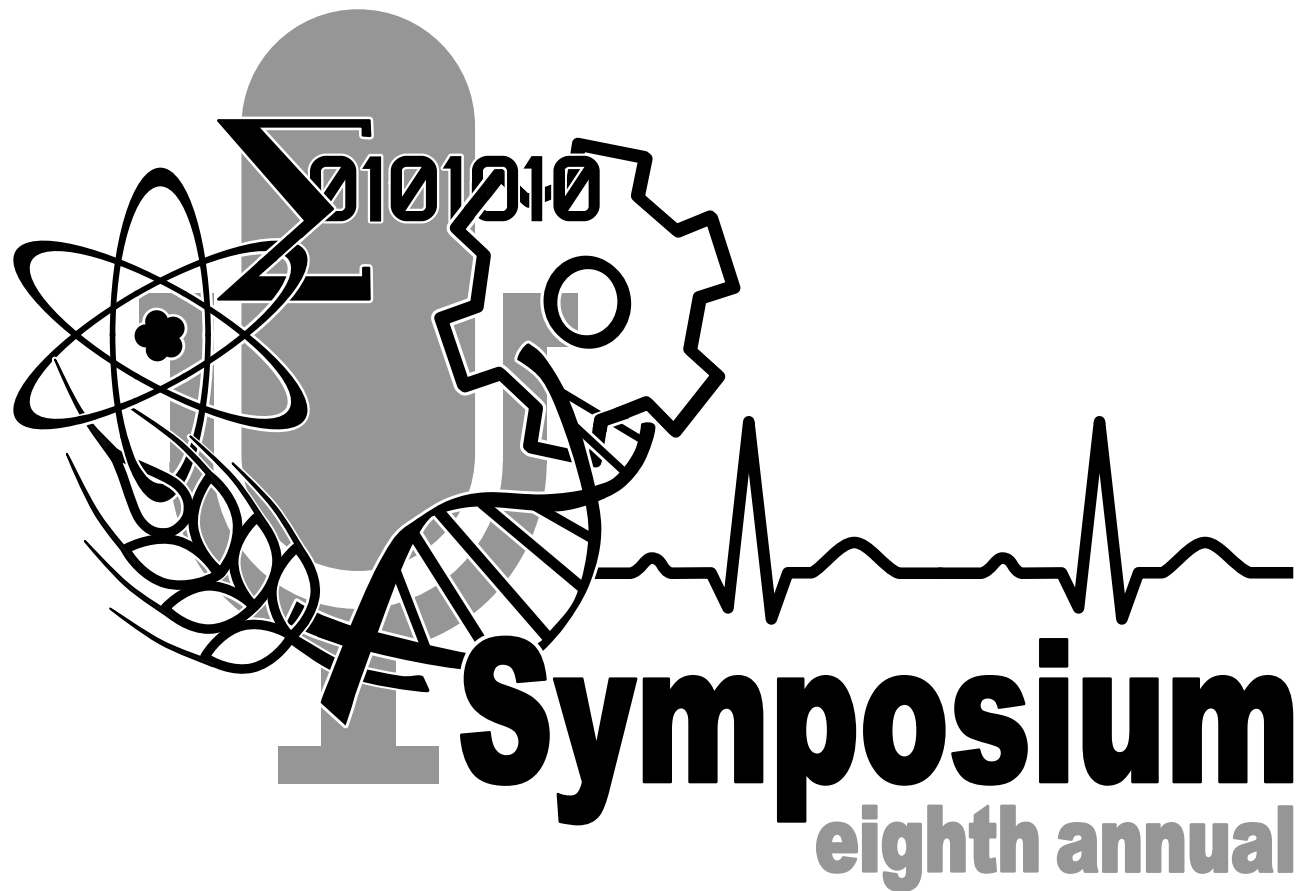


SCHOOL OF SCIENCE, ENGINEERING AND HEALTH



PROGRAM & ABSTRACTS

Frey Hall - Jordan Science Center - Kline Hall of Science
Friday, April 29, 2011



(Rear of front cover)

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Notes from the Symposium Organizer...

Welcome to the 8th Annual Symposium of the School of Science, Engineering and Health!


This symposium continues a strong tradition of annual events designed to showcase student and faculty innovation, creativity and productivity. However, it is the first that we are holding as a newly re-organized School of Science, Engineering and Health. So, if you notice new formats or customs that you really enjoy or really miss traditions of the past, please pass your suggestions along to me. We look forward to incorporating improvements into future symposia.



This combined Program and Abstract booklet in itself is new to the symposium. I have tried to provide you with a guide to times, locations and topics for all of the presentations that will be given as part of the symposium this year. A consolidated “Schedule at a Glance” is found on the next page which provides the names of the student presenters and times and locations of each oral presentation. Each presentation has been assigned a unique number based on the order in which it falls in the symposium. Oral and Poster presentations and are grouped into blocks designated Oral Presentations I – X, and Poster Sessions I and II. The title of each presentation and the names of all contributing co-authors and mentors can be found in numbered lists on the following pages. Abstracts for all presentations follow these schedules. Abstracts are arranged in alphabetical order by the last name of the first author, and the number of the presentation from the schedule appears in parentheses at the end of each abstract. Finally, the names of all co-authors (and mentors) are given in a single alphabetized list along with the number(s) of each presentation to which that individual contributed.

A variety of symbols are used throughout to designate the roles of authors or contributors:

The “*” symbol indicates research or project mentor.

The “^” symbol indicates an off campus contributor

The “” symbol indicates that a project was affiliated with or supported by the Collaboratory for Strategic Partnerships and Applied Research.

The easel symbols (e.g.  or ) contain numbers indicating that an oral presentation is accompanied by a poster in the following session (Poster Session I or II, respectively).

I apologize in advance for any errors in, or omissions from the program.

I want to especially thank several individuals without whom I could not have organized the symposium or produced this booklet.

Thanks to Scott Weaver (Information & Mathematical Sciences) and his students Brian Douglass and Jeremy Stuter for providing and assisting with the new on-line Symposium Project Registration and Management system (SymPRM) that was used to collect information for the program and symposium schedule. Thanks also to the “brave” faculty members and students who used it for the first time!

Thanks also to John Harms (Biological Sciences) for the cover art and additional helpful suggestions.

Sincerely, Larry Mylin (Biological Sciences)

Schedule at a Glance: Oral Presentations

8th Annual Symposium April 29, 2011

Frey Hall

Kline/Jordan

	F110 (Eng.)	F243 (Math)	F150 (Bus. Inf. Sys.)	K120 (Biol.)	Hollinger Lounge	J163 (Ex. Sci.)
9:00	Welcome/Intro from Dean Ray Norman (Frey 110)			(Chem, Biochem, Travel, Nursing Sim)		
	Oral Presentations I					
9:05	1 Jordan Beckler					
9:35	2 Daniel Ross					
10:05	3 Jeremy Miller					
10:35	4 Geoff Pezon, Joseph Eshelman					
11:05	5 Richard Houck, Paul Foerth					
11:35	6 Patrick Miller, Zach Mino, Steve Knudsen					
12:05	Lunch					
1:10	Welcome by Provost Randy Basinger (Webcast to all presentation venues)					
	Oral Presentations II	Oral Pres. III	Oral Pres. V	Oral Pres. VI	Oral Pres. VIII	Oral Pres. X
1:20	7 Ethan Meade, Andrew Basom, Andrew Breighner	21 Kaitlyn Valis	28 Luke Smith, Douglas Coiner, Timothy Yacko, Steven Miller	32 William Swinsburg	41 Jennifer Esbenshade	50 Grace Lankford
1:40	8 Sarah Jarnecki	22 Bethany Blackwood	29 Rick Lima	33 Molly Bletz	42 Megan Buhler	51 Danielle Veacock
2:00	9 Alex Brubaker	23 Timothy Hayes	30 John Forsythe	34 Karisa Martin	43 Stephanie Ferguson	52 Elizabeth Hendricks
2:20	10 Nathaniel Nichols	24 Stephanie Knepper	31 Chris Miller	35 Roanna Martin	44 Scott Hoeckele	53 Amy Chrisfield
2:40	11 Matt Hoover, Joshua Sorrell					
3:00	12 John Forsythe					
3:20	13 Zachary Crane, James Stetson					
		Oral Pres. IV		Oral Pres. VII	Oral Pres. IX	
3:40	14 Joel Siegrist, Tim Brinkman	25 Matthew Sakow		36 Cjloe Vinoya	45 Meagan Wademan	
4:00	15 Suzanne Smart	26 Zachery Boughter		37 Katherine Miller	46 David Foster, Kristen Listor	
4:20	16 Lance Martin	27 Bethany Blackwood		38 Mackenzie Stamer	47 Kate Rowader, Caitlyn Williams	
4:40	17 Eric Spring, John Sletta			39 Chris Jacobs	48 Elyse Dailey	
5:00	18 Joshua McCamey, Samuel Hurne			40 Molly Bletz	49 Debbie Loop, Eileen Gardner	
5:20	19 Jonathan Yoder					
5:40	20 Bryan Tyson, Sara Finn					
6:00	Program Concludes					

Poster Session I (Jordan Lobby & Jordan 159): Evidence-Based Nursing Care; Exercise Science; Biological Sciences; Chemistry & Biochemistry

**Poster Session II (Jordan Lobby & Jordan 159); Nursing Simulation Lab Tour (K106)
Reception for Student presenters, Parents, Mentors (Hors d'oeuvres; Oakes Museum)**

Schedule at a Glance: Poster Presentations

8th Annual Symposium April 29, 2011

Jordan Lobby and Jordan 159

Poster Session I (2:40 - 3:40)

Evidence-Based Nursing Care

Conducted with Holy Spirit Hospital Collaborators

- 54 Jennifer Heisey, Brittney Hostetter, Whitney Maust, Sarah Neumann
- 55 Christin Shenk, Kristine Williams, Tiffany Brighton
- 56 Caitlyn Williams, Laurissa Ash, Bridgette Todd
- 57 Amanda Hammaker, Bethanie Yoder
- 58 Rebecca Miller, Beth Sterling, Kristen Todd
- 59 Abigail Glenzel, Juliette Brinks, Sarah Henningsen, Sara Mueller
- 60 Brittany Petry, Kate Rowader

Conducted with PinnacleHealth Collaborators

- 61 Ashley Praetsch, Hilary Artz, Elyse Dailey, Joseph Jacaruso
- 62 Jana Balmer, Bethany Duffield, Hannah Reed
- 63 Angie Rapchinski, Philina Henton, Nissi Saju
- 64 Talisha Maxwell, Rachel Ashworth, Lauren Tennis
- 65 Ritamarie Testa, Rachel Delmar, Ashley Rittenhouse, Hillary Snyder
- 66 Anne McClary, Deborah Mascia, Gretchen Brandt
- 67 Abigail Groves, Kara Griffiths, Jade Craun, Candice Martin

Exercise Science

- 68 Sarah Romberger

Biological Sciences

- 32 William Swinsburg
- 34 Karisa Martin

Chemistry & Biochemistry

- 41 Jennifer Esbenshade
- 42 Megan Buhler
- 43 Stephanie Ferguson
- 44 Scott Hoeckele

Poster Session II (5:20 - 6:00)







Biological Sciences

- 36 Cjloe Vinoya
- 37 Katherine Miller
- 38 Mackenzie Stamer
- 39 Chris Jacobs
- 40 Molly Bletz




Chemistry & Biochemistry

- 45 Meagan Wademan


Oral Presentations I: Engineering
Frey 110 (9:05 AM – 12:05 PM)


-  1. **9:05**
Biodiesel Centrifuge Project
Jordan Beckler, Michael Zummo*, Carl Erikson*
-  2. **9:35**
VWOS Datalogger
Daniel Ross, Randall Fish*
-  3. **10:05**
Biodiesel: Methanol Recovery
Jeremy Miller, Michael Zummo*, Carl Erikson*
-  4. **10:35**
Filter Testing Apparatus and Procedures in Support of Water Purification Systems for the Developing World
Geoff Pezon, Joseph Eshelman, David Vader*, Timothy Whitmoyer*
-  5. **11:05**
Solar Water Heating
Richard Houck, Paul Foerth, Brendon Earl^*, Carl Erikson*
-  6. **11:35**
Hand-Power Water Pumps: Research and Application
Patrick Miller, Zachary Mino, Steven Knudsen, Tony Beers^*, Timothy Whitmoyer*


Oral Presentations II: Engineering
Frey 110 (1:20 – 6:00 PM)


-  7. **1:20**
The Light Sport Aircraft Gets a New Engine
Ethan Meade, Andrew Basom, Andrew Breighner, Donald Pratt*
-  8. **1:40**
A Substitute Teacher--The MultiModal Tutor (MMT)
Sarah Jarnecki, Randall Fish*, Harold Underwood*
-  9. **2:00**
Mobility Project: Tricycle Rear Axle and Bearing Wear Assessment
Alex Brubaker, John Meyer*, Tim Van Dyke*


Oral Presentations II: Engineering (contd.)
Frey 110 (1:20 – 6:00 PM)


-  **10. 2:20**
Energy Audit for CURE International
Nathaniel Nichols, Jose Vasquez, David Hostetter[^]*, Carl Erikson*


-  **11. 2:40**
Electric Motorcycle Battery Pack
Matthew Hoover, **Joshua Sorrell**, Donald Pratt*


-  **12. 3:00**
Wireless Enabled Remote Co-presence (WERC)
John Forsythe, Harold Underwood*


-  **13. 3:20**
Mali Water and Disabilities Study: Handpump Fatigue Analysis and Testing
Zachary Crane, **James Stetson**, Barbara Ressler*


-  **14. 3:40**
Light Sport Aircraft: Wing-Folding System
Joel Siegrist, **Tim Brinkman**, Donald Pratt*


-  **15. 4:00**
The Moxy Project: Providing Oxygen in Zambia
Suzanne Smart, Barbara Ressler*

-  **16. 4:20**
ABWE Togo Medical Center
Lance Martin, Carl Erikson*

-  **17. 4:40**
Light Sport Aircraft: Suspension
Eric Spring, **John Sletta**, Donald Pratt*

-  **18. 5:00**
Flight Tracking and Messaging Systems (FTMS)
Joshua McCamey, **Samuel Hurne**, Harold Underwood*


-  **19. 5:20**
Solar Scholars Project Update
Jonathan Yoder, Carl Erikson*

-  **20. 5:40**
Battery Monitoring and a User Interface for the Electric Motorcycle
Bryan Tyson, **Sara Finn**, Donald Pratt*

Oral Presentations III: Mathematics
Frey 243 (1:20 – 2:40 PM)

21. **1:20**
Multi-Event Scoring in Track and Field
Kaitlyn Valis
22. **1:40**
Mathematical Puzzling Japanese Style: A Look at Sudoku Puzzles
Bethany Blackwood
23. **2:00**
On Arrangements of Lines and Induced Planar Graphs
Timothy Hayes
24. **2:20**
Mathematical Modeling Of Deep Bed Filtration
Stephanie Knepper

Oral Presentations IV: Mathematics
Frey 243 (3:40 – 5:20 PM)

25. **3:40**
New Geometries, Old Truths
Matthew Sakow
26. **4:00**
The Life and Work of René Descartes
Zackery Boughter
-  27. **4:20 (Mathematics Honors Presentation)**
Math Across Cultures: A Resource for Burkinabè Children
Bethany Blackwood

Oral Presentations V: Business Information Systems
Frey 150 (1:20 – 2:40 PM)

28. 1:20

Evaluating and Recommending a Software System for the Center for Autism and Development Disabilities

Luke Smith, Douglas Coiner, Timothy Yacko, Steven Miller

29. 1:40

Developing a Mobile/Web-Application for Recording Births and Deaths in Zambia

Rick Lima



30. 2:00

A Prototype Web Database Application for Managing Hydrocephalus Patients

John Forsythe

31. 2:20

Requirements Analysis & Design for Clubfoot.org

Chris Miller

Oral Presentations VI: Biological Sciences
Kline 120 (1:20 – 2:40 PM)

32. 1:20

The Independence of Nonnative Shrub Removal and Herbivory by White-tailed deer (Odocoileus virginianus)

William Swinsburg, David Foster*



33. 1:40

*Chytrid in a Canopy Amphibian: Picado's Bromeliad Treefrog, *Isthmohyla picadoi* (Hylidae) Persists at a Site Affected by *Batrachochytrium dendrobatidis**

Erik Lindquist*, Michael Shin*, John Cossel^*, Adam Stuckert, **Molly Bletz**, Nicole Trimmer



34. 2:00

Water quality analysis of stored water using Sawyer PointONE filters

Karisa Martin, Erik Lindquist*, Ariela Vader*








35. 2:20





Water Quality Analysis in Groups using the Sawyer PointONE Filter® in Cochabamba, Bolivia

Roanna Martin, Erik Lindquist*


Oral Presentations VII: Biological Sciences
Kline 120 (3:40 – 5:20 PM)

- 36. 3:40**
Transfection and Up-Regulation of Cholecystokinin-B and Cholecystokinin-C Receptors in Pancreatic Cancer Cell Line SW1990
Cjloe Vinoya, John Harms* 
- 37. 4:00**
Downregulation of Gastrin Receptors in SW1990 Human Pancreatic Cancer Cells Using shRNA
Katherine Miller, John Harms* 
- 38. 4:20**
Optimization of shRNA transfection to down-regulate CCK expression in PANC-1 cells
Mackenzie Stamer, John Harms* 
- 39. 4:40**
Sixty-eight years of change in herbaceous vegetation of a Pennsylvania Oak-Hickory forest
Chris Jacobs, David Foster* 
- 40. 5:00**
Identifying Suitable Primers for a Positive Control Mechanism in Molecular Detection of Disease Prevalence in Amphibian Conservation
Molly Bletz, Michael Shin*, Erik Lindquist* 

Oral Presentations VIII: Chemistry & Biochemistry
Hollinger Lounge (1:20 – 2:40 PM)

- 41. 1:20**
A Quantitative Analysis of the Uptake of Heavy Metals into Common Garden Vegetables from Contaminated Soils
Jennifer Esbenshade, Richard Schaeffer* 
- 42. 1:40**
Synthesis of 4-hydroxy-6-phenylmethyl-2-pyrone, Precursor to Aspernigrin A
Megan Buhler, Anne Reeve* 
- 43. 2:00**
Packaging of Archaeal DNA: Histone Binding Affinity
Stephanie Ferguson, Hannah Tims* 
- 44. 2:20**
Further Insight into the Aspernigrin A Pyridone System
Scott Hoeckele, Anne Reeve* 

Oral Presentations IX
Chemistry & Biochemistry; Travelogues; Nursing Simulation Lab
Hollinger Lounge (3:40 – 5:20 PM)

45. **3:40**
Inhibiting the Aggregation of Heat-denatured Citrate Synthase with ZmsHsp 17.0 for Future FRET Analysis
Meagan Wademan, Hannah Tims* 
46. **4:00**
Biology 269 - Ecology of Florida in Winter
David Foster*, Kristen Listor
47. **4:20**
Two Nations-One Purpose: Messiah College and the BCNC Exchange Program
Kate Rowader, Caitlyn Williams, Debbie Loop*
48. **4:40**
Zambia Alternate Senior Nursing Practicum Travelogue
Elyse Dailey, Wanda Thuma-McDermond*
49. **5:00**
Moving Beyond the Classroom into the Simulation Age
Debbie Loop*, Eileen Gardner*

Oral Presentations X: Exercise Science
Jordan 163 (1:20 – 2:40 PM)

50. **1:20**
Comparison of energy expenditure during Wii running and treadmill running
Grace Lankford, Sarah Romberger, H. Scott Kieffer*
51. **1:40**
The effects of chocolate milk compared to a carbohydrate beverage on performance in female endurance runners
Danielle Veacock, Jodie Haak*, H. Scott Kieffer*
52. **2:00**
The effects of caffeine on long-term anaerobic exercise
Elizabeth Hendricks, Jodie Haak*, H. Scott Kieffer*
53. **2:20**
Effect of Face-to-Face vs. E-mail Communication on Fitness and Quality of Life in an Employee-Based Walking Program
Amy Chrisfield, Doug Miller*

Poster Session I

Evidence-Based Nursing Care; Exercise Science Poster Presentations by Speakers from Oral Sessions VI & VIII Jordan Lobby and Jordan 159 (2:40 – 3:40 PM)

Evidence-Based Nursing Care: Holy Spirit Hospital Collaborators

54. *Addition of Aromatherapy in Treatment of Chemotherapy Induced Nausea and Vomiting*
Jennifer Heisey, Brittney Hostetter, Whitney Maust, Sarah Neumann, Barbara Snyder[^],
Nancy Woods*
55. *Evidence-Based Recommendations for Education of High-risk Stroke Patients*
Christin Shenk, Kristine Williams, Tiffany Brighton, Sister Elizabeth Kovacs[^], Nancy
Woods*
56. *The Influence of Education and Accountability on Adherence to Standard Isolation
Precautions*
Caitlyn Williams, Laurissa Ash, Bridgette Todd, Betsy Davison[^], Nancy Woods*
57. *Significance of Nosocomial Infection Related to Improper Cleaning of Pulse Oximeters*
Jennifer Brewer[^], Terrie Davis[^], **Amanda Hammaker, Bethanie Yoder**, Nancy Woods*
58. *Evidence-Based Interventions for Reducing Readmission Rates in Congestive Heart Failure
(CHF) Patients*
Christine Braunegg[^], Jenny Cox[^], Carol O'Hara[^], **Rebecca Miller, Beth Sterling, Kristen
Todd**, Nancy Woods*
59. *Consistent-Carbohydrate Diet for Hospitalized Adult Diabetic Clients*
Abigail Glenzel, Juliette Brinks, Sarah Henningsen, Sara Mueller, Suzanne Nesmith[^],
Nancy Woods*
60. *Evidence-Based Interventions for Post-Operative Nausea*
Brittany Petry, Kate Rowader, Susan Swails[^], Bethany Eby[^], Nancy Woods*

Poster Session I (contd.)
Evidence-Based Nursing Care
Jordan Lobby and Jordan 159 (2:40 – 3:40 PM)

Evidence-Based Nursing Care: PinnacleHealth Collaborators

61.

Narcotic Analgesia: Too Much of a Good Thing

Ashley Praetsch, Hilary Artz, Elyse Dailey, Joseph Jacaruso, Bonnie Clemence[^], Sharon Harig[^], Lydia Johnson[^], Amy Lesher[^], Gina Reccé[^], Sandy Rybecki[^], Louann Zinsmeister*

62.

Depression Screening in Hospitalized Antepartum Patients

Jana Balmer, Bethany Duffield, Hannah Reed, Crystallein Egresits[^], Nancy Frank[^], Yovanka Hoover[^], Michalena Levenduski[^], Laura Martin[^], Rebecca Weese[^], Louann Zinsmeister*

63.

Can I Pray for You?

Angie Rapchinski, Philina Henton, Nissi Saju, Tiffany Boyd[^], Sheena Dellinger[^], Mary Lou Mortimer[^], Avis Pulaski[^], Theresa Sellers[^], Louann Zinsmeister*

64.

Are Your Patients Ready for Discharge?

Talisha Maxwell, Rachel Ashworth, Lauren Tennis, Kim Fowler[^], Karissa Harbold[^], Joanne Konick-McMahan[^], Leighann Oldham[^], Dawn Schlegel[^], Naisha Stoney[^], Louann Zinsmeister*

65.

Everyone Needs a Little Heart to Heart: Examining the Effect of Social Support on Readmission Rates for Cardiac Patients

Ritamarie Testa, Rachel Delmar, Ashley Rittenhouse, Hillary Snyder, Marianne Allen[^], Cathy Druckenmiller[^], Melanie Sherman[^], Louann Zinsmeister*

66.

Amiodarone: Worth the Risk?

Anne McClary, Deborah Mascia, Gretchen Brandt, Brittany Baker[^], Tina Daniels[^], Tricia Falgoust[^], Michelle Heim[^], Sue Spencer[^], Sarah Weaver[^], Louann Zinsmeister*

67.

The Impact of Contact Isolation

Abigail Groves, Kara Griffiths, Jade Craun, Candice Martin, Cindy Hallman[^], Haley Hardenstine[^], Donna Roller[^], Deborah Schafer[^], Louann Zinsmeister*

Poster Session I (contd.)
Exercise Science;
Poster Presentations by Speakers from Oral Sessions VI & VIII
Jordan Lobby and Jordan 159 (2:40 – 3:40 PM)

Exercise Science

68.
Comparison of EPOC between Circuit Weight Training and Treadmill Running in Females
Sarah Romberger, H. Scott Kieffer*

Biological Sciences (Posters by Speakers from Oral Session VI)

32.
The Independence of Nonnative Shrub Removal and Herbivory by White-tailed deer (Odocoileus virginianus)
William Swinsburg, David Foster*
34.
Water quality analysis of stored water using Sawyer PointONE filters.
Karisa Martin, Erik Lindquist*, Ariela Vader*

Chemistry & Biochemistry (Posters by Speakers from Oral Session VII)

41.
A Quantitative Analysis of the Uptake of Heavy Metals into Common Garden Vegetables from Contaminated Soils
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Synthesis of 4-hydroxy-6-phenylmethyl-2-pyrone, Precursor to Aspernigrin A
Megan Buhler, Anne Reeve*
43.
Packaging of Archaeal DNA: Histone Binding Affinity
Stephanie Ferguson, Hannah Tims*
44.
Further Insight into the Aspernigrin A Pyridone System
Scott Hoeckele, Anne Reeve*

Poster Session II
Poster Presentations by Speakers from Oral Sessions VII & IX
Jordan Lobby and Jordan 159 (5:20 – 6:00 PM)

Biological Sciences (Posters by Speakers from Oral Session VII)

36. *Transfection and Up-Regulation of Cholecystokinin-B and Cholecystokinin-C Receptors in Pancreatic Cancer Cell Line SW1990*
Cjloe Vinoya, John Harms*
37. *Downregulation of Gastrin Receptors in SW1990 Human Pancreatic Cancer Cells Using shRNA*
Katherine Miller, John Harms*
38. *Optimization of shRNA transfection to down-regulate CCK expression in PANC-1 cells*
Mackenzie Stamer, John Harms*
39. *Sixty-eight years of change in herbaceous vegetation of a Pennsylvania Oak-Hickory forest*
Chris Jacobs, David Foster*
40. *Identifying Suitable Primers for a Positive Control Mechanism in Molecular Detection of Disease Prevalence in Amphibian Conservation*
Molly Bletz, Michael Shin*, Erik Lindquist*

Chemistry & Biochemistry (Posters by Speakers from Oral Session IX)

45. *Inhibiting the Aggregation of Heat-denatured Citrate Synthase with ZmsHsp 17.0 for Future FRET Analysis*
Meagan Wademan, Hannah Tims*

What is this?



The icon indicates that a project presented in this Symposium was supported by, or conducted in association with the...

The Collaboratory for Strategic Partnerships and Applied Research!

Service today ... servant-leaders tomorrow.

The **Collaboratory** is a center for applied research and project-based learning in the School of Science Engineering and Health at Messiah College. We add value to classroom learning by enabling participants to apply academic knowledge and live out their Christian faith through imaginative, hands-on problem solving that meets needs brought to us by Christian mission, relief and development organizations and businesses. The twofold mission of the Collaboratory is:

- To foster justice, empower the poor, promote peace, and care for the earth through applications of our academic and professional disciplines.
- To increase the academic and professional abilities of participants, their vocational vision for lifelong servant-leadership, and their courage to act on convictions.

Areas of engagement include science, engineering, health, information technology, business, and education. Our projects enable students to engage classroom fundamentals in an authentic client-provider environment. Student leaders run the Collaboratory organization in partnership with the educators who mentor them. As God enables us to serve others today, we seek to grow as disciples of Jesus, to serve as God's stewards over the resources of our academic and professional disciplines, and to bear witness to the good news of the Kingdom of God.

To learn more about the Messiah College Collaboratory for Strategic Partnerships and Applied Research please visit our web site at www.messiah.edu/collaboratory.



*We graciously acknowledge the oversight and training provided by
Messiah College faculty and others!*

Engineering Faculty and External Collaborators

Energy Group

Dr. David Gray for Solar Scholars Update

Prof. Carl Erikson for ABWE Togo

Mr. David Hostetter for CURE International Energy Audit

Mr. Brendon Earl for Solar Heating

Mr. Mike Zummo for Biofuels - Methanol Recovery and Biofuels - Production & processor Development

Communications Group

WERC advisors: Dr. Nancy Patrick (faculty, Special Education), Dr. David Owen (faculty, Computer Science), Dr. Harold Underwood (faculty, Engineering), Mr. Curt Byers (president, Symbionyx Foundation / therapist)

FTMS advisors: Dr. Harold Underwood (faculty, Engineering), Mr. Cary Cupka (Independent Avionics Consultant), Mr. Carman Frith (JAARS Avionics Specialist)

MMT advisors: Dr. Randall Fish (faculty, Engineering), Dr. Harold Underwood (faculty, Engineering)

Water Group

(Village Water Ozonation System)- Dr. David Vader

(VWOS Water Meter) – Dr. Randy Fish

(Hand Pump Project: Research and Application)- Mr. Tony Beers and Dr. Timothy Whitmoyer

Disability Resources Group

Mr. John Meyer

Dr. Ray Norman

Dr. Barbara Ressler

Dr. Tim Van Dyke

Dr. Lamarr Widmer

Transportation Group

Dr. Donald Pratt

Biomedical Engineering Group

Dr. Barbara Ressler



*We graciously acknowledge the oversight and training provided by
Messiah College faculty and others!*

Information and Mathematical Sciences

Angela Hare

Brian Nejme

Lamarr Widmer

Biological Sciences

David Foster

John Harms

Erik Lindquist (Messiah College) & John Cossel (Northwest Nazarene University)

Michael Shin

Ariela Vader

Chemistry & Biochemistry

Hannah Tims

Anne Reeve

Richard Schaeffer

Health & Human Performance

Jodie Haak

H. Scott Kieffer

Doug Miller

Nursing

Debbie Loop

Eileen Gardner

Wanda Thuma-McDermond

Nancy Woods

Louann Zinsmeister

We graciously acknowledge the oversight and training provided by these Nursing Professionals!

Holy Spirit Hospital

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Brewer, Jennifer	BSN, RN, CNRN
Cox, Jenny	BSN, RN
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Kovacs, Sister Elizabeth	RN
Nesmith, Suzanne	RN, BSN, M.Ed., CDE
O'Hara, Carol	RN, BSN, MEd
Snyder, Barbara	RN, OCN
Swails, Susan	MEd, BSN, RN-BC
Braunegg, Christine	BSN

PinnacleHealth

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Boyd, Tiffany	BSN, RN, PCCN
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Harig, Sharon	RN, BS
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Mortimer, Mary Lou	MSN, RNC
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Pulaski, Avis	RN
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Spencer, Sue	RN
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Weaver, Sarah	RN
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Abstracts

Abstracts were provided for each oral and poster presentation. Abstracts are arranged here in alphabetical order by the last name of the first author. The number of the presentation that appears in the preceding schedule appears in parenthesis at the end of the abstract.

Jana Balmer, Bethany Duffield, Hannah Reed, Crystallein Egresits[^], Nancy Frank[^], Yovanka Hoover[^], Michalena Levenduski[^], Laura Martin[^], Rebecca Weese[^], , Louann Zinsmeister*

Depression Screening in Hospitalized Antepartum Patients

Researchers have found that there is an increased risk of postpartum depression among hospitalized antepartum patients. Adequate measureable depression screening methods for hospitalized high-risk antepartum patients have not been established. Due to the unique psycho-neurological pathways and stressors associated with pregnancy, the development of a specially-designed method of identifying patients at risk for postpartum depression is necessary. After reviewing several research articles, we found that antepartum depression screening is a useful tool for the identification of patients who are at high risk for postpartum depression. **(62)**

Jordan Beckler, Michael Zummo*, Carl Erikson*

Biodiesel Centrifuge Project

The Biodiesel Centrifuge Project attempts to determine how waste vegetable oil can be best purified before it goes through the chemical process to be turned into biodiesel. This centrifuging process involves using a Raw Power Centrifuge to separate by density the pure oil from the impurities in the oil. The project's focus is to determine the best RPM speed the centrifuge should be run at and the best flow rate the oil should be put through the centrifuge to efficiently create the most pure oil. **(1)**

Bethany Blackwood

Math Across Cultures: A Resource for Burkinabè Children

My senior honors project, the development of a math learning kit, is in conjunction with my work with the Collaboratory Education Group and our partnership with a school for children with disabilities in rural Burkina Faso, West Africa. My learning kit is based on research into French and Burkinabè math standards (curricula) and addresses several of the students' shortcomings that I noticed while implementing our summer enrichment program in 2010. The final product is a workbook with supplementary materials that will be utilized during the Collaboratory site team trip this summer. While promoting abstract thinking is an overall goal, the workbook focuses on specific math topics for students in the upper elementary grades, such as fractions, decimals, percents, area and perimeter. **(27)**

Bethany Blackwood

Mathematical Puzzling Japanese Style: A Look at Sudoku Puzzles

Sudoku puzzles have been famous internationally for about five years. Despite their simplicity, Sudoku puzzles still manage to interest many mathematicians, teachers and ordinary people. An overview of the history, the recent international craze and the mathematics behind Sudoku puzzles will be presented. Additionally, the educational and intellectual value of Sudoku puzzles and their variations, especially for math teachers and their students, will be considered. **(22)**

Molly Bletz, Michael Shin*, Erik Lindquist*

Identifying Suitable Primers for a Positive Control Mechanism in Molecular Detection of Disease Prevalence in Amphibian Conservation

The purpose of the research was to identify suitable primers for a positive control mechanism in molecular chytrid detection research in amphibian conservation. Currently there is no way to differentiate between a false and true negative in Chytrid detection experiments. With the identification/ creation of primers that specifically amplify amphibian DNA, this can act as a positive control mechanism in such experiments. Experimentation was done with various primers to test their specificity to amphibian DNA. Primers derived from Isthmohyla Rhodopsin, 28s rDNA, Rhodopsin, and Tyrosinase DNA sequences were tested. Initial experimentation was completed using *Lithobates pipiens* DNA and Chytrid DNA. The Isthmohyla Rhodopsin primers yielded no bands, indicating no amplification occurred for frog or chytrid DNA. The 28s rDNA primers generated inconsistent bands for *L. pipiens* DNA and no bands for Chytrid DNA. General Rhodopsin primers produced strong bands for *L. pipiens* and only faint chytrid bands. The tyrosinase primers generated bands for *L. pipiens* DNA and no bands for Chytrid DNA. Further experimentation was completed with difference sources of amphibian DNA, including, *Cynops spp.*, *Lepidobatrachus laevis*, *Hyla cinerea*, and *Lithobates sylvaticus*. Both the general Rhodopsin and Tyrosinase primers amplified all new DNA sources except *Cynops spp* and did not show any chytrid amplification. This study determined that two designed primers, derived from the Rhodopsin and Tyrosinase gene, are specific to anuran DNA and can be used as a positive control in chytrid detection research; however, further study is needed to determine primers that can also amplify urodelan DNA which will assist us in determining true disease prevalence statistics. (40)

Zackery Boughter

The Life and Work of René Descartes

Descartes' work in mathematics was the greatest single step ever made in the history of the exact sciences. Descartes was not only a mathematician, but a philosopher, and was one of the most influential characters in scientific research and philosophical studies that the world has ever known. He has become a household name to high school students through graduate students and has made a positive effect on most mathematicians' lives for the past three-hundred years. René Descartes was a man of pure thought, pure reason, and to mathematicians, pure genius. (26)

Christine Braunegg[^], Jenny Cox[^], Carol O'Hara[^], Rebecca Miller, Beth Sterling, Kristen Todd, Nancy Woods*

Evidence-Based Interventions for Reducing Readmission Rates in Congestive Heart Failure (CHF) Patients

Background and significance: In the United States, there are 5.8 million people living with heart failure. In addition, there are over half a million patients diagnosed yearly. The readmission rate for patients with a diagnosis of CHF is substantial (Weintraub, 2010). The current practice at Holy Spirit Hospital is to review standardized discharge instructions at the time of discharge only. It has been suggested that post discharge teaching can reduce readmission rates. **PICO question:** In patients with a diagnosis of CHF, what is the effect of follow up discharge instructions compared to standardized discharge instructions at discharge only on readmission rates? **Methods of literature search:** A review of the literature was conducted utilizing PubMed, CINAHL, and the Cochrane Database from 2000 to 2010. A total of 71 articles were initially identified; ten articles were found to address the problem and were the focus of the study. The majority were Level II with a B quality. **Findings from EBP project:** Evidence shows inconsistent results regarding the effect of post discharge instructions on reducing readmission rates. However, the majority of the literature suggests post discharge instructions result in a decrease in cost over time, and an increase in quality of life as defined by the patients themselves. **Recommendations for practice:** Based on the literature review, we cannot recommend a change in practice at this time. Further research is needed to determine the efficacy of post discharge instructions on reducing readmission rates.

Jennifer Brewer[^], Terrie Davis[^], Amanda Hammaker, Bethanie Yoder, Nancy Woods*

Significance of Nosocomial Infection Related to Improper Cleaning of Pulse Oximeters

Background and significance: Current practice for measuring a patient's oxygen saturation involves placing their finger on a probe that touches both the top and bottom surfaces of the instrument. Many times, it has been observed that this probe is not cleaned or disinfected between patient contacts. With recent emphasis on infection control, throughout the hospital environment, and the increase cost related to nosocomial infections, the need to visit this issue is of utmost importance. Nosocomial Infections have a severe impact on hospital and patient financial budgets as well. **PICO question:** Among hospitalized adults throughout the acute setting, does proper cleaning of pulse oximetry probes decrease the spread of infection as compared to current lack of cleaning enforcement? **Methods of literature search:** A review of the literature was conducted utilizing PubMed, MedLine, CINAHL and the Cochrane Database from January 1972 to the September 2010. Of those found, 30 addressed this topic and 6 articles fit the criteria for use of this study. These articles chosen were primarily level IV with some also in the I,III, and VII range, and all were a C quality. **Findings from EBP project:** Evidence is limited in regards to the prevalence of infection spread through the reuse of pulse oximetry probes. Most of the articles concluded that there was, indeed, bacteria found on probes that were tested, but because of limitations within each article as well as the articles used for systematic reviews, definitive results could not be drawn. **Recommendations for practice:** Based on this literature review, a need for further research is indicated. Current literature lacks evidence and current guidelines are based upon old literature. Until further research is conducted, cleaning with 70% alcohol between uses is recommended. (57)

Alex Brubaker, John Meyer*, Tim Van Dyke*

Mobility Project: Tricycle Rear Axle and Bearing Wear Assessment

The Disability Resources group of the Collaboratory partners with The Center for the Advancement of the Handicapped in Burkina Faso, West Africa, to design and build hand and electric powered tricycles for local Burkinabe persons with limited mobility. These designs are sustainable in that they can be fabricated in Burkina Faso using locally available raw materials and bicycle parts. A recent redesign of the frame allows the tricycles to be better fit to the individual while decreasing cost and weight. In this redesign, the rear wheels are supported on only one side, which significantly increases the loads experienced by the wheel axles. Traditional bicycle axles and bearings are not suited for this loading, so a larger bicycle bottom bracket bearing and welded axle assembly are used to support the rear wheels. Initial testing indicated that this design was able to handle these larger loads. However, more recent testing has shown that the ball bearings have worn large grooves in the new axles on a prototype tricycle. Excessive wear in this area could lead to permanent failure and increased maintenance costs. The purpose of this project is to determine the factors contributing to excessive wear at the bearing-axle interface and assess the suitability of the current design to function over a suitable life cycle. Static load analysis, weld process analysis, experimental road testing and controlled experimental testing are used to make these assessments. (9)

Megan Buhler, Anne Reeve*

Synthesis of 4-hydroxy-6-phenylmethyl-2-pyrone, Precursor to Aspernigrin A

Aspernigrin A (6-benzyl-4-oxo-1,4-dihydropyridine-3-carboxamide) is a natural product isolated from the fungus *Aspergillus niger* found in a Mediterranean sea sponge, *Axinella damicornis*. This secondary metabolite has proved cytotoxic to colon cancer cell lines. The synthesis of Aspernigrin A is required to obtain enough material to study its bioactivity and potentially optimize it for clinical drug use. The best proposed plan is a multistep process requiring the preliminary production of a specific starting compound, 4-hydroxy-6-phenylmethyl-2-pyrone. This pyrone is not obtainable commercially and must first be synthesized. After attempting several different reactions, the first step of the pyrone synthesis was achieved by the bromination of dehydroacetic acid using N-bromosuccinimide in an organic solvent of carbon tetrachloride. The reaction was irradiated under a 160W UV lamp and a 56% product yield was verified using ¹H NMR spectroscopy. The reaction product was subsequently treated to various separation

methods in attempt to isolate it from the starting material. Success of this isolation would allow progression to the next phase of the synthetic reaction scheme of Aspernigrin A. (42)

Amy Chrisfield, Doug Miller*

Effect of Face-to-Face vs. E-mail Communication on Fitness and Quality of Life in an Employee-Based Walking Program

E-mail delivery of workplace wellness programming has become an increasingly popular, cost-effective, and efficient means of disseminating information. In light of that trend, this study compared the effect of face-to-face interventions with email interventions on fitness, quality of life, and maintenance of an exercise program. Twenty previously sedentary employees, age 49 +/- 6.8 years, at Messiah College participated in a 10-week progressive walking program. Prior to the intervention, all subjects performed the Rockport Walk Test and a constant-speed treadmill test, filled out the WHOQOL-BREF, and had their resting blood pressure recorded. Participants were asked to walk four days per week, at a moderate intensity, with duration progressing from 20 to 45 minutes, and report to the researcher via weekly workout logs. Weekly motivational information and walking prescriptions were delivered to 11 of the 20 participants via e-mail. The other 9 met with the researcher and several other subjects for one walk per week, during which the researcher verbally delivered the same messages. All testing measures were repeated at the end of the 10-week program. All participants showed significant ($p < 0.05$) improvement on Rockport time, and the general, physical, psychological, and environmental health measures of the WHOQOL-BREF. There were no significant differences between groups in any measure. However, a 3-month follow-up survey indicated that individuals in the face-to-face group maintained a significantly greater level of exercise after the walking program than the e-mail group. Researchers concluded that technology based and face-to-face interventions are equally effective in improving fitness and quality of life during a 10-week employee-based walking program, but face-to-face interventions may be more effective in promoting long-term exercise adherence. (53)

Zachary Crane, James Stetson, Barbara Ressler*

Mali Water and Disabilities Study: Handpump Fatigue Analysis and Testing

The India Mark II pump is used all over the world to provide clean water to people in rural settings. However, the India Mark II pump is not well designed for use by people with physical disabilities. Our group has made modifications to the pump design to improve accessibility, but we were concerned that these modifications may increase wear and tear on the pump mechanism. For this project we determined whether the India Mark II pump can withstand the various stresses induced by pump handle modifications and resist fatigue over time. We will show a stress and fatigue analysis performed on the pump's internals to determine if handle modifications are sustainable. We will also report on our progress of creating a working model of the India Mark II pump on which we can test our design modifications. (13)

Elyse Dailey, Wanda Thuma-McDermond*

Zambia Alternate Senior Nursing Practicum Travelogue

A presentation about the January 2011 alternate senior nursing practicum to Macha Hospital in Zambia, Africa. (48)

Jennifer Esbenshade, Richard Schaeffer*

A Quantitative Analysis of the Uptake of Heavy Metals into Common Garden Vegetables from Contaminated Soils

Eight common garden vegetables grown in four different levels of contaminated soils were sampled and analyzed for copper, cadmium, nickel, and lead concentrations by flame atomic absorption spectrometry. Vegetables grown in soil with a higher concentration of the metals had significantly higher concentrations of metals in the edible portions of the plant than vegetables grown in soil with a lower metal concentration. The p-values associated with the differences in the metal concentration of the vegetables across the different soils were <0.0001 to 0.0646 (copper), 0.0003 to 0.5570 (cadmium), <0.0001 (nickel), and <0.0001 to 0.4570 (lead). At the 0.05 confidence level, beans, peas, and broccoli absorbed significantly more metal from the contaminated soil than the other vegetables tested. Carrots and beets absorbed significantly less metal than the other vegetables tested. All significant trials were fitted to a linear model and many provided a good fit with an adjusted R² greater than 0.9000. (41)

Stephanie Ferguson, Hannah Tims*

Packaging of Archaeal DNA: Histone Binding Affinity

The packaging of DNA is of great importance to the cell, protecting vital information from degradation. Eukaryotic organisms use nucleosomes as a basic repeating unit of DNA packaging, while Bacteria condense their genetic information with supercoiling. The purpose of this study was to determine how Archaea combine these two systems in a unique packing process. The binding affinity of specific DNA fragments to archaeal histones and mutants were analyzed to further understand this process. DNA sequences, KS1344 and KS1418, which have been shown to have high affinity for archaeal histones were first amplified with mega prep, cut and purified. Electrophoretic mobility-shift assays (EMSA) were done to determine the binding affinity of the histone proteins to the DNA. Successful binding showed that that HMfB and HMfA binding affinities are very similar, while the mutant M35C is much greater in comparison. The data also suggested that DNA strains KS1344 and KS1418 have the same binding affinities. Further assays should be done to test the binding affinity of histones containing a fluorescent probe. If fluorescently tagged histones bind to DNA we can use them, with a fluorescence resonance energy transfer (FRET) assay, to measure the equilibrium dynamics of the archaeal nucleosomes. Funding was provided by the Steinbrecher summer program. Special thanks to Kathleen Sandman (The Ohio State University) for providing the *Methanothermus fervidus* (HMfA, HMfB) used in this study. (43)

John Forsythe, Harold Underwood*

Wireless Enabled Remote Co-presence (WERC)

People living with Aspergers need to hold jobs in the workplace despite social challenges. WERCware intends to enable people with such challenges to keep suitable jobs and pursue a more independent life by providing remote coaching that is un-obtrusive to the user and other workers. To accomplish this goal the WERC team has developed an assistive technology including a wearable device that feeds audio and video to a remote coach, while also providing the opportunity for real time audio feedback from the remote coach to the WERCware user. (12)

John Forsythe

A Prototype Web Database Application for Managing Hydrocephalus Patients

Hydrocephalus is a curable disease where the body ceases to drain fluid out of the brain. In Africa parents of hydrocephalus babies often think their child is cursed and will kill their child to "cleanse" their village. CURE international strives to educate and treat those affected by hydrocephalus, stop the unnecessary deaths of those infants, and cure those living with the disease. Messiah College's Database Applications class is working together with CURE international to build a software program that can track and report data on CURE international's treatment of Hydrocephalus, which will enable CURE to improve and monitor their progress. (30)

David Foster*, Kristen Listor

Biology 269 - Ecology of Florida in Winter

Join us for a tour through the wilds of Florida, from snorkeling with manatees, crawling up on alligators, research in the Everglades for nine days, snorkeling in the Florida Keys, to travel to the Dry Tortugas Islands. This presentation is narrated by Kristen Listor and includes the first place photo for the EpiCenter photo contest. Course meets every other January (2013,2015) and carries both Gen Ed Lab Science credit and Biology Elective credit. (46)

Abigail Glenzel, Juliette Brinks, Sarah Henningsen, Sara Mueller, Suzanne Nesmith[^], Nancy Woods*

Consistent-Carbohydrate Diet for Hospitalized Adult Diabetic Clients

Background: Hospitalized adult diabetic clients are more prone to hyperglycemia and hypoglycemia from infection and scheduled prandial insulin doses, respectively. Diabetes mellitus, if not controlled, can cause long-term sequelae including, but is not limited to, peripheral neuropathy, nephropathy, vasculopathy, and retinopathy. Controversy has risen concerning a set diet for diabetics to follow. The ADA states that an understanding about the disease is necessary to prevent complications and increasing healthcare costs. **PICO question:** Among hospitalized adult diabetic patients, are consistent carbohydrate amounts at each meal, compared to inconsistent carbohydrates, more effective in maintaining glycemic control? **Methods of literature search:** A review of the literature was completed using Medline, PubMed, and CINAHL databases from 2005 to 2010. A total of -----24 articles were identified; ---17 addressed our problem. The majority were Level I and Level VII, of B quality. **Findings from EBP Project:** Consistent-carbohydrate diets indicated small, but clinically significant, decreases in hypoglycemic episodes. The ADA recommends close monitoring of carbohydrates, regarding diet therapy. In addition, carbohydrate diets of varying amounts did not show improvement of blood glucose levels. There was lack of concrete evidence for a specific hospital diabetic diet, because of small sample sizes and short durations of studies, which impeded the findings. Stegenga (2010) addressed that acute hyperglycemic episodes cause longer hospital stay, increased costs, and harm to the client. **Recommendations for practice:** Further research, including randomized controlled trials, about consistent carbohydrate diets is necessary to further the field of improving diet management for inpatient diabetics. Research on this topic is inconclusive, and although there are recommendations; there are not set dietary guidelines for inpatient diabetic patients. (59)

Abigail Groves, Kara Griffiths, Jade Craun, Candice Martin, Cindy Hallman[^], Haley Hardenstine[^], Donna Roller[^], Deborah Schafer[^], Louann Zinsmeister*

The Impact of Contact Isolation

Introduction: The goal of nursing is to provide holistic care to patients. In congruence with this idea, it is important to consider not only the physical precautions necessary to keep a patient healthy, but also to foster the maintenance of their emotional, psychological, and spiritual well-being. **Objective:** The primary purpose of this study was to identify the current research findings related to the effects of isolation precautions on clients and to develop recommendations for Evidence-Based nursing practice. **Methods:** A systematic review of literature was performed employing PubMed, CINAHL, and Cochran Database. Four studies were reviewed where the dependent variable was isolation and the independent variable was effects. **Results:** Patients in isolation are more prone to errors, generally more sick, require more time for care, receive less time with the nurse, and experience depression and anxiety as well as feelings of loss of control and decreased self-esteem. **Conclusion:** Based on the evidence, we suggest that all HCPs be educated regarding potential consequences of isolation, specific protocols, and their rationales. In addition, HCPs should be assisted in developing self-awareness of attitudes toward isolation patients. Patient and family education on the rationale for isolation precautions, and potential consequences of isolation, should be implemented. Families should be encouraged to remain in contact with isolated family members. In order to foster psychological well-being, pastoral care and volunteer visitation, as well as diversional activities and recreational therapy, should be offered. To improve

patients' sense of control, we recommend developing patient preferred schedules and encourage them to decorate their rooms. (67)

Timothy Hayes

On Arrangements of Lines and Induced Planar Graphs

An introduction into line arrangements and my own particular research into induced planar graphs, which are graphs induced by a line arrangement of straight lines such that the regions caused by the lines are vertices, and adjacent regions have an edge incident to each vertice. A brief history of research into line arrangements will be discussed, along with problems similar to my own. Then I will address my own criteria to determine whether such a graph is an induced planar graph and then my more recent research, an effort to determine a complete set of characteristics of induced planar graphs. (23)

Jennifer Heisey, Brittney Hostetter, Whitney Maust, Sarah Neumann, Barbara Snyder[^], Nancy Woods*

Addition of Aromatherapy in Treatment of Chemotherapy Induced Nausea and Vomiting

Background and significance: Chemotherapy patients who have symptoms of nausea and vomiting (N&V) are not receiving total relief from anti-emetic medications. We want to know if aromatherapy will help in relieving symptoms of N&V in addition to the regimen already used. **PICO question:** Among adult oncology patients on emetogenic chemotherapy regimens, what is the effectiveness of the addition of aromatherapy compared to usual care on the decrease of chemotherapy induced nausea and vomiting (CINV)? **Methods of literature search:** A review of the literature was conducted using PubMed and CINAHL databases from 2000 to 2010. A total of 115 articles were identified; eight were found to address the problem and were the focus of study. The majority were Level V-VI with a B quality. **Findings from EBP project:** Our findings showed a lack of evidence to support the use of aromatherapy in chemotherapy induced nausea and vomiting (CINV). For the majority of the studies we analyzed, there were small sample sizes and insufficient power. However, the benefits were noted in reducing nausea and vomiting (N&V) in short-term treatments. More research was suggested by these articles that should focus on specifically N&V, scents of aromatherapy, and use in oncology patients. **Recommendations for practice:** At this time we do not have enough evidence in order to change current nursing practice. Our recommendation is therefore for an increase in research. (54)

Elizabeth Hendricks, Jodie Haak*, H. Scott Kieffer*

The effects of caffeine on long-term anaerobic exercise

The effects of caffeine ingestion and potential for performance enhancement have been studied extensively for years. However, few studies have investigated the effects of caffeine on the long anaerobic system. Therefore, the purpose of this study was to determine the effects of caffeine on long-term anaerobic exercise using a 90 second Wingate protocol. 10 males and 10 female (between the ages of 18 and 22) attended three separate exercise sessions. The first session was a familiarization session that served to obtain the participant's demographic data, signed consent and a practice session on the cycle ergometer (5% of the subject's body weight). The two experimental sessions were double-blinded in which the participant received either caffeine (5 mg /kg of body weight) or placebo (rice flour) in capsule form. The subject rested quietly an hour before performing a 2-minute warm-up and then the 90-second Wingate protocol. The participants were instructed to pedal as fast as they could before the resistant weight was dropped to continue pedaling as fast as they could for the entire 90 seconds. The bike revolutions were counted on each down stroke by the same researcher. The number of revolutions were recorded every 5 seconds by another researcher. Total power, average power, power decline, and intermittent power gradations were analyzed across the 90 second cycle protocol. The results will be presented and discussed during the symposium. (52)

Scott Hoeckele, Anne Reeve*

Further Insight into the Aspernigrin A Pyridone System

The pyridone ring of Aspernigrin A can be synthesized from the appropriate pyrone according to the mechanism proposed in the literature. After the pyridone ring is formed, the carboxylic acid group can be converted to the amide. Previous work had converted a structural analog of the model pyridone into the desired model pyridone with yields of 61% and in good purity. Conversion of the carboxylic acid to the amide, the addition of the Boc group, and the synthesis of a t-butyl pyridone acid were attempted in this project. The amide was successfully driven to 90% completion. The t-butyl pyridone acid and the Boc reactions were unsuccessful, yielding only starting material. However, the mechanism of the pyrone-to-pyridone reaction attempted did verify by experiment the mechanism proposed in the literature. (44)

Matthew Hoover, Joshua Sorrell, Donald Pratt*

Electric Motorcycle Battery Pack

Come hear about the exciting progress that has been made on the Electric Motorcycle, and more specifically the Battery Pack. We now have a completed structure to hold the 240 batteries that will provide power to the motorcycle. The project is nearing completions and we hope to start testing the Motorcycle in the near future. (11)

Richard Houck, Paul Foerth, Brendon Earl^, Carl Erikson*

Solar Water Heating

The Solar Water Heating Project is partnered with the Theological College of Zimbabwe. Our main goal is to provide them with advice on a solar heating system and assist them with the installation. Our project has been working with evacuated tube type solar water heaters and designing a frame that will allow the system to be setup on a roof. We also have been working on several improvements to the base model of the system that would improve the rate at which the water is heated. (5)

Joshua McCamey, Samuel Hurne, Harold Underwood*

Flight Tracking and Messaging Systems (FTMS)

The FTMS team is working with an organization named JAARS to upgrade their in-flight Automatic Flight Following System (AFFS). The original AFFS system requires a hardware upgrade to allow for continued manufacturability. FTMS team members Joshua McCamey and Samuel Hurne are addressing this issue by integrating a modern microprocessor with the AFFS interface. The team has made progress towards developing a testing environment and system firmware for the upgraded unit. The work done on this project will ensure the continued ability of JAARS to provide flight tracking solutions to mission aviation organizations. (18)

Chris Jacobs, David Foster*

Sixty-eight years of change in herbaceous vegetation of a Pennsylvania Oak-Hickory forest

Long-term studies of temperate forest herb communities are rare despite the importance of the information such studies reveal. In the early 1950s, Kenneth Bert Hoover performed a Ph.D. thesis project in which he looked at the wildflowers, grasses, sedges, and ferns growing in the forest at Messiah College in south-central Pennsylvania. The forest was logged for the first and only time in 1953; a year after his work was completed. Dr. David Foster and I sampled the same forest that Hoover did determining coverage by all herbaceous species in one hundred one-meter-square quadrants three times during the growing season of 2010. Comparison with Hoover's data reveals 74 different kinds of non-woody plants present now—47 more than the 27 that Hoover found. The majority of new species were weedy. Garlic mustard (*Alliaria petiolata*) increased almost eight-fold from 3% of all the plants in 1952 to just under 24% in 2010. At the same time, some native plants, like spring beauty (*Claytonia virginica*), clearweed (*Pilea pumila*), and shining bedstraw (*Galium coccinum*) decreased significantly. As is common in many forests with high densities of white-tailed deer (*Odocoileus virginianus*), we also saw more grasses,

sedges, and ferns than there were 58 years ago. This research was supported by the Steinbrecher Research Program. (39)

Sarah Jarnecki, Randall Fish*, Harold Underwood*

A Substitute Teacher--The MultiModal Tutor (MMT)

In the United States, a common high school education is readily available for almost every individual. However, in Africa, children are considered fortunate if they are able to attend school for even a few grade levels and teachers are in high demand. The MultiModal Tutor (MMT) is a small hand-held device, much like a GameBoy, that is designed to aid the teachers in their classrooms and provide students with supplemental activities and educational games to aid them in the learning process. The presentation will cover aspects of designing a printed circuit board for the project as well as improvements in research and documentation that have been made throughout the course of the past school year. (8)

Stephanie Knepper

Mathematical Modeling of Deep Bed Filtration

There are over four and a half million children under the age of five dying from diarrheal diseases a year. The most common way of contracting these diseases is through water consumption. A way to stop this epidemic is by controlling the water. A method for controlling the water is with water filters. There are many water filters available, but this paper will focus on the deep bed filters. Mathematics can be applied to the filters to better understand the filter efficiency. In mathematical modeling there are three main components; the formulation, manipulation and the evaluation. This paper will explain the techniques and methods in mathematical modeling for developing the equation for the filter efficiency, as well as the manipulations that have made, and the current results. (24)

Grace Lankford, Sarah Romberger, H. Scott Kieffer*

Comparison of energy expenditure during Wii running and treadmill running

PROBLEM: One problem amongst the American population, specifically adolescence and college-aged individuals, is the increase of sedentary behavior. However, video game companies have begun to consider creating more physically active video gaming systems to help promote more active lifestyles due to young adults interest in these games. A popular interactive gaming system is the Nintendo Wii. **PURPOSE:** The purpose of this study was to determine the difference between Wii running (running in place) and treadmill running for energy expenditure, heart rate and VO₂ when exercising at a perceived exercise intensity of 13 (Somewhat Hard on the Borg Scale). **METHODS:** Fifteen college-aged individuals (6 females and 9 males) performed two separate ten-minute exercise sessions (jogging in place or running on the treadmill) while using the Wii Fit running program. Testing sessions were conducted in a randomized counterbalanced order to eliminate treatment bias. Prior to the study, each subject attended a familiarization session to become accustomed to monitoring exercise intensity according to the Borg Scale during Wii and treadmill running. In addition, the speed of the treadmill was recorded for each individual to help monitor the experimental session's intensity. For each experimental session, the participants reported to the lab for a ten-minute exercise session. During the exercise sessions, the subjects either ran in place (for ten minutes) with the Wii controller or ran on the treadmill with the Wii controller. Throughout each session, the MedGraphics Ultima oxygen analyzer (Minneapolis, MN) measured VO₂, kcals, and RER (% of carbohydrates and fats) of each participant as they wore a mask linked to the analyzer. Also RPE was recorded every minute to assure maintained an RPE of 13. **RESULTS and CONCLUSION:** To be discussed. (50)

Rick Lima

Developing a Mobile/Web-Application for Recording Births and Deaths in Zambia

We are developing a mobile application to support volunteers in Zambia who need to track/print birth and death records. The mobile application will be able to send data to a web application located at the Macha Mission Hospital. The web application will manage all the records and have the ability to report and print birth/death certificates. (29)

Erik Lindquist*, Michael Shin*, John Cossel[^], Adam Stuckert[^], Molly Bletz, Nicole Trimmer[^]

Chytrid in a Canopy Amphibian: Picado's Bromeliad Treefrog, *Isthmohyla picadoi* (Hylidae) Persists at a Site Affected by *Batrachochytrium dendrobatidis*

Batrachochytrium dendrobatidis has been a major cause of amphibian decline world-wide. Its geographic distribution, dispersal mechanisms, and ecology of *Bd* is poorly understood yet imperative for species conservation. The purpose of this study was to determine 1) whether *Bd* is detectable in the population of *I. picadoi* at the Panamanian study site; and if so, 2) the prevalence of infection; and 3) whether any connection exists between *Bd* infections in individual frogs and phytotelmic water sources. Using approved techniques each frog was swabbed and the swab was brought back to the US for molecular detection. Traditional and quantitative PCR analyses were conducted on the 32 collected samples using chytrid specific primers. Initial analysis with traditional PCR indicated the presence of *Bd* in one sample. Later analysis using qPCR confirmed the presence of *Bd* in that sample confirming the presence of chytrid in a new *Isthmohyla* species. The mean number of zoospore equivalents calculated from triplicate samples drawn from the infected frog was 366.50 ± 150.82 (SE). The individual testing positive for *Bd* was found in a phytotelmic water source that contained an elevated zoospore load. The implications of these findings suggest *I. picadoi* may be a vector transferring *Bd* from lotic to phytotelmic water sources, and also present the possibility of *I. picadoi* possessing adaptive or innate immune responses allowing it to survive *Bd* infection. Further study is needed to confirm these propositions. (33)

Debbie Loop*, Eileen Gardner*

Moving Beyond the Classroom into the Simulation Age

High fidelity simulation is considered standard training in high-risk industries to provide an avenue for safe and deliberate practice. In recent years, the healthcare industry has recognized the need for high fidelity simulations in order to assure patient safety, professional competence and effective team work. In addition, simulation use in nursing education has increased to meet educational needs caused by the nursing shortage and limited clinical availability. Simulation provides an active learning environment for student experiential learning that is applicable to population and situation specific learning. Messiah College, recognizing this growing need, financially supported the renovation of the Department of Nursing's Patient Simulation Laboratories (PSL). The current PSL includes three Advanced Patient Simulation Labs equipped with high fidelity simulators, one large AV control room, two Basic Labs equipped with medium fidelity simulators, one Mental Health Lab with a small AV control room, a Maternal-Child Lab with high fidelity simulators and a Physical Assessment Laboratory. Technology advancements such as the Electronic Medical Record (EMR) and a Computerized Medication Dispensing System has also been added to the PSL. This session will provide a visual tour of the PSLs and discuss the pedagogy behind the use of technology and high fidelity simulations. (49)

Lance Martin, Carl Erikson*

ABWE Togo Medical Center

This project's main focus is to begin providing a medical center located in Mango, Togo with electricity using solar energy. This facility is on 63-acres and will serve as a surgical hospital and a ministry launch point for the region. Working with the Association of Baptists for World Evangelism (ABWE), we are in the initial phase of providing the gatehouse located at the entrance of the facility with a solar photovoltaic system that will power the gatehouse without using the unreliable electric grid. In the future, we are planning to expand the use of solar energy in the medical center and begin powering the on-site residences with alternative energies. (16)

Roanna Martin, Erik Lindquist*

Water Quality Analysis in Groups using the Sawyer PointONE Filter™ in Cochabamba, Bolivia

This study examined the effectiveness of the Sawyer PointONE Filter™ on improving water quality through an eight month long study in Cochabamba, Bolivia. Participating families were divided into four groups: “Control”, “Behavior Change Communication” (BCC), “Filter Only”, and “Filter with BCC”. Water samples were analyzed for the presence of hydrogen sulfide producing bacteria using the Hach PathoScreen™ Field Kit. A total of 1,196 families began the study, with 983 carrying it through to completion. Filters significantly reduced the amount of hydrogen sulfide producing bacteria in the water from >8.0 bacterial colonies/100 ml of water to 1.33 (Filter Only Group) and 1.40 (Filter with BCC Group) per 100 ml of water ($p=0.005$ and $p=0.0001$ respectively). At a 95% confidence interval, rates of diarrheal prevalence dropped by 41.2% in the “Filter Only” group, and by 71.6% in the “Filter with BCC” group over the course of 5 months. In addition to quantitative water analysis, focus groups were conducted with participating mothers to gather suggestions for the improvement of filter performance. (35)

Karisa Martin, Erik Lindquist*, Ariela Vader*

Water quality analysis of stored water using Sawyer PointONE filters

In many parts of the developing world, drinking water is held in household storage vessels. Drinking water may be contaminated at the source or during storage; effective water purification methods must address both potential contamination sites. This research investigated a two-component purification method using Sawyer PointOne bucket filters, a point of use hollow fiber membrane filtration system, and post-filtration chlorination with AguaTabs, a tablet product containing sodium dichloroisocyanurate. Ten liters of distilled water were filtered through the Sawyer PointOne filters and stored with 67 mg of AguaTabs in sealed plastic buckets at 20° C. Microbiological and free chlorine testing were conducted at 12 time points (0 minutes, 30 minutes, 1-10 days). Free chlorine levels decayed as storage time increased, but remained above accepted standards for residual disinfection of water. Bacteria testing with the membrane filtration method at 8, 9, and 10 days showed growth of several colonies. Further research with varied source water quality is needed to evaluate the effectiveness of this two-component water purification method. (34)

Talisha Maxwell, Rachel Ashworth, Lauren Tennis, Kim Fowler^, Karissa Harbold^, Joanne Konick-McMahan^, Leighann Oldham^, Dawn Schlegel^, Naisha Stoney^, Louann Zinsmeister*

Are Your Patients Ready for Discharge?

Throughout the years, patient readmissions have been increasing, creating greater demands on medical institutions. This evidence based project was done to evaluate patient’s perceived readiness for discharge in order to assess the amount of readmissions caused by knowledge deficit or poor discharge planning. Four research articles which evaluated patient readiness for discharge were analyzed and critiqued. After thorough critique of the articles, additional research is needed to determine the nursing interventions that will improve patient readiness for discharge if the readiness for discharge tool reflects that this patient is at risk for readmissions. (64)

Anne McClary, Deborah Mascia, Gretchen Brandt, Brittany Baker[^], Tina Daniels[^], Tricia Falgoust[^], Michelle Heim[^], Sue Spencer[^], Sarah Weaver[^], Louann Zinsmeister*

Amiodarone: Worth the Risk?

The purpose of this research is to explore the question: In adult cardiac post-op patients, what are the risks associated with peripheral IV administration versus central line administration of amiodarone? A search of Medline, CINAHL, PubMed, and Cochrane Database was conducted. After critiquing four of the seven studies, it was found that amiodarone is the drug of choice for the conversion of post-op atrial fibrillation and is associated with potentially serious cases of phlebitis when administered through a peripheral IV. Several researchers suggest the use of a central line for administration of amiodarone. More research is needed to weigh the risk of central line infection against the risk of phlebitis as well as to define proper dosages and administration of amiodarone. It is suggested that amiodarone be administered at the lowest dosage possible to decrease the risk of phlebitis. (66)

Ethan Meade, Andrew Basom, Andrew Breighner, Donald Pratt*

The Light Sport Aircraft Gets a New Engine

In the fall of 2009 the transportation group experienced a major setback when the Rotamax engine, which was installed on the Light Sport Aircraft at the time, was grounded and deemed unsafe for use. Since then the Engine Integration Team has been dedicated and working hard to find, obtain, and install a new aircraft engine on the L.S.A. Many hurdles and challenges had to be overcome to try and get the L.S.A. project back on track, but good progress was made and we are well on our way to having an operational engine for our aircraft again. (7)

Chris Miller

Requirements Analysis & Design for Clubfoot.org

This presentation will demonstrate how a website was planned and developed for CURE International's clubfoot branch through the use of a WordPress platform. (31)

Jeremy Miller, Michael Zummo*, Carl Erikson*

Biodiesel: Methanol Recovery

This project processes the hazardous glycerin and methanol byproduct of the biodiesel production process. This is done through a distillation process which distills the methanol alcohol from the glycerin. The methanol alcohol is then used to produce more biodiesel and the glycerin is used as compost or made into soap. (3)

Katherine Miller, John Harms*

Downregulation of Gastrin Receptors in SW1990 Human Pancreatic Cancer Cells Using shRNA

Pancreatic cancer is the fourth leading cause of cancer death in the United States and has a five year survival rate of only 6%. Researchers have previously identified the CCK-B/Gastrin receptor as a potential source for growth stimulation of the malignant tumor and downregulation of its ligand significantly slows cancer growth. Our hypothesis is that a lower amount of CCK-B/Gastrin receptors will result in slower tumor growth and provide an additional target for therapy. This project specifically attempts to down-regulate the presence of the CCK-B/Gastrin receptor on the surface of SW1990 human pancreatic cancer cells using shRNA sequences targeting two sites in the receptor mRNA. Vectors encoding these sequences were transfected into SW1990 cells and positively selected for the presence of the vector using the antibiotic Hygromycin. Two different transfection techniques were compared, adherent and immediate/non-adherent. Two different ratios of transfection reagent to DNA (3:1, 3:2) were compared as well. There was no significant difference in the number of resistant colonies between the different ratios of DNA to transfection reagent, but an adherent transfection technique yielded larger and healthier colonies than did the immediate transfection technique. (37)

Patrick Miller, Zachary Mino, Steven Knudsen, Tony Beers[^], Timothy Whitmoyer*

Hand-Power Water Pumps: Research and Application

The Department of Engineering and the Collaboratory have partnered with the *Handicapes en Avant* (a center for rehabilitation and education of handicapped persons in southeast Burkina Faso) for over a decade. One of the enduring student-faculty projects spawned from this relationship involves the design and installation of hand-powered water pumps for irrigating the center's orchards and vegetable gardens. The current work has two branches- one focusing on improving the overall design of the pump made for HeA's clients (research) and a second centered on developing a simple, durable pump that will be part of an irrigation solution for family gardens in Burkina Faso (application). The research aspect has redesigned and tested its pump to eliminate serious durability issues, including plastic bending of the pump rod. The application side has designed, constructed, and tested a proof of concept model and is currently working on a second prototype. **(6)**

Nathaniel Nichols, Jose Vasquez, David Hostetter[^], Carl Erikson*

Energy Audit for CURE International

CURE International (CURE) is seeking to identify potential ways to reduce energy expenses at ten hospitals in the developing world. This project conducted a general on-site energy audit at CURE's hospital in San Pedro Sula, Honduras. The goal of this project is to identify energy conservation measures and suggest projects that could help reduce the hospital energy costs. This presentation will highlight some of the energy conservation measures and some of the suggested projects that were identified during the audit for CURE to consider that could help to reduce or offset their energy costs. **(10)**

Brittany Petry, Kate Rowader, Susan Swails[^], Bethany Eby[^], Nancy Woods*

Evidence-Based Interventions for Post-Operative Nausea

Background and significance: Nausea is a common side effect experienced by post-operative patients who receive anesthesia. The current practice at Holy Spirit Hospital, is to manage nausea of post-operative patients, who received anesthesia, with Zofran (ondansetron). It has been observed by the Registered Nurse (RN) staff that Zofran is not as effective as some other antiemetics. Some patients report no change in the presence of nausea after administration of Zofran. **PICO question:** Among post-operative patients experiencing nausea, is dexamethasone more effective than using the routinely administered Zofran (ondansetron) in treating post-operative nausea? **Methods of literature search:** A review of the literature was conducted utilizing PubMed, MedLine, from 2000 to 2010. A total 82 articles were identified; nine were found to address the problem and were the focus of study. The majority were Level II with a B quality. **Findings from EBP project:** Due to a lack of strong conclusion, that were a result of research limitations, there needs to be additional research on the topic. Several articles recommended a combination of Zofran and Dexamethasone, while other articles recommended that there was no difference between using Zofran or Dexamethasone. **Recommendations for practice:** Based on the literature review, a change in practice is not recommended at this time for the treatment of nausea. Our suggestion is that there should not be a change in practice until further research is conducted. **(60)**

Geoff Pezon, Joseph Eshelman, David Vader*, Timothy Whitmoyer*

Filter Testing Apparatus and Procedures in Support of Water Purification Systems for the Developing World

The Water Group of the Collaboratory for Strategic Partnerships and Applied Research at Messiah College designs household and village scale water purification systems for partner communities in the Developing World. Designs currently under development and field testing include a Village Water Ozonation System (VWOS) and a system based on hollow fiber membrane technology provided by the Sawyer Products Corporation. Filtration is a common feature of these designs, resulting in a growing need within the Collaboratory for a test apparatus and measurement protocols for conducting sediment and biological filter challenges to determine filter efficiency and longevity, and to certify specific filter designs and brands for use in our systems. A filter test bed has been designed that comprises a 0.5 hp pump, bypass flow control, flow and pressure measurement capability, and a filter housing. Options for manufacturing standardized simulated raw water have also been researched and tested. The apparatus has been tested with sediment filters rated at 50 and 5 microns, a carbon block filter, and a hollow fiber membrane filter. Test procedures under development will determine the rate of increased pressure drop required for a fixed flow rate as filters become saturated with particulate contaminants, and provide for the detection of particles passing through the filters. **(4)**

Ashley Praetsch, Hilary Artz, Elyse Dailey, Joseph Jacaruso, Bonnie Clemence^, Sharon Harig^, Lydia Johnson^, Amy Leshar^, Gina Recce^, Sandy Rybecki^, Louann Zinsmeister*

Narcotic Analgesia: Too Much of a Good Thing

Several nurses have noted increased rates of respiratory depression in patients who are on patient controlled analgesia post-operatively. Currently, the methods used to measure respiratory depression most often include respiratory rate, oxygen saturation, and occasionally carbon dioxide levels. With increased rates of respiratory depression we performed a literature review to investigate whether or not the consistent use of capnography can prevent incidents of respiratory depression with patients using patient-controlled analgesia post-operatively. Our methodology included appraisal of ten studies, five of which we used to deduce the effects of capnography on respiratory depression. From the research studies, it is evident that capnography allows for indication of increasing carbon dioxide levels prior to decreasing oxygen saturation and respiratory rate. However, our sample size is not large enough to conclude that there is significant decrease in incidence of respiratory depression with capnography. Therefore, from the literature review, we recommend further research in regard to the clinical use of capnography in post-operative patients receiving patient-controlled analgesia. Furthermore, a standardized definition of respiratory depression should be developed in order to assure clinical competency across the spectrum. **(61)**

Angie Rapchinski, Philina Henton, Nissi Saju, Tiffany Boyd[^], Sheena Dellinger[^], Mary Lou Mortimer[^], Avis Pulaski[^], Theresa Sellers[^], Louann Zinsmeister*

Can I Pray for You?

Motivation/Problem statement: The nurse has a job to provide holistic care for every patient; therefore spiritual care cannot be neglected. Numerous personal accounts exist outside of research that credit healing to prayer. The question raised regards the possibility of prayer producing more such positive outcomes if it were offered regularly to patients. The literature reviewed revealed many gaps including the absence of a specific theoretical framework as well as a lack of qualitative studies of prayer intervention. As a result, the following question was developed for study: “In patients experiencing ill health, what is the effect of prayer as an adjunct therapy on pain management and general well being?”

Methods/Procedure/Approach: In approaching this question, the following databases were utilized: The Cochrane Library, CINAHL, and PubMed. Four quantitative research studies were critically appraised and a review of current literature was conducted to identify gaps in the research. **Results:** The review of quantitative literature yielded evidence that spiritual intervention is highly complex and multifaceted; therefore, the control of such a study is not feasible. The lack of qualitative research makes it difficult to address the lived experience of prayer as an intervention on the alleviation of ill health. Overall there is a lack of research to conclude that prayer as an adjunct therapy is beneficial in pain management and general wellbeing. However, while there is no definitive link to prayer and decreased pain management and general well being, prayer was never found to produce a harmful effect. **Conclusion:** Due the nature of prayer, it would be beneficial to conduct more qualitative research in order to understand the lived experience of the patient receiving prayer as an adjunct therapy. Researchers of Cochrane do not feel the need for further research on prayer, but they did suggest a plan for a quantitative study that may help to control for extraneous variables. (63)

Sarah Romberger, H. Scott Kieffer*

Comparison of EPOC between Circuit Weight Training and Treadmill Running in Females

PURPOSE: The purpose of this investigation was to study the difference between the EPOC response of circuit weight training (CWT) and continuous treadmill (TM) exercise of the same level of effort and duration. **METHODS:** Seven recreationally trained subjects performed a 30 minute TM run and a 30 minute CWT routine at an RPE of 13 on the Borg Scale. Prior to the study, each subject attended a familiarization session to become accustomed the Borg Scale and to select an appropriate resistance for each weight machine. During the TM session, the subjects ran for 30 minutes at a steady pace (RPE 13) and during CWT routine, the subjects performed 30 minutes of alternating 30 seconds of aerobic/weight training (RPE 13). Following each session, the subjects were immediately placed in a supine position and EPOC was monitored continuously for 60 minutes using indirect calorimetry. Dependent variables were compared using student t-tests. **RESULTS:** There was no significant difference in effort between TM and CWT via the measurement of RPE (13.1+0.51 and 13.2+0.27, respectively); however heart rates were significantly higher for CWT (166.78+14.35 and 182.67+15.77, respectively). During the EPOC phase (60 minutes post-exercise) there was no significant difference between the number of calories burned following TM exercise (70.57+10.50) and CWT (67.4+14.07). At the conclusion of the recovery period, RER did not differ (0.82+0.09 and 0.86+0.06, respectively). **CONCLUSION:** Exercise mode did not alter the EPOC response and specifically a CWT routine with a significant aerobic component does not increase the total number of calories burned. (68)

Daniel Ross, Randall Fish*

VWOS Datalogger

The VWOS Datalogger project is a subproject within the Village Water Ozonization System umbrella within the Collaboratory. The needs being met are the monotony and time-consumption of the testing procedures for the system. The goal of the Datalogger is to attach an external monitor to the system which will record the desired values and store them in memory. When the Datalogger is plugged into a computer, the data will be uploaded and exported to an Excel spreadsheet for ease of use and analysis by the user. When completed, this project could also see implementation on client sites, so that the success or failure of our systems can be monitored. (2)

Kate Rowader, Caitlyn Williams, Debbie Loop*

Two Nations-One Purpose: Messiah College and the BCNC Exchange Program

The Messiah College (MC) Department of Nursing and the Boromarajonani College of Nursing (BCNC), Chiangmai, Thailand enacted an enduring institutional linkage for educational co-operation. This agreement resulted in an opportunity for MC students to deliver nursing care within the Thai culture. Students participate in a 3-week intensive course during the January term. The Nakomping Public Hospital experience includes patient care as well as exposure to various specialty areas in the hospital. The rural Thai life is experienced first-hand as students participate in a 4-day/3-night home stay in Maegumpong Village. Under the supervision of Thai nursing faculty, students participate in using the 7-Tool Community Assessment. Traditional medicines including herbal remedies, Thai massage and acupuncture are presented by Thai experts. In addition to health care experiences, MC students engage in a variety of cultural events. Faculty and students of MC offer formal and informal educational experiences for BCNC. Sponsored programs include professional conferences, “English Camp” and individual relationship building. The exchange program provides collaborative experiential learning between the two nations. In addition to gaining understanding of each other’s cultures, students learn that nurses internationally share one purpose, to improve the health and welfare of humankind. (47)

Matthew Sakow

New Geometries, Old Truths

Axiomatic systems have enabled the development of various mathematical branches. However, the creation of hyperbolic geometry reveals the implications of rejecting previously held “truths”. (25)

Christin Shenk, Kristine Williams, Tiffany Brighton, Sister Elizabeth Kovacs[^], Nancy Woods*

Evidence-Based Recommendations for Education of High-risk Stroke Patients

Background and significance: Current guidelines for emergency stroke management dictate treatment with tissue plasminogen activator (tPA) for patients arriving to the emergency department with acute stroke, within three hours of symptom onset. Most patients do not arrive within the three hour window, and thus are unable to benefit from this highly effective therapy. We investigated whether patient education, particularly regarding stroke signs and symptoms, helps to reduce arrival times and treatment delays. **PICO question:** Among community patients at risk for stroke what is the effect of patient education on early access to emergency interventions? **Methods of literature search:** A review of the literature was conducted utilizing PubMed, MedLine, Cochrane Database and CINAHL from 1998 to 2010. A total of 99 articles were retrieved, with 9 that addressed the specific problem and were selected for review. The majority were Level IV with a B quality. **Findings from EBP project:** Factors associated with shorter treatment delays were more severe stroke and regarding symptoms as serious, but not better knowledge about the most frequent stroke symptoms. Evidence suggests that a major factor contributing to delay in treatment of acute stroke is lack of perception of symptoms as “serious.” Seven studies determined that calling Emergency Medical Services (EMS) contributed to a decrease in treatment delay and recommended that calling EMS for stroke symptoms is an important factor in stroke education. **Recommendations for practice:** Education for high-risk stroke patients should include a greater emphasis on the emergency nature of stroke, including the need to call EMS at the immediate onset of stroke symptoms, in an attempt to link the symptoms with a plan of action. Zerwic (2007) recommends creating an action plan with high-risk patients should stroke symptoms occur to expedite treatment. (55)

Joel Siegrist, Tim Brinkman, Donald Pratt*

Light Sport Aircraft: Wing-Folding System

The Wing-Folding design being developed for the Light Sport Aircraft is all about making the plane more portable and user friendly. With such a design, the aircraft will be capable of fitting inside a shipping container for potential overseas transport. We have picked up right where last year’s team left off and have helped to start turning their work into a reality. The culmination of a year’s work of research, design, analysis, and manufacturing can be seen here, as we present the completion of the first of three joints used in the wing-folding design. (14)

Suzanne Smart, Barbara Ressler*

The Moxy Project: Providing Oxygen in Zambia

The Macha Oxygen Project endeavors to provide much needed oxygen to patients at Macha Hospital in Zambia. Our goal is to learn how to fix the oxygen concentrators that the hospital already has and then to teach workers there how to fix and keep them running. In the first year of the project, we have learned much about how oxygen concentrators work. Our main focus has been on developing a testing procedure to help workers in Macha know whether or not the concentrators are operating within acceptable ranges, as well as diagnosing those that are broken. To this end, we have written a manual to be delivered to Macha this summer. (15)

Luke Smith, Douglas Coiner, Timothy Yacko, Steven Miller

Evaluating and Recommending a Software System for the Center for Autism and Developmental Disabilities

Jean Daly, a representative from the C.A.D.D. organization approached Brian Nejme regarding their need for a more efficient and effective software system to accommodate their internal processes and needs. A research team made up of 4 Messiah College Seniors researched various products with the capabilities required by C.A.D.D. and decided, based upon several in-depth comparisons based on quantitative analyses, that Appointment-Plus, a web-based appointment-scheduling software with an included database, would be the most beneficial for C.A.D.D. The research team then catered the solution to C.A.D.D., and trained its personnel on how to use the program proficiently. (28)

Eric Spring, John Sletta, Donald Pratt*

Light Sport Aircraft: Suspension

The suspension of the light sport aircraft is nearing completion. Significant research was conducted during the 2010-11 school year and a final design has been devised. Join us as we discuss the highlights of the suspension project and talk about an exciting future. (17)

Mackenzie Stamer, John Harms*

Optimization of shRNA transfection to down-regulate CCK expression in PANC-1 cells

Pancreatic carcinoma is one of the most deadly forms of cancer, with a survival rate of only 2-4%. In most cases, pancreatic cancer goes undiagnosed until later stages when carcinomas become inoperable. Current treatment options are ineffective and new therapeutic methods are needed. Studies have shown that pancreatic cells begin to produce gastrin and its sister peptide cholecystokinin (CCK) once they become malignant, which is significant because healthy pancreatic cells do not produce these peptides. Down-regulation of gastrin has been shown to decrease tumor growth, while studies have suggested down-regulation of CCK does not slow tumor growth. However, these studies were conducted with cell lines which express lower levels of CCK and its preferred receptor. Our hypothesis is that cells which express higher amounts of CCK are more dependent on this peptide for growth, so down-regulation of CCK in these cells would be significant in tumor inhibition. RNA interference (RNAi) was utilized to down-regulate CCK mRNA in PANC-1 cells which produce relatively high levels of CCK in comparison with 5 other pancreatic cancer lines. We transfected cells with vector-only (pSUPER.hygro) and shRNA constructs targeting two sites (+141, -6) in CCK mRNA. To overcome previous technical difficulties, cells were transfected with two different transfection reagents (Lipofectamine 2000 and FuGENE 6), and cells were cultured in media containing a higher percentage of fetal bovine serum (FBS) than previous experiments in order to provide additional nutrients. Colonies were selected based on hygromycin resistance, and resistant colonies were successfully generated for vector-only (control) and both shRNA constructs. Cells transfected with Lipofectamine 2000 produced 3 times as many colonies as FuGENE 6. Gene analysis of CCK mRNA levels in these clones is ongoing. (38)

William Swinsburg, David Foster*

The Independence of Nonnative Shrub Removal and Herbivory by White-tailed deer (*Odocoileus virginianus*)

It has been hypothesized that nonnative shrub removal may increase browsing on native herbs, due to increased visual apparency to the white-tailed deer, *Odocoileus virginianus*. This is the first study to test this hypothesis directly. A deciduous forest in Grantham, PA was divided into 10m x 10m plots. The plots were randomly selected for either nonnative shrub removal or a control treatment. Nine long-stemmed tulips were planted in each plot, and chicken wire exclosures provided a control against herbivory for one tulip per plot. Tulip emergence and browsing was recorded for two seasons. Flower heads were removed during the second season to eliminate color bias. Chi-square analysis revealed that nonnative shrub removal and browsing are independent at high deer densities (>25 deer/hectare). Nonnative shrubs were persistent, requiring multiple attempts at removal. Further work is needed to determine if this trend remains at lower deer densities. **(32)**

Ritamarie Testa, Rachel Delmar, Ashley Rittenhouse, Hillary Snyder, Marianne Allen^, Cathy Druckenmiller^, Melanie Sherman^, Louann Zinsmeister*

Everyone Needs a Little Heart to Heart: Examining the Effect of Social Support on Readmission Rates for Cardiac Patients

This presentation analyzes the relationship between social support of cardiac patients and hospital readmission rates. Social support was defined as “the size, structure, and frequency of contact with the network of people surrounding an individual” (Rodriguez-Artelejo et. al 2004). This definition was used to guide the critical appraisal of research studies when investigating how social support affects readmission rates for cardiac patients. Four studies were reviewed and are discussed throughout the poster. Recommendations were made in order to decrease future readmission rates after a cardiac event. **(65)**

Bryan Tyson, Sara Finn, Donald Pratt*

Battery Monitoring and a User Interface for the Electric Motorcycle

The purpose of our portion of the electric motorcycle project is three fold. The first part of the project is charge control; we would like to be able to monitor the batteries while charging and be able to stop charging once the pack is full. The second part is similar; we would like to be able to monitor the current and voltage of each string of batteries while we’re riding so that we don’t end up stuck on the side of the road with an empty battery pack. The last part of our project ties these two together; we would like to provide a user interface, through an LCD screen, that will give the rider important information while driving, such as speed, pack voltage and current and it will also give information while the motorcycle is charging about how far along the pack is in the charging process. **(20)**

Kaitlyn Valis

Multi-Event Scoring in Track and Field

The multi-events of Track and Field (pentathlon, heptathlon, and decathlon) are a test of versatility, strength, coordination, and endurance that only some athletes even attempt. The scoring is scientifically based and has evolved throughout history to make it fair for all competitors. This history will be developed and the current scoring method will be described, including criticisms and suggestions for changes or improvements to correct possible sources of bias or discrepancy in scoring. Lastly, the presentation will present strategies that one might use while training to improve one’s score in the multi-events. **(21)**

Danielle Veacock, Jodie Haak*, H. Scott Kieffer*

The effects of chocolate milk compared to a carbohydrate beverage on performance in female endurance runners

The use of chocolate milk as a recovery beverage following exercise has been suggested to help replenish energy stores within the body. Most studies using chocolate milk as a recovery beverage have been conducted on men; however, research suggests that women may metabolize the fat content of the milk differently than men during recovery and subsequent exercise. Therefore, the purpose of this study is to evaluate the effects of chocolate milk compared to a carbohydrate beverage on performance in female endurance runners when consumed as a recovery beverage. Ten female endurance runners are being recruited to participate in the study. Each woman will complete two separate trials, one for each beverage containing equal amounts of carbohydrates with a ratio of 4:1 carbohydrate to protein. The protocol consists of three stages: a glycogen-depletion run, a two-hour recovery period, and a 5K time trial. Subjects will run to volitional exhaustion during the glycogen depletion period. One of the two beverages will be consumed at the initiation of the two-hour recovery period. The 5K time trial will follow with subject self-selecting the treadmill speed. Oxygen consumption (VO₂), respiratory exchange ratio (RER), rate of perceived exertion (RPE), heart rate (HR), blood glucose levels, and caloric expenditure will be recorded throughout the glycogen-depletion and 5K time periods. It is hypothesized that there is no significant difference between time, RER, RPE, blood glucose levels, VO₂, and caloric expenditure when comparing the effects of chocolate milk and a carbohydrate beverage. **(51)**

Cjloe Vinoya, John Harms*

Transfection and Up-Regulation of Cholecystokinin-B and Cholecystokinin-C Receptors in Pancreatic Cancer Cell Line SW1990

While cancer alone is one of the leading causes of death in the United States, pancreatic cancer has the fourth highest mortality rate. Because pancreatic cancer is often diagnosed at a later stage, treatment options such as chemotherapy are not effective. Thus, it is necessary to understand the regulation of human pancreatic tumor growth. Previously, CCK and gastrin, peptide hormones that normally stimulate digestive enzymes, have also been found to promote pancreatic cancer cell growth. Both hormones signal through the CCK-B receptor (CCK-BR) and a splice variant of the CCK-B receptor, CCK-CR. We hypothesize up-regulation of CCK-BR will produce greater cell proliferation than an empty-vector control group, while the up-regulation of CCK-CR will be even more aggressive than that of CCK-BR. Empty-vector (pCAGEN.neo) and plasmids containing each receptor DNA were individually transfected into the moderately aggressive human pancreatic cancer cell line SW1990 with Fugene 6 transfection reagent (Roche). To fully optimize transfection, three ratios (3:1, 3:2, and 6:1) of transfection reagent to purified plasmid DNA were utilized. Clones were selected based on growth in the presence of neomycin. Successful resistant transfectants were obtained from empty-vector colonies, showing a higher level of transfectants with the 6:1 ratio. Failure to acquire colonies in both receptor transfectants led us to hypothesize an error in the vector backbone and absence of the neomycin-resistance gene. Future studies will proceed to carefully characterize all vectors prior to transfection. **(36)**

Meagan Wademan, Hannah Tims*

Inhibiting the Aggregation of Heat-denatured Citrate Synthase with ZmsHsp 17.0 for Future FRET Analysis

Small heat shock proteins (sHsps) are molecular chaperones that bind to denaturing proteins during cellular stress in order to prevent protein aggregation. sHsps are the most diverse in plants which contain six different classes based on cellular localization. Two of these categories are cytosolic class I and II sHsps. Although much is known about class I, very little is known about class II sHsps. It has been found that sHsps form dynamic oligomers ranging from 12-24 subunits, yet the oligomer association/disassociation mechanism is not fully understood. We isolated and purified sHsp 17.0 from recombinant *E. coli* cells by using Chitin Affinity Purification columns. We then attempted to measure sHsp 17.0 inhibition activities in the presence of heat-denatured citrate synthase by using a fluorometer. This preliminary work will be used for future Förster Resonance Energy Transfer (FRET) analysis of exchange rates within sHsp 17.0 oligomer complex, dimer structure, and monomer form. **(45)**

Caitlyn Williams, Laurissa Ash, Bridgette Todd, Betsy Davison^, Nancy Woods*

The Influence of Education and Accountability on Adherence to Standard Isolation Precautions

Background and Significance: Lack of adherence to standard isolation precautions is a universal problem within a variety of healthcare settings. Standard isolation precautions require all hospital staff and recommend that all visitors gown, glove, and perform appropriate hand hygiene. However, it has been observed that healthcare workers and non-healthcare workers entering isolation rooms do not always adhere to these standards. **PICO question:** Will education and accountability increase compliance in gowning, gloving, and hand-washing in isolation rooms? **Methods of Literature Search:** A review of the literature was conducted utilizing PubMed, CINAHL, and Cochrane Database from 2004-2010. A total of sixty-four articles were identified. Eight were found to address the problem and were the focus of the study. The majority were a level IV with a B quality, however the findings were scattered diffusely across the levels of evidence. **Findings from EBP project:** Studies showed that education and accountability are key to improved adherence to standard isolation precautions. Studies also revealed that educated healthcare workers were more likely to comply with standard isolation precautions implying that further education for hospital staff and visitors may indeed prove beneficial in increasing adherence. Further research is needed to confirm these findings. **Recommendations for Practice:** Based on the literature review, there is evidence to support that education and accountability improve adherence. Our recommendation is to increase educational to hospital staff, and encourage accountability regarding standard isolation precaution adherence within the units. Further research should also be conducted to determine the most effective method of achieving compliance and further confirm these findings. **(56)**

Jonathan Yoder, Carl Erikson*

Solar Scholars Project Update

This presentation will cover the work done on the Solar Scholars project as it has moved into its final stages. The group has worked on maintenance and upkeep of the system components in the Clifford L. Jones Solar Pavilion. Work has also been accomplished in training members for future work with the project as well as training Oakes Museum personnel on using the Solar Demonstration Cart during their tours. **(19)**

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