CHRISTIAN WOMEN IN SCIENCE – BIRTH AND PROGRESS

ASA 2014 Annual Meeting
July 26, 2014
Hamilton, Ontario
Lynn L. Billman
Lynn.L.Billman@gmail.com
Five Points.....

- Women in science and engineering
- Christians and science
- Being a Christian woman in science
- Women in ASA
- Christian Women in Science (CWIS) ASA Affiliate
The Good News!

In most fields, women's participation has risen since 1991. Women's participation in science and engineering fields is highest in psychology.

Science Degrees are Encouraging; Engineering Still Lags

Women pursue about 50% of science degrees, but only 20% of engineering degrees (2010)

The Degree-Career Gap

Women hold only 34% of science and 13% of engineering jobs (2010)

What Are S&E Jobs?

**S&E Related**
- Other S&E-related occupation
- S&E technician/technologist
- S&E precollege teacher
- S&E manager
- Mechanical engineer
- Industrial engineer
- Electrical engineer
- Civil engineer
- Chemical engineer
- Aerospace engineer

**Engineering**
- Social scientist
- Psychologist
- Physical scientist

**Science**
- Mathematical scientist
- Computer and information scientist
- Biological/life scientist

Visualization of Degree-Career Data

http://www.census.gov/dataviz/visualizations/stem/stem-html/
The Leader Gap

The Salary Gap

Bars show median salaries for men (blue) and women (pink).

Lines span early-career to late-career salaries.

The Professorship Gap

Women as a percentage of full-time, full professors with science, engineering, and health doctorates, by institution of employment: 1993–2010

Conclusion: Is There Still a Gender Problem in Science and Engineering?

• You can draw your own conclusions from the data.
• Some obstacles are new, but interviews conducted with women scientists in 2004 document that issues from thirty years ago remain, appearing today in somewhat different language, behaviors, and structures.
• Many women who earn PhDs in S&E leave the workforce soon after they begin academic employment

## Scientists and Faith

<table>
<thead>
<tr>
<th></th>
<th>All respondents</th>
<th>Scientists</th>
<th>Evangelical Protestants</th>
<th>Evangelical Protestant Scientists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Respondents-&gt;</td>
<td>9,138</td>
<td>574</td>
<td>2,149</td>
<td>104</td>
</tr>
<tr>
<td>Consider yourself &quot;very religious&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Responding</td>
<td>18.8</td>
<td>15.0</td>
<td>44.1</td>
<td>51.2</td>
</tr>
<tr>
<td>Attend religious services every week/several times a week</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20.1</td>
<td>18.2</td>
<td>42.4</td>
<td>54.2</td>
</tr>
<tr>
<td>Pray several times a day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>26.4</td>
<td>19.1</td>
<td>54.7</td>
<td>55.6</td>
</tr>
<tr>
<td>Read a sacred book every week/several times a week</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17.0</td>
<td>13.5</td>
<td>40.5</td>
<td>46.8</td>
</tr>
<tr>
<td>Know God really exists and have no doubts about it</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>55.5</td>
<td>35.9</td>
<td>87.0</td>
<td>85.3</td>
</tr>
</tbody>
</table>

### Christians and Science

<table>
<thead>
<tr>
<th>Who Would You Consult with a Question about Science?</th>
<th>All Respondents</th>
<th>Scientists</th>
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<td>574</td>
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<tr>
<td>% Responding &quot;Very Likely&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A book written by a PhD scientist</td>
<td>9.6</td>
<td>22.7</td>
<td>8.4</td>
<td>18.3</td>
</tr>
<tr>
<td>A general Internet source such as Wikipedia</td>
<td>29.7</td>
<td>41.0</td>
<td>23.6</td>
<td>33.2</td>
</tr>
<tr>
<td>A scientific magazine, such as National Geographic, Discover, Smithsonian, Popular Science, or Scientific American</td>
<td>16.0</td>
<td>16.3</td>
<td>13.9</td>
<td>12.4</td>
</tr>
<tr>
<td>A person working in a scientific occupation</td>
<td>13.7</td>
<td>27.9</td>
<td>13.5</td>
<td>28.3</td>
</tr>
<tr>
<td>A teacher at a local school or college</td>
<td>8.9</td>
<td>9.0</td>
<td>10.8</td>
<td>5.5</td>
</tr>
<tr>
<td>A friend or family member</td>
<td>14.8</td>
<td>12.1</td>
<td>17.0</td>
<td>6.7</td>
</tr>
<tr>
<td>A religious text</td>
<td>4.5</td>
<td>2.0</td>
<td>10.9</td>
<td>2.9</td>
</tr>
<tr>
<td>A religious leader</td>
<td>4.1</td>
<td>1.6</td>
<td>10.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Other people at your religious congregation</td>
<td>3.0</td>
<td>2.2</td>
<td>6.7</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Is There a Conflict Between Religious and Science Communities?

For me personally, my understanding of science and religion can be described as a relationship of...

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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conflict -- I'm on the side of religion</td>
<td>13.9</td>
<td>3.3</td>
<td>29.4</td>
<td>13.7</td>
</tr>
<tr>
<td>Conflict -- I'm on the side of science</td>
<td>12.9</td>
<td>21.4</td>
<td>1.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Independence -- they refer to different aspects of reality</td>
<td>35.0</td>
<td>34.9</td>
<td>21.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Collaboration--each can be used to help support the other</td>
<td>38.3</td>
<td>40.4</td>
<td>48.4</td>
<td>72.5</td>
</tr>
</tbody>
</table>

Another View of the “God” Gap

83% of the public believes in God, but only 33% of scientists

Religious Belief Among the General Public and Scientists

- % Who believe in God: 83%
- % Who don’t believe in God, but do believe in a universal spirit or higher power: 18%
- % Who don’t believe in either: 41%
- % Don’t know/Refused (VOL.): 1%

Being a Christian Woman in Science: The Challenges (Anecdotal)

- Your husband has a job opportunity on the other side of the country, so you quit your job and start over.
- You’re starting a family, can’t afford decent child care, so quit your job.
- Secretly you’d like to use your hard-earned science or engineering BS degree, but social pressures (family, friends) convince you to stay home.
- You’d rather stay home with kids, but afraid of re-entry issues, you continue, with all the stress.
- You choose to work while you have your family, but your employer is not family-friendly, so you take minimal time off with each birth and are incredibly stressed.
- You take a mommy break and suffer when attempting to re-enter career.
Being a Christian Woman in Science: The Positive View

• So whether you eat or drink or whatever you do, do it all for the glory of God.” -- St. Paul, 2 Corinthians 1:20

• There is neither Jew nor Gentile, neither slave nor free, nor is there male and female, for you are all one in Christ Jesus. – St. Paul, Galatians 3:28

• If we’re going to out-innovate and out-educate the rest of the world, we’ve got to open doors for everyone. We need all hands on deck, and that means clearing hurdles for women and girls as they navigate careers in science, technology, engineering, and math.-- First Lady Michelle Obama

• ASA and CWIS!
First ASA Convention (1946)
Another Early ASA Convention (1948)
## Women in the ASA

<table>
<thead>
<tr>
<th>Category</th>
<th>As of 6-1-13</th>
<th>As of 7-10-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members: Male</td>
<td>1450</td>
<td>1438</td>
</tr>
<tr>
<td>Members: Female</td>
<td>320</td>
<td>401</td>
</tr>
<tr>
<td>Women as % of Total Members</td>
<td>18%</td>
<td>22%</td>
</tr>
<tr>
<td>Fellows: Male</td>
<td>167</td>
<td>171</td>
</tr>
<tr>
<td>Fellows: Female</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Women as % of All Fellows</td>
<td>12%</td>
<td>11%</td>
</tr>
</tbody>
</table>

Source: ASA member database as of 7/10/14
Women on ASA Council

- ASA Council has five members, rotating one per year
- No women on ASA council before 1983.
- Since 1983:
  - For 23 years – one out of five
  - For 7 years – two out of five
  - For 1 year – three out of five
What is CWIS?

• A place for Christian Women in Science to connect with like-minded people
• An affiliate group of the American Scientific Affiliation (ASA)
• Birth: July 2013 ASA Annual Conference
• Mission: To encourage Christian women of all ages to pursue, sustain, and grow in a career in science, technology, engineering or math, and to encourage women in these endeavors to pursue, sustain, and grow in the Christian faith.
How to Find CWIS

• Webpage:  http://network.asa3.org/group/CWIS

• Facebook:  https://www.facebook.com/ChristianWomenInScience

• Email:  CWIS.ASA@gmail.com
Facebook – Please Like Us!
Christian Women in Science (CWIS) is an affiliate group of the American Scientific Affiliation (ASA). Founded in 1941, ASA is an international network of Christians in the sciences. The mission of CWIS is to encourage Christian women of all ages to pursue, sustain, and grow in a career in science, technology, engineering or math, and to encourage women in these endeavors to pursue, sustain, and grow in the Christian faith.

"If we're going to out-innovate and out-educate the rest of the world, we've got to open doors for everyone. We need all hands on deck."
CWIS Board of Directors

• Seven women, coast to coast
• Secular academic, Christian academic, government research
• Early career, mid-career, retired
• Members, 2013-2014:

- **Dr. Gayle Ermer**, engineering, Calvin College
- **Dr. Beth Kroa**, chemistry, Bethel College (IN)
- **Dr. Ann Marie Thro**, plant breeding and genetics, USDA
- **Ms. Faith Tucker**, physics/astronomy education, Valley Christian High School
- **Dr. Kristen Tolson**, biology, UC San Diego
- **Dr. Leslie Wickman**, astronomy, Azusa Pacific University
- **Ms. Lynn Billman**, chemistry and energy analysis, National Renewable Energy Lab (retired)
CWIS Charter, Publicity

Charter: Christian Women in Science
Revised August 12, 2013

Christian Women in Science is a fellowship of women in science and related disciplines who share a common fidelity to the Christian faith and a commitment to integrity in the practice of science. Christian Women in Science was founded in July, 2013.

Mission
The mission of Christian Women in Science is two-fold:

- To encourage Christian women of all ages to pursue, sustain, and grow in a career in science, technology, engineering or math, and
- To encourage women in these endeavors to pursue, sustain, and grow in the Christian faith.

Stakeholder Communities

Christian Women in Science
A Place to Connect!

JOIN US FOR -
E-MAIL BUDDIES
Students, those just starting their career, or those further along can ask questions and seek advice from a Christian woman involved in STEM.

BLOGGING
If you have something to share, or have found a good article related to our goals, please share it on our blog page.

HELP FOR STUDENTS
Students and early career women have unique needs. Contact us.

The How, What’s and Why of CWIS

Christian Women in Science (CWIS) is an affiliate group of the American Scientific Affiliation (ASA). Founded in 1941, ASA is an international network of Christians in the sciences. The mission of CWIS is to encourage Christian women of all ages to pursue, sustain, and grow in a career in science, technology, engineering or math, and to encourage women in these endeavors to pursue, sustain, and grow in the Christian faith.

How CWIS?
We want to support our CWIS members, whether student, early career mid-career, or the veterans who have been in the trenches a long time. Do you have a problem? Question? Need some advice? Send your questions to: cwis.asa@gmail.com

Why CWIS?
Take a look at our logo. You will see the three-way intersection that is the focus of CWIS - women, faith and science. Woman with a passion for...
What Does CWIS Offer You?

- For CWIS members
  - Emails on what’s new
  - Access to others CWIS-ers throughout the country through the ASA membership directory

- For all CWIS-ers
  - Blog space dedicated to CWIS topics
  - Email Buddy program – especially for Students and Early Career
  - Lifting Up Stories
  - Personal help from CWIS leaders (Board)
  - Info and informal partnerships with related organizations
  - Connections and encouragement!
Homage to Mary Anning

Posted By Alice C. Linsley. Wednesday, May 21, 2014

Today’s Google Doodle pays homage to one of the great women in Science, Mary Anning.

Mary Anning (1799-1846) by the age of 12 had already discovered in rocks of the English countryside fossils that she would later describe as a plesiosaur. She spent more than 30 years collecting and describing fossils mostly in rock of Jurassic age. Anning along with William Buckland, who was well aware and an admirer of Mary’s work and described the first true dinosaur, and Cuvier who described and wrote about dinosaurs were instrumental in developing a picture of life in the Jurassic. It eventually lead to Cuvier’s specific proposal that there had been an “age of reptiles.” This was a time when reptiles would have been the dominant animal in all places on earth versus the mammals that we have today. Like the discovery of deep time itself over the previous century this idea of earth’s changing biota over time presented a major challenge to established ideas of creation (Read more...)
Mayim Bialik On and Off the Screen

Posted By Alice C. Linsley, Monday, May 26, 2014

Mayim Bialik earned her undergraduate degree and a PhD in neuroscience from UCLA and plays a neuroscientist on *The Big Bang Theory*. She minored in Jewish Studies and Hebrew. She spoke at Boston University’s Graduate Women in Science and Engineering luncheon May 17.

There were many fans of the popular nerd-centric TV sitcom *The Big Bang Theory* at the BU Graduate Women in Science and Engineering (GWISE) luncheon Saturday with guest Mayim Bialik, who plays a neurobiologist on the show. But the 50 or so students and professors at the event, hosted by Beverly Brown, GWISE advisory board member and wife of President Robert A. Brown, also appreciated Bialik’s lesser known bonafides—she holds a doctorate in neuroscience and is a champion of science, technology, engineering, and mathematic (STEM) education for girls.
Talking Science and Bible with Prisoners

Posted By Alice C. Linsley, Saturday, May 17, 2014

Multiple security doors separate prisoners from the outside world.

"I needed clothes and you clothed me, I was sick and you looked after me, I was in prison and you came to visit me." -- Jesus Christ (Matthew 25:37)

Alice C. Linsley

There are 14 women in the Saturday afternoon Bible study at the local prison. This is not a Bible study in the traditional sense.
Lifting Up Story Examples

Lifting Up – Dr. Pat Fitzgerald-Bocarsly

Dr. Patricia (Pat) Fitzgerald-Bocarsly is a tenured professor at the New Jersey Medical School at Rutgers University. Andrew Bocarsly, also a scientist, have raised three children; one currently is a graduate student in science, another is in graduate school in social work, and the third is an undergraduate in chemistry. Pat has long been a supporter of women in science, and recently discovered the American Association for the Advancement of Science. See more about Pat at her profile in the ASA membership directory.

Why are you a Christian? While I was raised nominally Christian, being a Christian is not an intellectual solution -- God reached out to me and has been incredibly faithful. My husband and I met at Undergrads; he came from a Jewish background, and we talked about Jesus.

Why are you a scientist? I’ve always been fascinated with science from a first grade salt crystal experiment. In my first research lab things was my passion. I loved getting the data and discovering so have those “aha!” moments with my grad students. Biomedical science was where I was in my career as a physician, and it seems I’ve always been intered in viral immunology.

Lifting Up – Dr. Deborah Haarsma

Dr. Deborah Haarsma serves as President of The BioLogos Foundation, a position she has held since January 2013. Previously, she served as a professor and chair of Physics and Astronomy at Calvin College in Grand Rapids, Michigan. Deb has long been a supporter, presenter, and contributor to the American Scientific Affiliation (ASA). See more about Deb at her profile in the ASA membership directory.

Why are you a Christian? While I grew up in a Christian home, I am a Christian today because I made an adult choice to follow Jesus. I committed and recommitted my life to Christ multiple times through my childhood and young adult years, as I grew to understand God, the Bible, and my need for Christ more deeply. Every day is still a journey where I need God’s grace and forgiveness.

Why are you a scientist? I almost wasn’t. I grew up loving piano and classical music as well as science and math. I even did a double major in piano and physics, before deciding to pursue a science career. (I continued piano on the side, of course -- it’s a lot easier than doing physics on the side!) In college, I remember lab projects where our group collected data, graphed it, and plotted the theoretical prediction over the data, and -- lo and behold -- it fit! I am still amazed every time I see physical theories, developed by human reasoning, accurately describing the real world that God created. In grad school, I decided to specialize in astrophysics because I was fascinated by the extreme physics out there in the universe that we can’t replicate on earth, like
CWIS Informal Partners

- The Well at Intervarsity, and the Dear Mentor column
- Association of Women in Science
- Huffington Post “Girls in STEM” program
- MentorNet
- Christian Women in Medicine and Dentistry
- And more
CWIS – Who Are We? – 118 Members

By Highest Degree
- PhD: 65.47%
- MD: 8.7%
- D Educ: 1.1%
- M Div: 3.2%
- Masters: 1.1%
- Bachelors: 8.7%
- Other: 28.5%
- None/Student: 6.5%

By Membership Type
- Regular: 61.52%
- Student: 43.36%
- Family: 8.7%
- Family: 1.1%
- Retired: 5.4%
- Newsletter: 2%

By Profession
- Education/Christian: 22.44%
- Industrial Research: 6.12%
- Government Research: 4.8%
- Engineering: 3.6%
- Other Profession: 4.8%
- Computers: 4.8%
- Retired: 1.2%
- Medical: 2.4%
- Medical: 2.4%
- Education/secular: 2.4%
- Other Profession: 2.4%

Source: ASA member database as of 7/10/14
Christian Women in Science

By Technical Discipline

- Biology
- Chemistry
- Engineering
- Physics
- N/A
- Psychology
- History of science
- Ecology
- Astronomy
- Geology
- Physical Science
- Other
- Mathematics
- Medical
- Anthropology
- Zoology
- Education
- TBD
- Science and religion
- Meteorology
- Agriculture
- Computer Science

By Location

- Alabama
- Alberta
- British Columbia
- California
- Colorado
- Connecticut
- Delaware
- District of Columbia
- Florida
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Maryland
- Massachusetts
- Mexico
- Michigan
- Minnesota
- Nevada
- New Jersey
- New York
- Ohio
- Ontario
- Oregon
- Pennsylvania
- REPUBLIC of GAMBIA
- Tennessee
- Texas
- UNITED KINGDOM
- Virginia
- Wisconsin

Source: ASA member database as of 7/10/14
Some Questions We Wrestle With

• What are the needs of Christian women in science, and how can we help meet them most effectively (with no budget)?
• How do we better facilitate connections and fellowship among Christian women in science?
• How should CWIS encourage or help women who are discouraged from pursuing an S&E career?
• Should ASA/CWIS set up a member database for Buddy matching, with information such as marriage, children, age, etc?
• Should CWIS solicit grants to conduct data surveys for research? E.g., reasons Christian women don’t pursue or drop out of college or career, document specific challenges Christian women face in science/engineering, etc.
What Does CWIS Need From You?

- Your ideas: Join us Sunday, 8:30 pm, Rm 1009 MDCL – or write/email us comments at my email or cwis.asa@gmail.com
- Writers to contribute CWIS blog articles, Facebook finds
- Women to offer, or solicit/write, Lifting Up Stories
- Maintain the website
- Women to be Email Buddies
- A couple new members for the Board of Directors
- Someone to organize a special CWIS activity for the 2015 ASA Conference – workshop on starting family and career
- Co-authors for Huffington Post blog articles on CWIS
- Speakers to organize/offer webinars
- Enthusiastic, creative people to help increase our membership and influence
And Helping ASA Helps CWIS—And You!

- ASA/CSCA Newsletter editor(s)
- Homeschoool project leader
- Website updates (Daily news, LinkedIn, Facebook, Obits)
- Blog and Forum champion
- Local chapter coordinator
- Book review writer and subject area book review editor
- Your own local chapter support
THANKS!

Lynn L. Billman

Lynn.L.Billman@gmail.com