

Ontario Network of Women in Engineering (ONWiE) Summit Report

held November 20th 2015

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2015 Summit

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ONWiE is committed to:

COLLABORATING

ONWiE members and supporters work together to improve the participation rate of females as students and professionals in engineering in Ontario.

ENGAGING

Through programs such as Go ENG Girl, Badge Day and AWESome lectures, ONWiE members engage girls and young women in hands-on activities and introduce them to engineering profession.

SHARING BEST PRACTICES

Through communication of best practices and opportunities around mentorship, communication materials and assessment strategies.

PROVIDING OPPORTUNITIES

By offering opportunities for participants to network and to share information and available resources related to women in engineering.

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Hosted by Mary Wells, PhD, P.Eng. (ONWiE chair)
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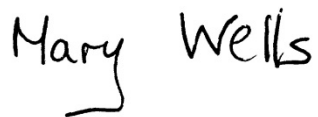
Dear ONWiE members and guests,

This document represents a harvest of the ideas that we uncovered together during our first-ever ONWiE summit held at the University of Waterloo on November 20th, 2015.

By exploring the three prompts together: ‘What’s Working and Why?’ ‘What’s Still a Challenge and What Would Make a Difference?’ and ‘What is Happening in 2025?’ we discovered the many areas in which we share a common vision for the future of diversity in engineering and many opportunities to work together on our way to this goal.

Through the ideas captured in this document and the common ground we have established, we can continue to move forward. Thank you for your commitment to promoting girls and women in engineering.

Sincerely,

A handwritten signature in black ink that reads "Mary Wells". The signature is written in a cursive, slightly informal style.

Mary Wells, Ph.D., P.Eng., ONWiE Chair

March 2016

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What's working? And why?

Summary

There was general agreement on what is working well, with widespread agreement on the following:

Hands-on activities in an all-female space - and intervene early

Given the chance to try it for themselves in a safe, supportive environment, girls gain confidence in activities connected to engineering (designing, building, trying things out). Intervening early - before girls have time to count themselves out - is another key. Lots of variety in the activities.

I can be what I can see

Whether meeting them on campus or in classrooms in local K-12 schools, female undergrads are a powerful force for influencing through the power of in-person role models. Girls can more easily see themselves in those roles, as they are relatable, positive, great presenters. Using a diverse group of female engineering students ('near-peers') shows a welcoming inclusive environment.

Parents as partners

One of the most unique advantages of ONWiE programming is the engagement of parents as partners in guiding young girls past stereotypes and self-imposed limitations and into a mindset of possibility around a career in engineering.

Creativity, teamwork and engineering as a helping profession

Giving girls the opportunity to work together, dream up something new, and see examples of the social, environmental and humanitarian-related implications of engineering, and positioning it as a caring, 'helping' profession is a very effective way to capture their interest.

Tapping into fun, passion, underlying motivation and enthusiasm

When contemplating their future, girls enjoy the chance to imagine not just a job, but the life they will have and how they will feel about it. Asking them what they love to do and sparking to their emotional side helps them see how engineering could be a part of that life. Storytelling is an important tool in 'painting the picture' for the girls, and doing so in a way that actively dispels stereotypes.

Linking to a global movement

The W20 girls summit, HeForShe, Because I am a Girl were just a few of the larger efforts aimed at supporting women to achieve greater participation for women currently happening around the world, and ONWiE can tap into that momentum.

Knowledge-sharing and ONWiE support

Building a community and working together on outreach activities were important goals to allow the broader ONWiE group to flourish. Creating community with the local communities in which ONWiE members were located, uncovering advocates for change throughout the community and utilizing two-way communication channels are all important to ensure a healthy, thriving ONWiE.

Retain as well as recruit

Many successful interventions to keep female engineering students from dropping out of their university program (e.g. clubs, study programs, mentors, female faculty members to provide mentorship and further role-modelling) are not only a great way to ensure a supply of outreach volunteers for students but also a key piece of increasing women's participation in the profession.

Other points

Girls are attracted to joint programs and flexibility in their degree choices

High school teachers and guidance counsellors can also be very valuable allies in encourage (or not discourage) girls to consider STEM careers - especially physics teachers. Workshops for teachers are a high-leverage way to transmit the message about engineering to many many students.

Girls can also gain confidence by presenting about their experiences upon return to their home classrooms. Undergrads can present interesting projects they're doing: e.g. UROP at U Ottawa

Top opportunities from the ‘What’s Working?’ Section

Short term

- How can we raise the bar on physics teachers? Annual prize to a physics teacher in Ontario that does an awesome job engaging students and linking the importance of physics to engineering
- How can ONWiE members utilize consistent messaging, co-ordinate and share - best practices around diversity?
- How can we leverage the presence of other student clubs on campus (e.g. EWB, WISE, Solar Car, etc)?

Longer term

- What are some good ideas for managing parents’ influence in a positive way?
- What are ways in which high school teachers can improve the effectiveness of ONWiE’s efforts?
- What are ways to update engineering student culture to be more inclusive?
- How are ONWiE members using social media together effectively? What more could they do?
- How can engineering outreach draw from other fields (including cognitive psychology)?

What's still a challenge? And what would help?

Summary

The following challenges were identified by ONWiE members in their outreach work to girls:

Combating Prejudices and Stereotypes

Despite progress on inclusion and improving young women's confidence, persistent negative attitudes and stereotypes persist. Even once included in engineering design teams at university for example, young women are often assigned a 'secretary' role. Much of this attitude is held by an older generation and connected to broader engineering culture/culture in general.

Disrupting Male-only Culture

The engineering culture shows up as macho, militant, and rewards and values competitive, aggressive behaviour. Some male students demonstrate increasingly rude behaviour which is difficult to counter; their attitudes toward women shape those women's experience, confidence and success. A change in industry culture may help address this gap.

Getting good Information about Careers in Engineering

Any messages that ONWiE is able to send through their outreach must compete with other persistent, contradictory messages. Explaining engineering when it's so broad is one challenge, as is demonstrating societal impact when it's not obvious for every discipline/path. Mis-information on engineering and lack of information on what engineers do are two uphill battles with youth audiences.

Leveraging the Power of Stories

Sending positive messages through story-telling is widely agreed to be an effective approach. Finding role models and volunteers willing to share their stories in a powerful and inspiring way is a challenge; one idea is to tap into alumni networks for examples of successful women engineers to profile.

Improving Public Portrayals through Media

There's a near-complete lack of portrayal of engineers in the media, and few opportunities for youth to educate themselves on engineering through job shadowing, ads on TV, etc. Getting the message to youth who are not already members of 'engineering families' who are pre-disposed to this information anyway is very challenging. More profiling of women, or positive portrayals of women as engineers in popular culture would be helpful. Leveraging celebrity endorsements from successful STEM women may help bridge this gap. Closer to home, more women in upper management, leadership and positions in academia can act as role models and mentors.

Showing Engineers are World-Changers

The appeal of engineering increases dramatically when branded as a 'caring' profession. While links between societal problem-solving and physics (for example) can be hard to show, offering meaningful electives and options in engineering programs helps underline these connections. Ideally, outreach activities and courses that include social impacts reinforce the message and strengthen the narrative of engineers as caring societal problem-solvers serving the public good and taking care of society.

Removing Barriers to Entry

As a matter of fairness and social justice, the engineering profession needs to recognize and reduce barriers for oppressed populations and marginalized people, including additional barriers for trained female grads. One example of barriers at the outreach activity level is the prevalence of competitions which may not appeal to girls and send the message that engineer is competitive, adversarial, scary, etc. From the youth audience side, a generation gap where youth are accustomed to highly sophisticated media and have short attention spans, making them harder to engage and influence.

Instilling a Positive Mindset

Overall, the experience engineering-related subjects for girls is intimidating and makes them feel like they "can't do it". Removing negative influences from the environment, talking openly about what kind of marks you need (to remove the perception 95%+ marks are needed), and about peer influences are all important ways to shift this default negative mindset. Linking engineering to existing interests can help spark inspiration and overcome intimidation. An approach, or a set of approaches to use when "I can't do math" comes up is helpful for outreach leaders.

Organizing and Delivering Events

Coming up with fresh new activities every year can be very challenging. The activities have to be fun, cool, interesting, adjustable for various grades and feasible to pull off. Disorganized student volunteers affect the participants' experience and overall perception of engineering. Where co-ed outreach programs are offered, there are always unequal gender splits (i.e. more boys); limiting registration to achieve 50-50 does work.

Activating Educational Allies

There are currently no 'engineering' classes in the K-12 system; math and science and how they are taught are the proxies for engineering. Their image and appeal is often poor if elementary school teachers do not have a fondness for or ease with those subjects. Better training for teachers, lessons on engineering in the classroom and more information for guidance counsellors could help with this issue. When students are pigeon-holed by teachers it can be hard for them to break out. Ministry of education needs to be involved. Primary school teachers that like math are powerful allies for engineering outreach programs.

Opening up Physics as Gateway

Given that physics is a prerequisite for engineering programs, the physics teachers' skill and enthusiasm is a crucial factor to getting students to apply to engineering. A few approaches are possible: making physics mandatory for all students would be one approach. Working with physics teachers to make the subject more relevant, interesting and inspiring is a major opportunity.

Getting Big Bold Moves

If post-secondary institutions were willing to make a 50-50 gender split in their first year classes mandatory (taking a page from the [recent federal cabinet appointments](#)), things would shift dramatically. Such bold moves require repeatedly stated buy-in from high levels and a willingness to take risks in order to accomplish the goal of better gender-representation in engineering.

Finding Male Champions

Support from faculty members, including more men as advocates for women in engineering and teaching male engineers how to support female colleagues and classmates would be a powerful boost to women in engineering efforts.

Enough People Power

Across the board, ONWiE members face similar logistical challenges: difficulty in getting contacts to respond, getting volunteers, getting enough mentors involved etc. Having sufficient staff support to carry out all of the required activities and dealing with the pressure to 'do more with less' can also be tough. Repeated, consistent buy-in from university leaders is essential.

Creating More Growth

Every year, ONWiE members aim to grow their numbers and reach new audiences within the same geographic boundaries. Advertising and marketing events are opportunities to bring in more participants, as are leveraging local PEO chapters to visit schools. Creating programs for Grade 11 students could increase the total number of participants.

Tools and resources needed

Several specific challenges encountered by ONWiE members: getting support/mentors from faculty with fewer females, lack of networking channels, access to computers and social media.

Engaging with ONWiE

The effectiveness of ONWiE conference calls could be enhanced with the addition of other communication tools. The group is not widely aware of available shared resources (on the ONWiE website for example). ONWiE members would enjoy getting together in person to have group discussions more often (every 2 years). Members would enjoy some impact measurements to help understand which programs are most effective.

Other points

Changing the process for hiring could lead to more female tech instructors, which in turn will lead to higher university enrolment + female eng grad students. Still tough to budge the ~15% women in Mechanical and Electrical disciplines, though other disciplines have improved. It's very tough to track students throughout their educational career - a universal number from K – Post Secondary Education (PSE) would allow much better insights into their choices and analysis of how we can improve gender balance in engineering.

Top opportunities from the 'What's Still a Challenge?' Section

Short term

- How can men actively participate as allies for women in engineering?
- What are the best ways to recruit volunteers, find mentors and deliver events on a set budget? – Ambassador programs
- What examples and messages are available to explain engineering?
- What are the most effective ways to engage with youth audiences?
- How can stories about successful women in engineering be captured, shared and used to open young people's minds to possibilities? – ONWiE ambassadors
- How could Physics teachers be encouraged to create a positive, welcoming experience for all? – Annual physics prize from ONWiE
- How can societal/helping impacts be better understood and explained for all engineering fields?
- What additional communication tools could ONWiE Chair provide to members?
- How can creating high quality new workshop materials and activities be made easier?
- What are the best ways to prepare student volunteers to set a positive impression?
- How can ONWiE leaders contribute to higher profile for members' events?

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- Who are additional partners who can help promote ONWiE events (like PEO) in local communities?

Longer term

- How can stereotypes be dismantled from both sides: about girls/women and about engineering?
- How can women in engineering avoid being pigeon-holed into 'girly' roles in team settings?
- What will shift male students' behaviour and attitudes to be more respectful?
- How can girls and women become resilient to rude behaviour, being stereotyped, etc?
- How can the gender balance in ELEC and MECH engineering be targeted?
- How could ONWiE members reach more non-engineering families in their promotions and outreach?
- Who are dream celebrity endorsements for girls in engineering?
- How can negative mindsets and a lack of confidence in girls toward STEM be overcome?
- How could ONWiE influence and inform guidance counsellors about engineering?
- How can K-12 science teachers be supported to model confidence and inspire in STEM subjects?
- Would university admissions adjust their engineering admissions criteria for better gender balance?
- How can the ROI of improving the gender balance in engineering justify investment in outreach?
- What are some best practices that ONWiE members can use to reduce bias and barriers?

It's 2025 - what's up?

As the last exercise of the day, the group of ONWiE members took some time to create a vision of 2025 - ten years into the future, which is the same amount of time that ONWiE has existed.

There was broad alignment on the following changes as the *ideal* future state (participants were specifically directed not to worry about what is likely, or realistic):

Policy and Government

Our government is now made up of very obvious examples of engineers in politics and key decision-making roles, including the Prime Minister of Canada who is P.Eng. Paid family leave nationally, equal for maternity and paternity leave, and flex time in engineering jobs to accommodate the family responsibilities of those parents. More than 30% of politicians are female.

Equal footing in industry

Across industry, 50% of CEOs/Prez of companies are female and there is now parity in leadership position pay. There has been a shift in workplace culture to allow easy and liquid transition into the workforce, gainful and stimulating opportunities for new grads, and training or mentorship for women and underrepresented/marginalized groups.

Gender Roles Redefined

Broadly speaking, our culture has now embraced a less rigid definition of masculinity and femininity. Understanding that new problems need new solutions, there are no more gender stereotypes or relegating women to 'caring' positions only. There are no more girls/boys toy aisle as kids are encouraging to explore their interests without limitations based on gender.

Women and engineering in the spotlight

Female tech heroes are now normal. Strong female role models redefine stereotypes & create new image of the modern engineer. There is a female engineering superstar who is a role model to girls. Creative girls are encouraged to go into engineering.

Symptoms of the shift

A more playful, esthetic attitude has affected industry; multi-coloured construction equipment can be seen everywhere. 3D printers are common and used regularly to try out new ideas on the fly. Creativity is prized and seen as a necessary accompaniment to technical talent.

Engineering Education Evolved

Engineering Education has evolved tremendously: virtual reality courses are now offered, where courses are organized into a 'choose your own adventure' format.

Engineering is two-year specialization, requiring volunteer or Co-op experience in addition to academic achievement. There is much more flexibility in engineering degree options, with engineering students opting to be artists philosophers as well. There is a Liberal Arts of engineering option available, and there are many more sub-specialities of engineering. Interdisciplinary Projects are commonplace, and engineering is seen as a collaborative discipline, welcoming to all. Student don't need to chose between engineering and other interests.

Information will be presented in problem-based and discovery-based learning formats, and emphasis is placed on achieving competency rather than grade %. Open-ended questions and evaluation of project outcomes with emphasis on 'soft skills' will prepare students to create real-world results. Profs have time to revamp their teaching approaches. Students can plug into the matrix to download knowledge (!) and much of their learning will be done from online sources. Their university courses are exciting and fun.

Confidence and Mindset

All girls feel empowered and supported to do whatever they want to. No more girls saying 'I can't' or 'I'm not good at'. Amongst young people, being involved in STEM makes you cool/popular. Engineering is considered cool and girls are jumping at the chance to participate in STEM programs.

Engineering as service

Engineers focus on human-centred design that is ecologically sound. The CWSE is right in the middle of a second grant to research and develop engineering projects that serve women's interests, e.g. better mammogram machine. Engineering students have global education and internships, have community-based learning experience in each year. All engineers and engineering students incorporate mentorship, volunteerism and giving back in the community. Engineering is seen as the degree of choice to change the world.

Equal (or near-equal) representation

Near-equal participation of female engineering students has been achieved (though numbers quoted were anywhere from 35% to 55%) in each engineering discipline. Similarly, female engineering profs and female Deans of engineering are more common across entire engineering faculties. Parents and teachers encourage girls to consider engineering.

Fame

There is hit TV show with a female engineer as the lead; media representation of women in eng/tech is realistic. There are “celebrity” women engineers and many cool female engineers portrayed in media (real and fictional). Stereotypes about engineering are now passe, and all students know what engineering is because of TV. People think engineering is a good choice for women. More broadly speaking, 50% of movie lead roles are women.

Financial backing

There is funding available for research on factors driving female participation in engineering scholarship for female students, esp for female international students. Tuition is free for engineering degrees, eliminating the cost barrier and allowing affordable access to education, providing access to marginalized populations. There is ‘unlimited money’ for ONWiE activities.

K-12 Education

ONWiE members hold a Teacher workshop day to talk about What is engineering? and provide them with an experience of the profession. Events targeting grade 11 girls provide more focus on next steps. Throughout K-12 grades there is a focus on STEM literacy and a clear curriculum to teach engineering at elementary and high school, with backing from the Ministry of Education. There is a focus on engineering instead of math and science, and high school courses are taught in clusters. ONWiE regularly meets with guidance counsellors to keep them updated on latest developments.

Future of ONWiE

Two distinct potential scenaria for the future of ONWiE and other organizations like it: either it no longer exists as it is no longer necessary or it has evolved and grown beyond its current mandate. ONWiE as a global organization that is consulted on how to achieve gender balance.

Collaborative groups that currently promote gender equality will be able to focus their attention on other things. Universities will focus support on all student successes not so much on awareness or gender specific effort.

A Sustained Driving Force

There is a broader engineering movement - a cohesive, resilient, evolving one - that involves industry, academia and other organizations helping to redefine role of the engineering profession in a post oil/heavy tech/manufacturing economy. Engineers are now a major driver - in collaboration with others - to solve world's most pressing problems.

Student involvement

Students refer to themselves in the technically correct form: I'm an engineering student not I'm an engineer. Student see themselves as Ambassadors to engineering, and visit primary and secondary schools to represent engineering.

Top opportunities from all exercises

Shorter term

- How could ONWiE highlight areas of natural fit between women and engineering, e.g. both are community-builders?
- What are some ways to portray the extreme flexibility of the engineering degree?
- In explaining engineering, could a definitive definition be helpful?
- Who are other stakeholders interested in this problem and how can ONWiE maximize their contributions?
- Could ONWiE run a series of events, not just one?
- What can we learn from organizations and professions with natural gender-balancing features (e.g. EWB)?

Longer term

- How can ONWiE events catalyze spark and passion for engineering in girls?

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- How could ONWiE members understand ethnic and cultural factors: stereotypes and how they affect performance and put strategies in place to avoid them?
 - Could ONWiE members also retain and support current engineering students?
 - What are the best ways to manage perception of engineering work?
 - How to speak effectively to many audiences?
 - How to overcome parental disinterest in STEM?
 - Can ONWiE work with Guidance Counsellors become effective ambassadors for engineering? - (perhaps through Regional dialogues or OSCA)
 - What are way to achieve buy-in from faculty and administration?
 - Does outcome-based accreditation present an opportunity to shape curriculum that welcomes girls?
 - What would reshape 'women's role' in culture/mindset?
 - How can we send key messages to the parents about engineering?
 - How can students engage to lead their own learning during workshops?

Next steps

Several points emerged as follow-up actions:

1. Repeat this exercise. The post-it note technique creates engagement and can be used to get input across broader audiences at ONWiE member schools.
2. Reduce stereotype threat from teachers and faculty. Given the compelling evidence around performance gaps in girls being caused by situational factors, ONWiE members can act to leverage these research findings to make GoENGGirl, GoCODEGirl and Badge Day events extra welcoming and supportive environments for girls.
3. Solve the boy problem. Most ONWiE members reported being asked 'Why can't boys participate?' by parents. A strategic response would allow them to respond effectively.

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4. Tapping into global/broader movements (#HeForShe, #GuysforEquality, #PledgeforParity, etc) can help ONWiE members find allies outside of engineering and encourage a broader shift that model respect for women. Create affirmation for (male) engineering students, given men the chance to 'step up their game'.
 5. Common messaging. ONWiE members are interested in using common messaging to convey engineering more effectively in workshops and to get the message out there into the community.
 6. Common materials. Could ONWiE members share resources in order to keep materials fresh and high-quality? Leverage the ONWiE website and other assets, for story-telling to change perceptions and for promotion. Put together youtube for ONWiE, make playlists. Have universities show women in marketing materials.

I'd like to contribute to ONWiE

Some ONWiE members offered up specific resources and examples to the group. Their school is in brackets, beside the description of what they are offering:

Link culture shift to orientation activities (York)

Go ENG Girl Jr (UOttawa)

Platform for cyber-mentoring (U Calgary)

Website for girls by girls (Ryerson)

High school engineering - arts camp this summer. Pam (pam@aesstaff.ca) (UOttawa)

Model for engaging guidance councillors (Ryerson)

Target diverse populations:UOttawa, UMan CREATE, Queen's Access to Aboriginal, Laurentian

Anything immediate we can do to remove identity threat for women? (Edwin, UW)

Utilizing students (Difference Makers program) ([U of Ottawa](#))

Upcoming events

The following events were flagged as opportunities to

Already happened: Get Steve Spencer to CODE in January, CAN-CWIC Conference
Ottawa - Jan 22 - 23 2016

CCWESTT May 3-6 2016 Ottawa - ONWiE could suggest a workshop?

Could ONWiE also be present at OUF?

CDE by CFES is now an annual event - represents an additional opportunity for ONWiE

Next ONWiE summit

Suggested date was June 2017

Invite OEC or CODE along to the next ONWiE summit?

Thank you to all ONWiE members and guests for your participation!

LIST OF ATTENDEES

First name	Last name	Organization
Mark	Abbott	EWB
Lauren	Briens	Western University
Karen	Cain	Conestoga College
Iwona	Centurami	McMaster University
Karen	Chan	OSPE
Scott	Compeau	Queen's University
Valerie	Davidson	Founding Chair of ONWiE
Lynn	Dony	University of Guelph
Amy	Gaukel	York University
Chanel	Ghazzawi	AIA Canada
Zoey	Gould	Engineers of Tomorrow
Claire	Heymans	University of Waterloo
Shari	Hodges	Ryerson University
Anna	Kaur	York University
Pamela	Lee-Shanok	University of Ottawa
Lauren	MacWhirter	McMaster University
Catherine	Mavriplis	U of Ottawa
Lesley	Mounteer	Western University
Natasha	Palmer	UBC (eng-cite)
Alex	Porco	McMaster University
Josie	Pynadath	Engineers of Tomorrow
Martin	Scherer	University of Waterloo
Jacqueline	Stagner	Windsor University
Marisa	Sterling	York University
Ramesh	Subramaniam	Laurentian University
Qiao	Sun	University of Calgary
Edwin	Tam	Windsor University
Mawuena	Torkornoo	Carleton University
Ana Luisa	Trejos	Western University
Michelle	Tsui-Woods	UOIT
Jing	Ren	UOIT
Carm	Vespi	McMaster University
Mary	Wells	ONWiE Chair
Rohini	Wittke	ONWiE Coordinator
Gayathry	Wright	York University
Nika	Zolfaghari	Ryerson University



AGENDA

Time	Program	Location
Thursday November 19, 2015		
1:00 pm	Go CODE Girl workshop	E5-2004
5:30 pm	Dinner	University Club
Friday, November 20, 2015		
8:30 am	Breakfast and networking	E5-2004
9:00 am	Mary Wells – Welcome	E5-2004
9:30 am	Val Davidson – Founding Chair of ONWiE Group Activity – Erica Lee Garcia to Facilitate	E5-2004
11:00 am	Coffee Break	E5-2004
11:30 am	Catherine Mavriplis – NSERC Chair	E5-2004
12:00 noon	Steven Spencer – Professor of Psychology - Creating a Culture of Respect: Undermining Stereotypes about Women in Engineering	E5-2004
12:45pm	Lunch	Student Design Centre
1:45 pm	Talk on Messaging by Engineers of Tomorrow	E5-2004
2:00 pm	ONWiE over the next decade Workshops/discussions	E5-2004
4:30 pm	Wrap up and Vote of thanks etc. – Mary	E5-2004