

# EDUCATION WORKSHOP

## WHEN AND WHY DO CHILDREN MAKE STEM CAREER CHOICES?



### With

an eye to the promotion of Science, Technology, Engineering and Mathematics (STEM) in schools and higher education, EPCA organized this workshop with representatives from the Young EPCA Think Tank (YETT), the Belgian Foundation "Entreprise/Institut", academia, and Borealis, an EPCA member company. The workshop looked at what needs to be done to encourage more students to pursue STEM careers, and at what is already underway.

For several years now, EPCA has been promoting STEM to attract more talented girls and boys to join the chemicals industry, explained Wouter Bleukx, the EPCA YETT chair, and Business Unit Manager Vinyls, for Ineos Chlorvinyls. Introducing the workshop, he said EPCA had collaborated with Unesco

and the European Schoolnet to produce two videos to promote the industry and careers in the sector, and to organize a students' workshop in 2011 and a teachers' workshop in Berlin in 2013.

In 2012 and 2013, EPCA also sponsored kids' marathons respectively in Budapest and in Berlin promoting STEM among children, their parents and teachers. EPCA has also invited XperiLAB.be® to its 2014 Annual Meeting in Vienna. This learning vehicle is designed to give children a chance to explore science and scientific methods first hand.

### CLOSING THE STEM SKILLS GAP, INCREASING STEM ATTRACTIVENESS

Workshop chair, Marc Durando, executive director of European Schoolnet, started the session by pointing out that there are skill shortages in almost all science and technology jobs, including ICT (Information and Communications Technology). There are not enough mathematicians or physicists, and too few maths and physics teachers

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in many countries. The percentage of girls choosing STEM studies also remains far too low. To address these shortages, it will be necessary to increase the attractiveness of STEM studies in Europe, which will need new teaching approaches and better career prospects – compared to other sectors – and better communication about STEM careers. Making all these things happen will require significant and coordinated effort on the part of all stakeholders – from industry, from the education sector and from governments.

Durando said research suggested Europe currently needs an additional 850,000 STEM graduates and that the skill short-

age amounted to billions of euros in lost revenues. Furthermore, with an ageing workforce – where 20% of engineers are currently over 55 years old – the skills gap is likely to worsen if it is not addressed. If the situation is to change, Durando said, STEM teachers need to be better motivated and get more recognition. They also need new, improved teaching tools, more creative lesson content, and other resources. Industry must also play a more active role to ensure it is better engaged with education, to provide role models, to link with teachers, and to better explain the career prospects for STEM graduates.

### WINNING HEARTS AND MINDS FOR STEM AT AN EARLY AGE

At the UK's University of York, the Centre for Industry Education Collaboration (CIEC) has been studying when and why children and young adults choose STEM careers. Director Joy Parvin told the workshop about the results of research in the UK, but suggested they reflected global issues relating to STEM recruitment. Although there has been a slight increase in 16-18 year olds choosing to study maths and sciences at Advanced Level, with the exception of maths at 11%, uptake for STEM subjects ranges from about 1% to 8%. However, the figures also show that apart from chemistry – where students are split equally between boys and girls – boys dominate among maths, physics and computing students. Sadly, few of the girls who choose chemistry go on to work in the industry.



**JOY PARVIN**  
 Director of CIEC Promoting Science,  
 UNIVERSITY OF YORK (UK)



**WOUTER BLEUKX**  
 Chairman  
 EPCA YETT  
 and Business Unit Manager Vinyls,  
 INEOS CHLORVINYLs



NMS  
 Jakob Thoma  
 Mödling  
 4a  
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**MARC DURANDO** Executive Director, EUROPEAN SCHOOLNET | **JOY PARVIN** Director of CIEC Promoting Science, UNIVERSITY OF YORK (UK) | **GERARD COBUT** Project Manager, XPERILAB.BE© | **LINA NEUNER** Chemistry Teacher, KLOSTERNEUBURG INTERNATIONAL SCHOOL | **EVA PFANZELTER** Senior Communications Specialist, BOREALIS POLYOLEFINE GMBH



LINA NEUNER, EVA PFANZELTER

Parvin said research into 9-14 year olds indicates that initial enthusiasm for STEM subjects is largely dissipated by age 14 as students find lessons uninspiring and disconnected with everyday life, although 45% still enjoyed the practical side of school science. The CIEC director said that while 52% of 9 year olds have a firm idea of what career they'd like to pursue, only 6% said becoming a scientist and of these 72% were boys.

Changing these trends will require much closer collaboration between schools and industry, Parvin said. Science-based industries need schools – teachers and students – to gain a much better understanding of what they do and the careers they offer. Better teacher training and resources and industry-focused and problem-solving lessons, complemented by site visits by students or school visits by industry ambassadors, create role models and a much more positive and attractive

image of STEM industries in the minds of children, she explained. Meeting women in science-based industry and jobs will also influence the career choices of girls.

#### **XPERILAB.BE® – TAKING STEM TO THE STUDENTS AND COMMUNITIES**

For the past four years, a specially designed truck – XperiLAB.be® – containing an experimental laboratory has been visiting local communities across Belgium and beyond to encourage 10-14 year olds to choose STEM subjects at senior school level. With official approval from all three ministries of education and support from Solvay (an EPCA member company) and other partners, XperiLAB.be® hosts about 450 groups and about 10,000 children a year. This October, it was parked up in Vienna beside the hotel where EPCA's annual meeting was held.

Gerard Cobut, the XperiLAB.be® project manager, says the science truck gives chil-

dren the chance to carry out hands-on experiments, arousing their curiosity and giving them a sense of discovery and the potential of science. "We're not teaching them with XperiLAB.be®. That's the job of teachers. But the students get a chance to feel what it's like to be a scientist, to wear a lab coat, to use a microscope, and attempt to solve real problems by experimentation," Cobut explained.

Staffed by two "explainers" and a driver, XperiLAB.be® enables children to engage with scientific methods – observing, following instructions, experimenting by doing or making [e.g. toothpaste, air vent rotors], testing hypotheses, and communicating results. "XperiLAB.be® is reliable, beautiful, attractive, and has great on-board IT. We're getting great feedback from the children and on our website, but it's too early to say whether students are choosing STEM careers as a result. But they are certainly leaving XperiLAB.be® happy!" said Cobut.



### **XPERILAB.BE® – HOW THE STUDENTS INTERACT: A TEACHER'S PERSPECTIVE**

Middle and high school chemistry teacher, Lina Neuner, from Klosterneuburg International School in Austria, stressed the importance of XperiLAB.be® in giving children a chance to become familiar with the actual business of doing science. She explained that different children and different groups of children took different approaches to the experiences on offer. For example, some younger children in the 10-11 year age range need more assistance or encouragement from XperiLAB.be® support staff, while older children tend to be more confident.

She said the children have no difficulty following step-by-step approaches to the challenges they face, but sometimes do not read instructions carefully enough and improvise. Some children were discouraged by failure, but others were keen to learn from mistakes or lack of success and to

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try again – which is an important, positive lesson for science. Neuner praised the opportunity for children to practice manual skills – such as transferring liquids using pipettes, fine-tuning microscopes, or cutting, shaping or mixing materials. She recalled watching children experimenting with different shaped paper blades in an effort to get a solar-powered air vent rotor to spin at speed, noting how they tried different weights, delighting in coincidences, and seeing one group use leaf-shaped rotor blades to meet the challenge.

The teacher did not see big differences in the way boys and girls interacted in the mobile lab. Rather, she suggested that a student's relationship with science is personal, noting that XperiLAB.be® gives children the opportunity to demonstrate patience, concentration and logic, and to see connections.

### **BOREALIS – HOW ONE COMPANY IS PROMOTING STEM AND CHEMISTRY TO STUDENTS**

Eva Pfanzelter, senior communications specialist with Borealis Polyolefine GmbH, offered some insights into how the Borealis Group – which produces polyolefins, base chemicals and fertilizers – is working in Austria and beyond to attract talented students into the industry and into the company. She explained how Borealis is doing this by promoting the chemical industry, its products and opportunities in partnership with associated institutions – like EPCA – and by communicating the group's own brand values as an employer and chemicals producer.

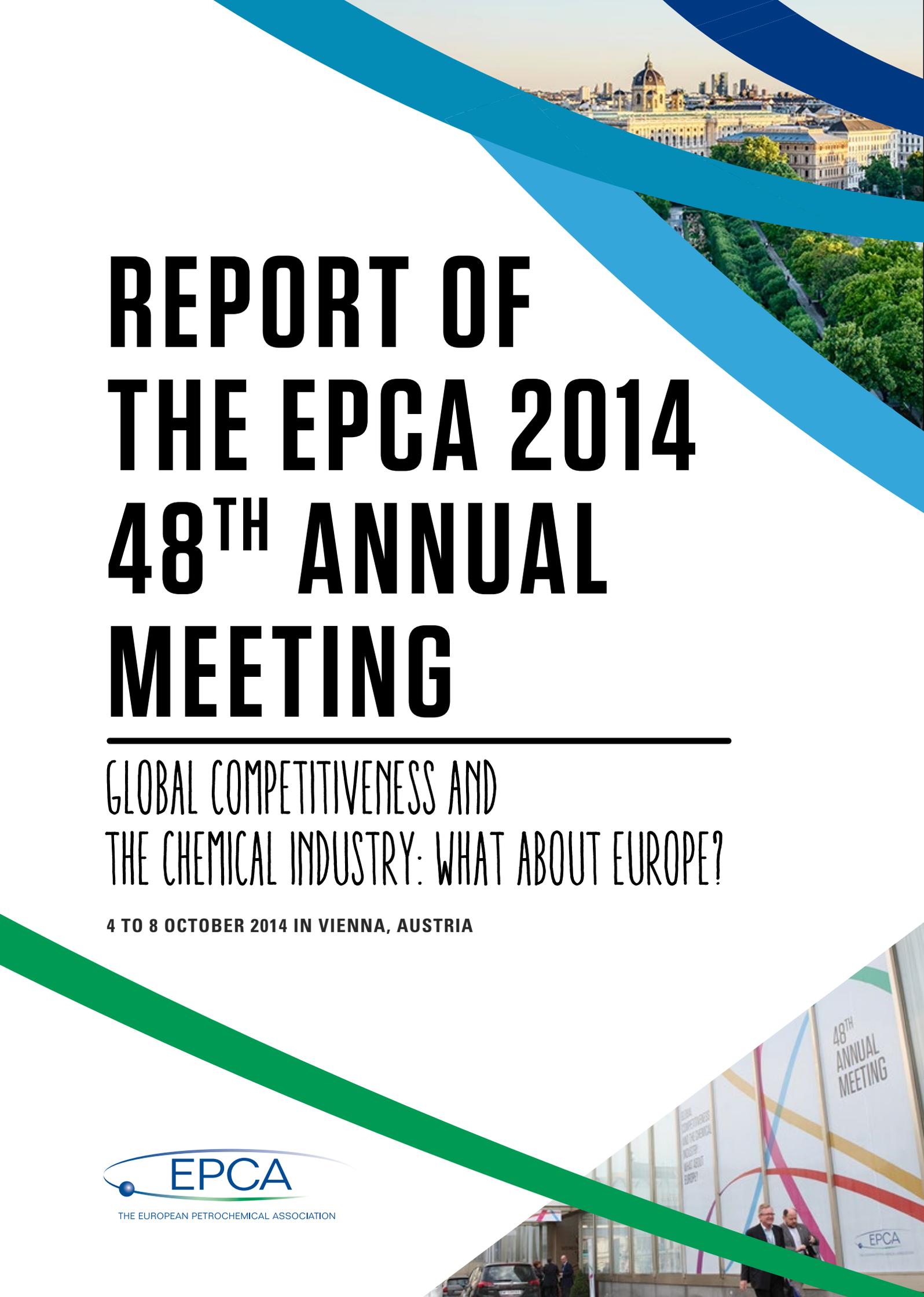
In Austria, Borealis has a range of educational sponsorships – with the International

Kindergarten and Linz International School, promoting plastics engineering and catalyst research at Johannes Kepler University in Linz, and donating materials and other resources to primary and secondary schools for use in chemistry labs. On a wider stage, Borealis awards scholarships for PhD and master theses at several universities across Europe, and has a special student innovation award – Borstar – for doctoral and master degrees, which is worth €5,000 and attracts hundreds of applicants.

The company is also partner of the Young Polymer Scientist programme, a summer school for 17-year old students, including 12 lectures at Linz university and 4 weeks summer traineeships at Borealis.

Another innovative Borealis initiative is Power Girls, which is a one-day workshop for 12-year old girls, giving them the opportunity to visit the company and undertake different experiments. “Our hope is that Power Girls will help participants to develop an emotional and intellectual attraction for a career in the STEM sector,” says Pfanzelter.

Borealis also participates in two other initiatives promoting STEM careers and industry understanding. Lange Nacht der Forschung (Long Night of Research), is organized by two government ministries, and involves a number of institutions, museums and companies interacting with the public to encourage children and parents to learn about the industry and apprenticeships and other job opportunities. Borealis is also one of the three main sponsors of the Zoom Kindermuseum in Vienna, which is a 2015 exhibition focused on fostering interest in chemistry and plastics by making them more accessible to children and raising awareness of responsible resource use.



# REPORT OF THE EPCA 2014 48<sup>TH</sup> ANNUAL MEETING

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