

Mainstreaming Green Chemistry Webinar Series

**Advancing Green Chemistry Through
Business to University Partnerships:
Lessons from BASF**

January 6, 2015



What is the GC3?

- Cross-sectoral, B2B network of over 70 companies and other organizations
- Formed in 2005
- Collaboratively advances green chemistry across sectors and supply chains



Today's Speaker

Chris Hewitt



Chris Hewitt,
Science Relations Manager,
North America
BASF Corporation



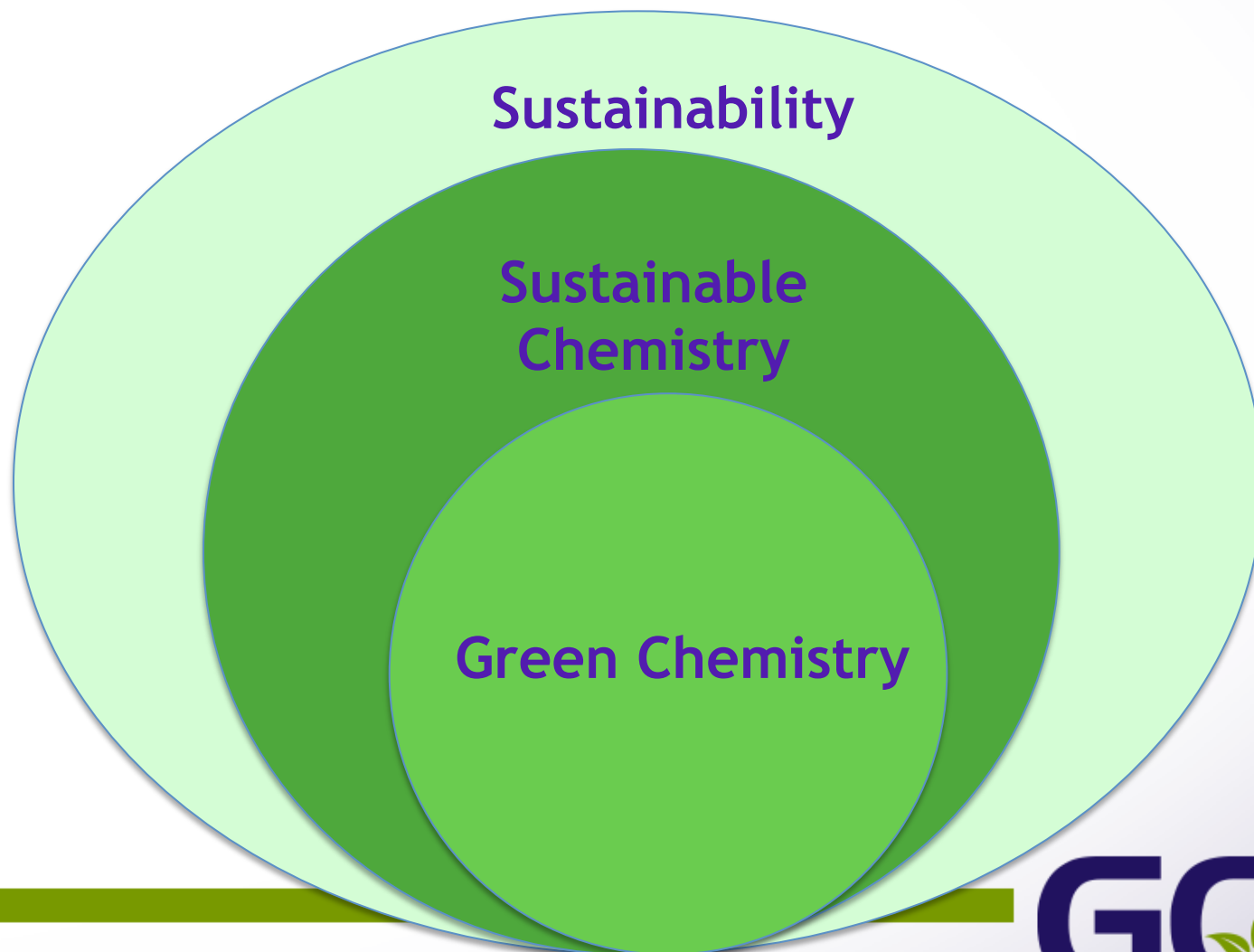
Mainstreaming Green Chemistry

when all chemistry

=

green chemistry

What is Green Chemistry?



Mainstreaming Green Chemistry Project Overarching Questions:

- What can be done to make all chemistry green chemistry?
- What are the current barriers and drivers?
- What partnerships will have to be built, policies put in place, educational needs met, and investments made?
- What role should the GC3 take?

Mainstreaming GC Project

Member survey on drivers, barriers, needs

+

Input from Advisory Committee

+

Discussions at Roundtable

+

Interviews with thought-leaders

+

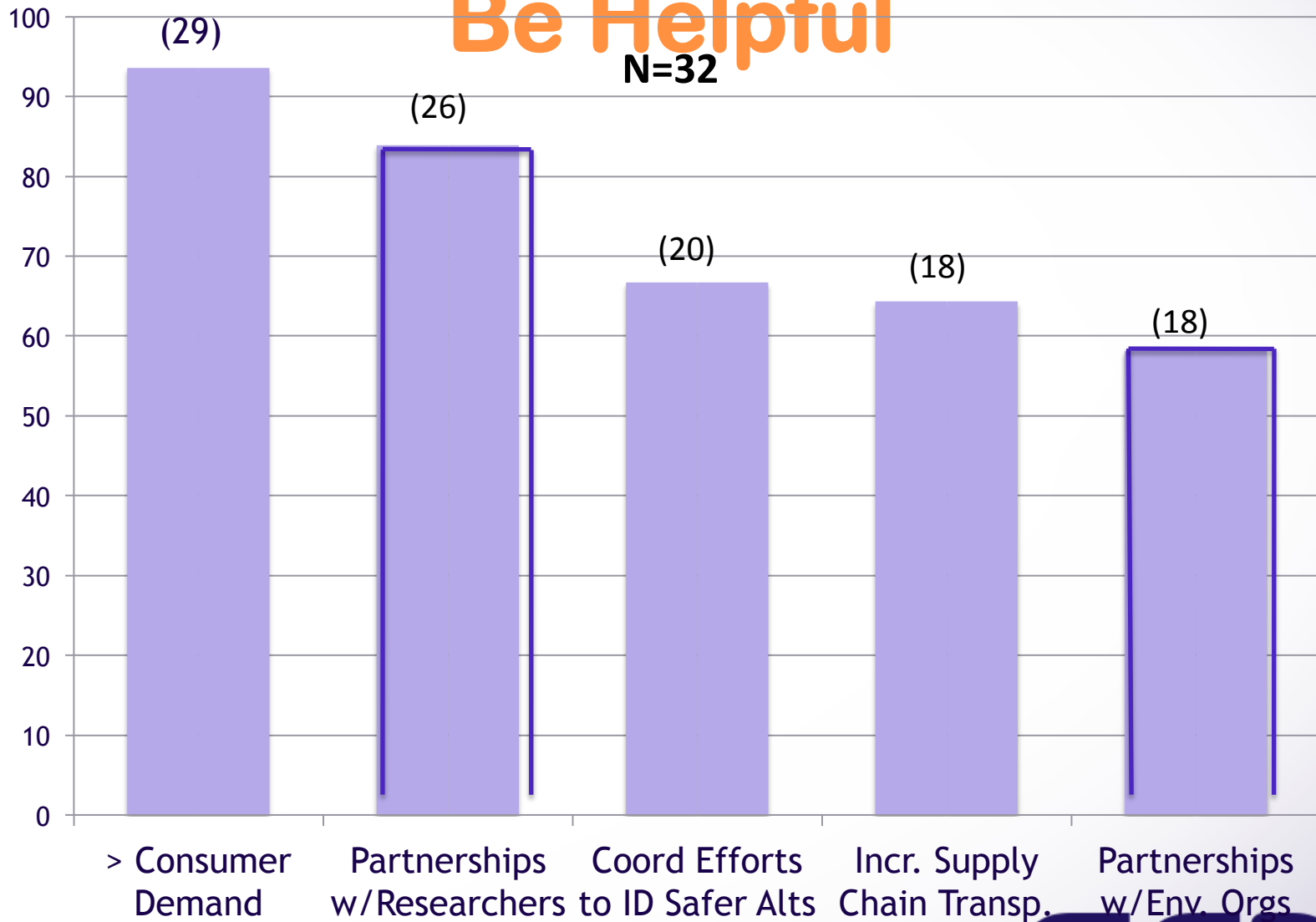
Additional Research



AGENDA FOR MAINSTREAMING GREEN CHEMISTRY



Other Things That Would Be Helpful



More about Partnerships from GC3...

- GC3 10th Annual Innovators Roundtable, April 28-30, 2015, Beaverton, OR

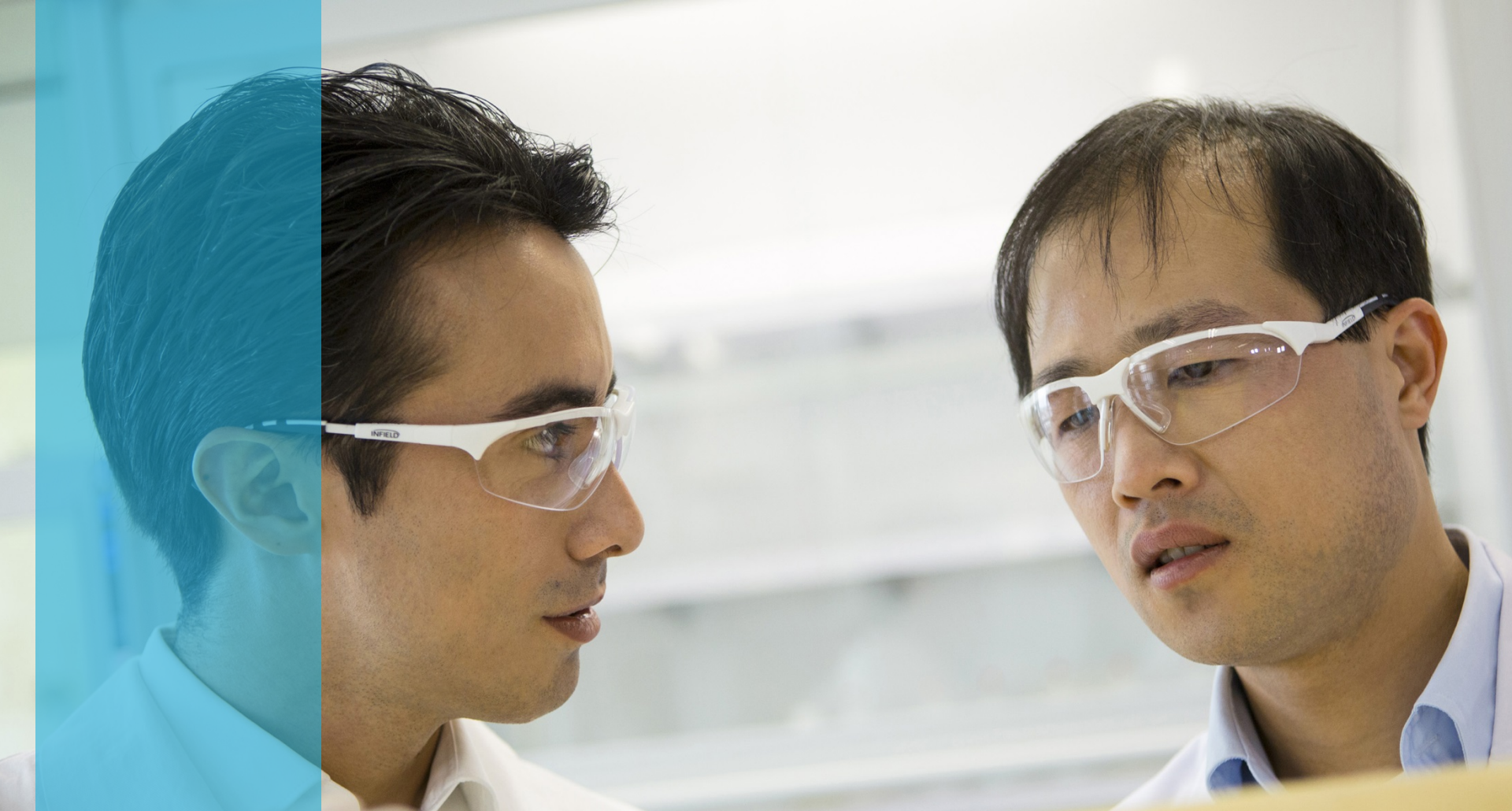
What Makes Partnerships Work: Lessons from the Real World

- Staples *and* Wegmans
 - Business to Business Partnership
- Berkeley Center for Green Chemistry *and* Method
 - Business to University Partnership
- Register at www.greenchemistryandcommerce.org



Ground Rules

- Due to the number of participants in the webinar, all lines will be muted
- If you have a question or comment, please type in the Q&A box located in the drop-down control panel at the top of the screen
- Questions will be answered at the end of the presentation
- To Tweet: @ChrisHewitt1609 @The_GC3



150 years

 **BASF**

We create chemistry

Lessons Learned Advancing Green Chemistry through Business:University partnerships

Chris Hewitt, Ph.D.

Science Relations Manager, North America

Agenda

- | | | |
|----------|---|----------------|
| 1 | Strategy and Sustainability | slides 3 – 8 |
| 2 | Research and development in BASF | slides 9 – 10 |
| 3 | Innovations, Growth and Technology fields | slides 11 – 14 |
| 4 | University Relations at BASF | slides 15 – 16 |
| 5 | Working with Universities | slides 21 – 25 |
| 6 | An example | slides 26 – 27 |

Our purpose

We create chemistry
for a sustainable future



Company overview

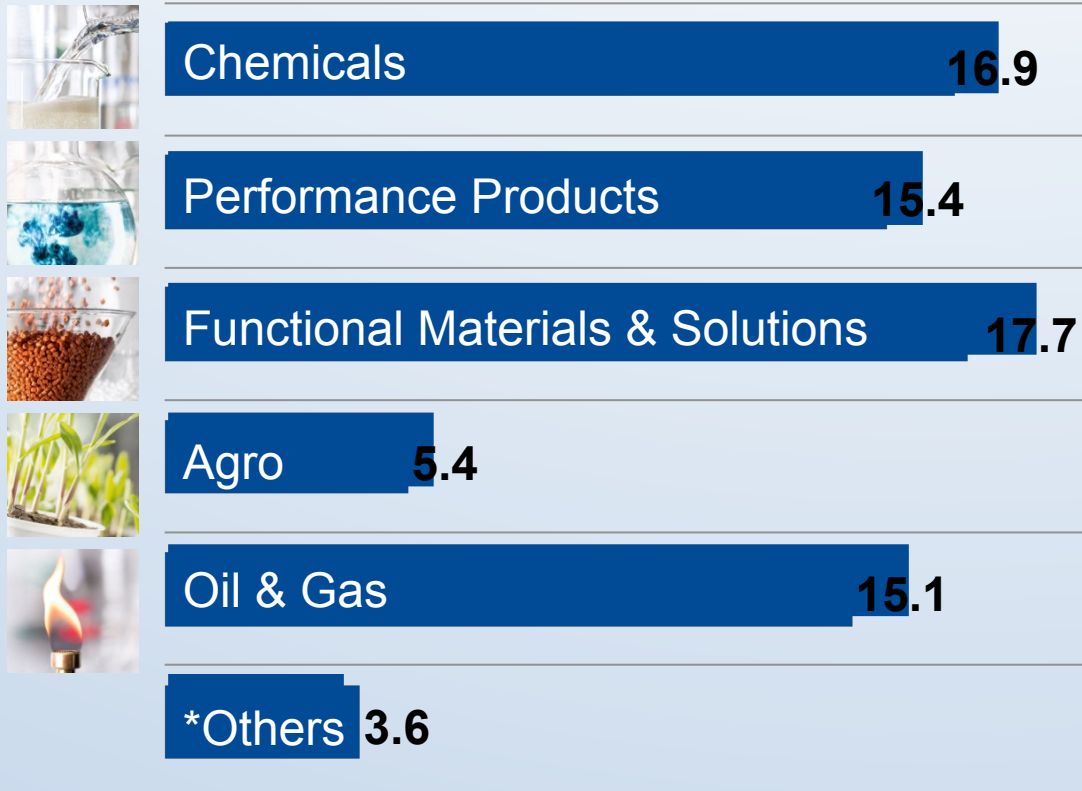
BASF – We create chemistry

- ❖ The world's leading chemical company
- ❖ Serves all major industries
- ❖ 380 production facilities including six Verbund sites
- ❖ Largest R&D spend in the global chemical industry (more than €1.8 billion)
- ❖ 2014 Sales: €74 Billion
- ❖ Employees: 113,000

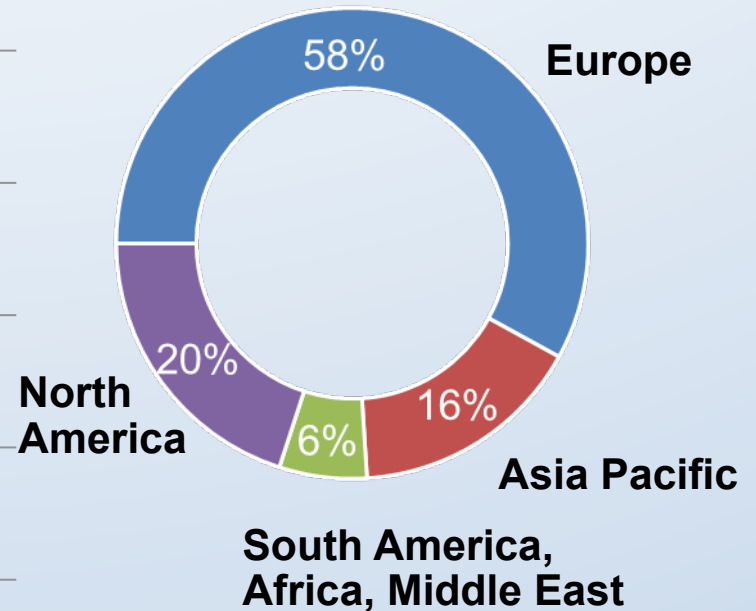
Sales by segment

Total sales 2014: € 74.3 billion

Sales by segment* (billion €)



Sales by region*



* Sales by location of customer

* Oil and Gas does not operate in North America

Demographic challenges set the stage for the future of the chemical industry

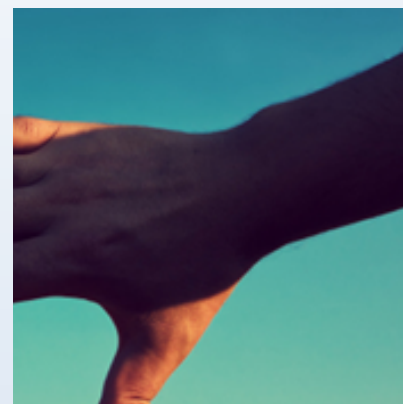
In 2050: More than nine billion people **but** only one earth



Chemistry as enabler

Our sustainability understanding

Contributing to meet society's needs more sustainably is the growth driver for our business.



Human beings consume more than the earth can regenerate.

On this journey, we need to act decisively together with and for our customers and other stakeholders.



Balancing economic, environmental and social needs to find the best available solutions is essential to ensure a more sustainable future.

Integration of sustainability into our business decisions

Enable our customers to develop more sustainable solutions

Connect – in our team and with society

Deliver excellence in our operations

Creating value

Reducing risk

Innovation

Research and development at a glance

Research for the future: with our innovative products and processes, we provide sustainable solutions for global challenges.

- Expenditures for research and development €1,884 million, world leader in chemical industry
- Around 3,000 projects
- Strongest innovation power in the chemical industry (No.1 in the Patent Asset Index™)
- Targets 2020: around €30 billion sales and circa €7 billion EBITDA from innovations



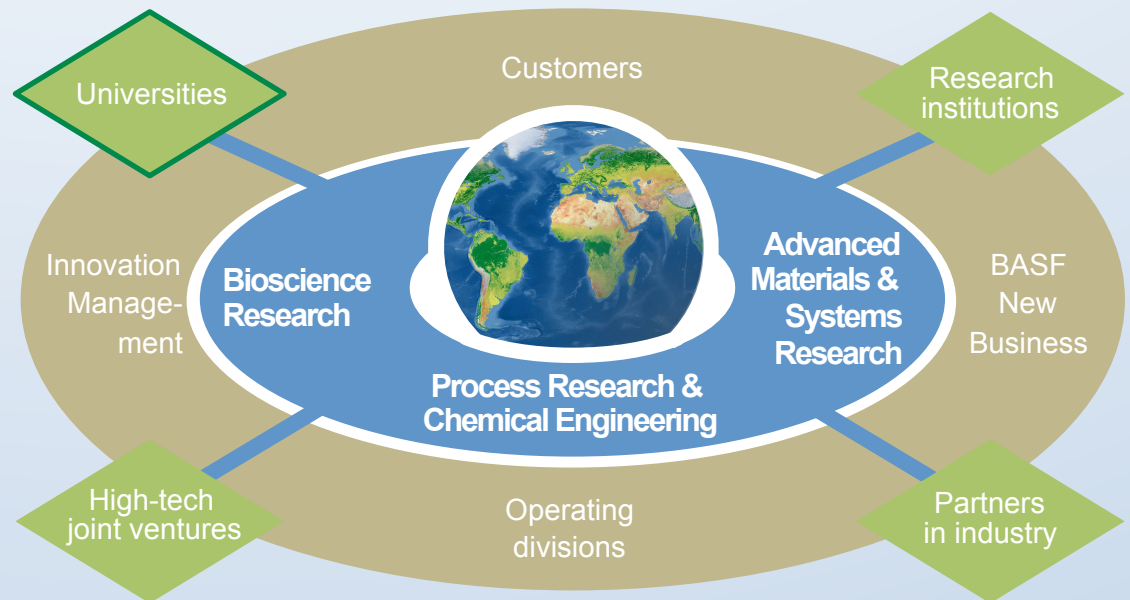
| | | |
|---|----------------------------------|-----|
| 1 | Chemicals | 10% |
| 2 | Performance Products | 19% |
| 3 | Functional Materials & Solutions | 20% |
| 4 | Agricultural Solutions | 27% |
| 5 | Oil & Gas | 27% |

Innovation

Global Know-How Verbund

Thanks to our close cooperation with numerous partners in science and industries worldwide, we have created an international and interdisciplinary Know-How Verbund.

- Approx. 10,700 employees in research and development worldwide
- Know-How Verbund with around 600 excellent universities, research institutions and companies



150 years



Growth by tackling new business areas

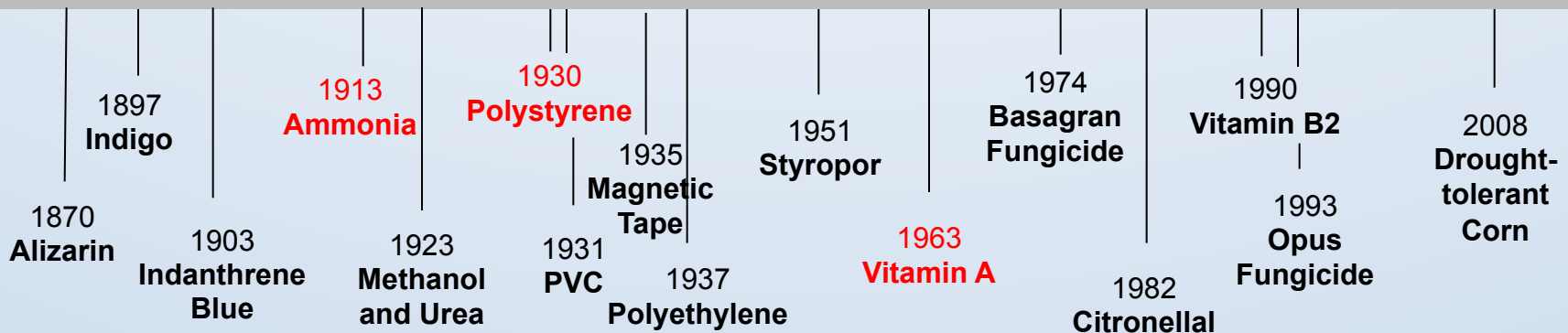
BASF Innovation Highlights



1900

1950

2000



Synthetic
Dyes

Fertilizers

Plastics/
Foams

Health Care & Nutrition
Plant Protection & Plant Health

Chemistry-based innovations

Growth and technology fields

Global needs

Customer industries

Growth fields

Technology fields

**Resources,
Environment
and Climate**



Transportation



Agriculture



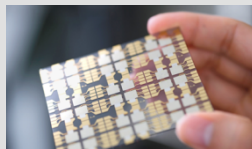
Construction



Energy & Resources



Consumer Goods



Electronics

**Food and
Nutrition**



Health & Nutrition

Quality of Life

Automotive Lightweight Composites

Batteries for Mobility

Enzymes

E-Power Management

Functional Crop Care

Heat Management for Construction

Organic Electronics

Plant Biotechnology

Water Solutions

Wind Energy

...

**Materials,
Systems &
Nanotechnology**

**Raw Material
Change**

**White
Biotechnology**

Growth field

Automotive Lightweight Composites

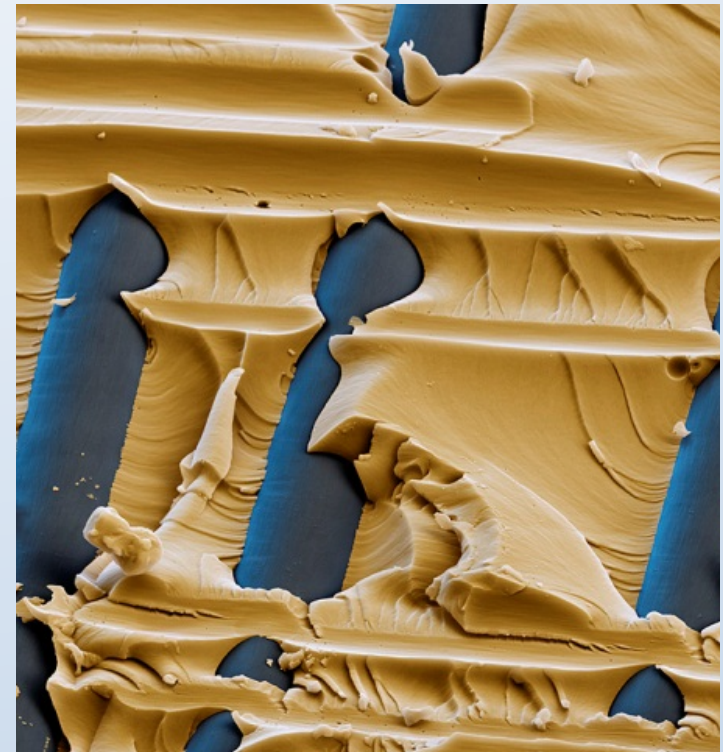
Innovative composite materials from BASF are helpful in automotive lightweighting and reducing carbon emissions.

Existing activities

- Replacing metal with short, long and continuous fiber-reinforced composite materials (epoxy resins, polyurethanes, thermoplastics and foams)
- System solutions: tailored multi-material systems, material data, simulation models, processing and testing know-how

Targets

- Position BASF as one of the leading suppliers of composite material systems
- Extending existing business and accessing new markets by utilizing synergies between different material systems



Growth field

E-Power Management

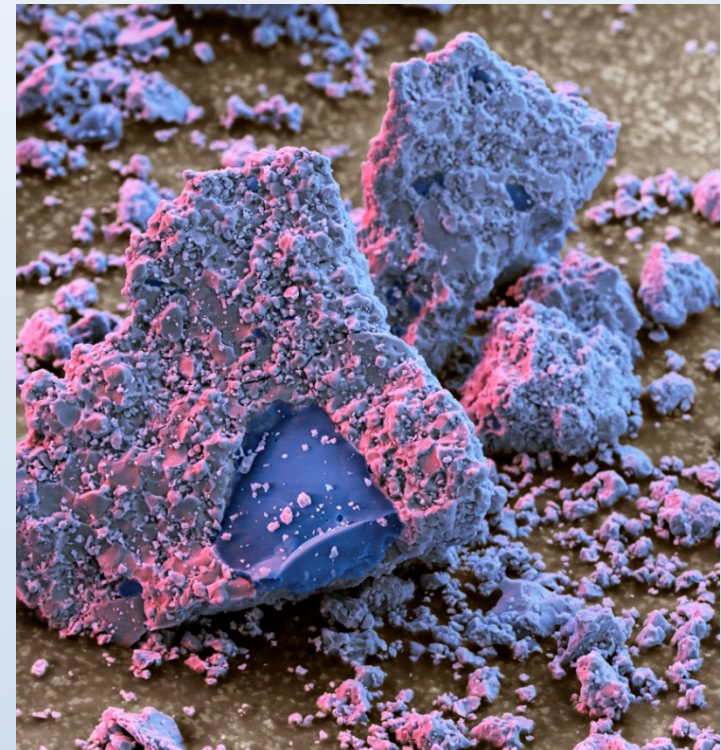
BASF develops innovative solutions to increase energy and CO₂-efficiency in the power value chain.

Existing activities

- Solid state materials for efficient cooling
- High temperature superconductors for efficient current conduction
- Stationary power storage in the grid

Targets

- Development of material-based breakthrough technologies for use in the power value chain
- Development of new markets in power generation, power transmission, stationary storage and power usage (cooling, heating, electric motors)



University Relations at BASF

Holistic Approach in North America

Access

- Access to talent and cutting edge science

Influence

- Influence on what's being taught

Awareness

- Increase awareness of BASF in select parts of regions & strengthen visibility with local universities

University Relations at BASF

UNIQUE – The BASF Academic Partnership Program

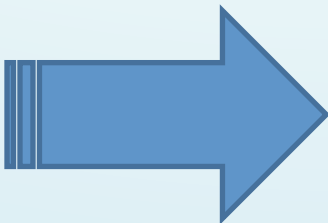
► Essence

The BASF Academic Partnership Developers generate scientific opportunities by matching BASF R&D with top universities worldwide, identifying new ideas, trends, research topics and paving the way to joint innovations.

► What UNIQUE differentiates

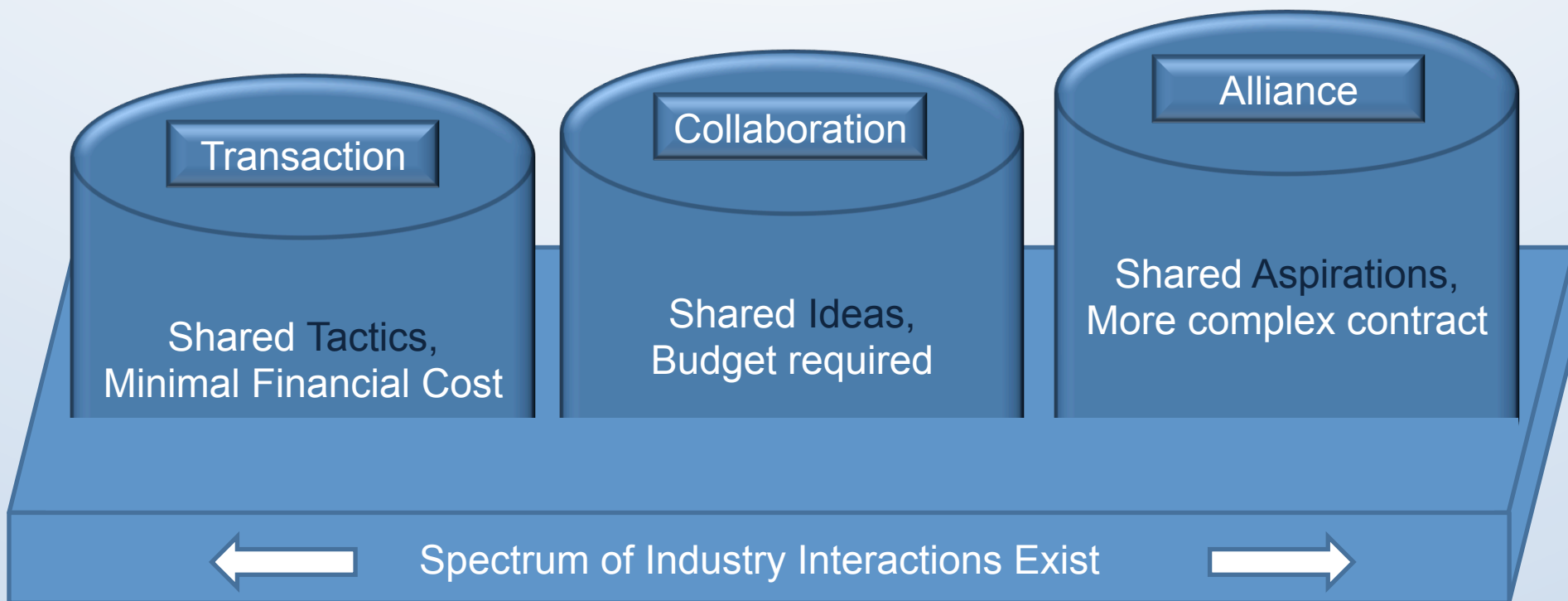
- the widest scientific range
- the largest internal industrial network in the chemical industry
- guarantees the most personal direct approach
- long-term perspective and commitment

Why work with Universities?

- Talent acquisition
 - Employee Development
 - Research and development
 - Marketing support
 - Political support
 - Corporate citizenship
 - Sales
- 
- Engagement comes in many shapes and sizes
 - Permeates all aspects of a company
 - Tailor to unique business needs
 - Not just Science

Types of Interactions

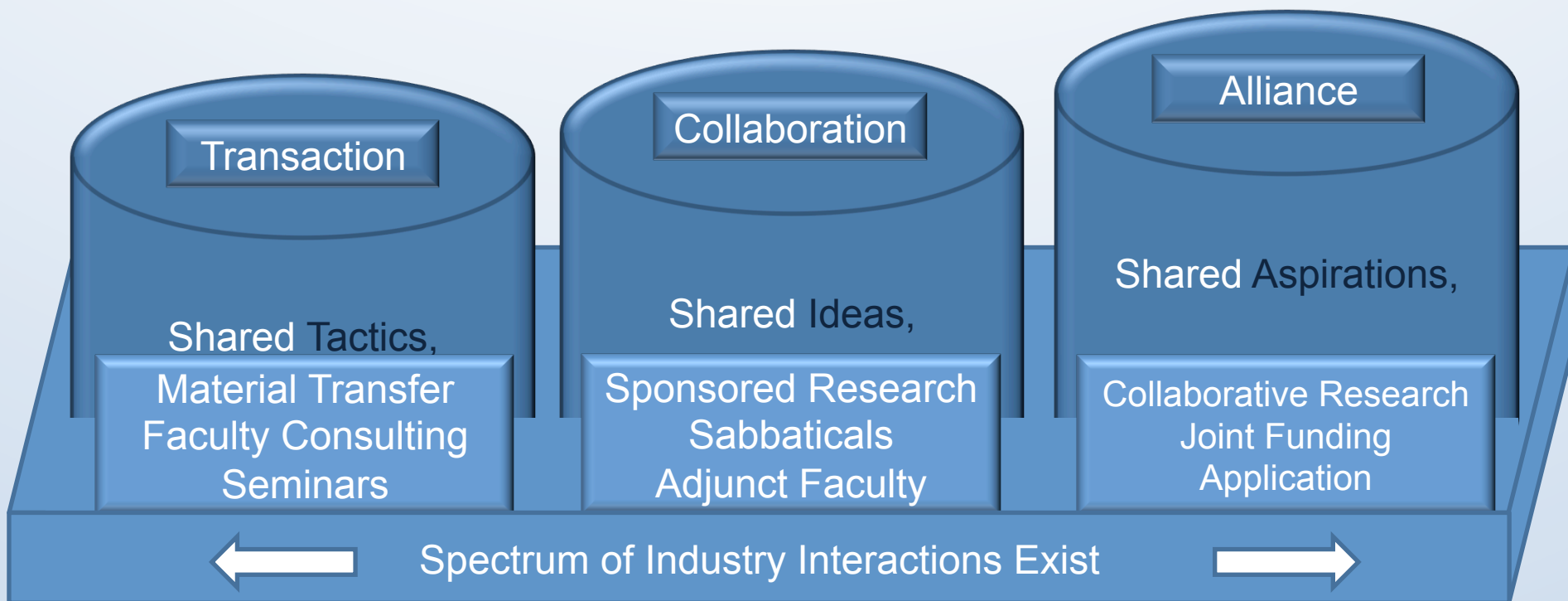
Researchers



- No prescriptive approach; start at any point.
- Sometimes parties will interact at several levels simultaneously and move between levels in any direction.

Types of Interactions

Researchers



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Disconnects

Who gets what and how long it takes...

1. Time and especially rights

- ☹ Simple terms for non-exclusive rights
- ☹ Exclusive rights for joint inventions for fully funded research - can be a deal breaker for land grant universities – Minnesota/European models
- ☹ Fear of losing the big deal can guarantee the loss of recurring support

2. What's financially equitable

- ☹ Market risk
- ☹ Scaleup and Capex



Disconnects

Scaleability, fit and profitability

3. Scaleability

- ☹ Risk for industry

4. Lack of understanding of what it takes to go to market

- ☹ Fit to business models
- ☹ Profit pools in the value chain

5. Short term vs long term perspective

- ☹ project lifetimes, measures and milestones
- ☹ Length of time and barriers to commercialization

6. IP terms understanding of what it takes to create value from new technology

- ☹ Are claims sufficient for what industry needs
- ☹ Prior art/FTO can have a huge impact

7. Companies work globally with universities

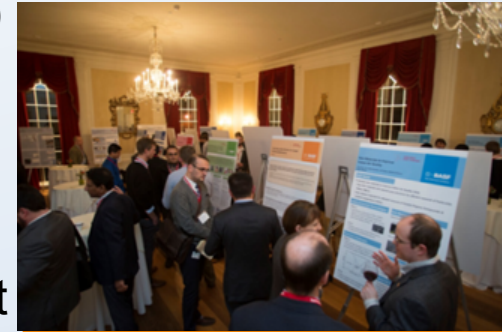
- ☹ US Universities must be competitive – but see the next slide



Disconnect

The good news.....

- ☺ Businesses want to work with Universities (and are doing so)
- ☺ Industry is more interested in underlying capability than just specific IP
- ☺ Industry fully understands need of universities to publish (just need time to protect IP prior to disclosure)
- ☺ Industry wants to engage with talented partners to create value and provide employment



Making it work

Prerequisites

Industry / Academia



Prerequisites for Successful Collaboration

- Right Partners
- Framework
- Clear Goals
- Trust
- Equal Excitement

Making it work

Finding Exciting Projects



Other key factors

- Legal umbrella simplifies project start
- Critical mass leads to "clustering" to solve problems

Making it work

Key points

- Understand each other's strategic context. competencies and goals
 - ▶ R (Basic) -> R (Applied) -> D (demonstrate) continuum.
 - Where are we?
- Recognize relationship management is a two-way street
 - ▶ Importance of the right project managers
- Make communication a priority
 - ▶ Don't pre-assume the right answer to the question
 - ▶ Listen carefully to understand organizational constraints and find creative solutions
- Remember one size doesn't fit all
 - ▶ Build flexibility into processes
 - ▶ Research takes time

Example

Magnetocaloric materials

- Joint research Program
- Focus on strengths
 - ▶ University – Fundamental principles
 - ▶ BASF – scaleup and production
- Multiple years
 - ▶ Started 2008, renewed 2011, continues
- Exclusive license 2013
 - ▶ Followed successful scaleup by BASF
 - ▶ Continued research collaboration
- Brought in additional partners for device development
 - ▶ BASF – Manufacture of high quality materials from abundant and affordable raw materials
 - ▶ Astronautics – Specialty expertise for integration into the magnetocaloric heat pump
 - ▶ Haier – Knowledge of appliances
- Product launched at CES 2015

Example video

- <https://www.youtube.com/watch?v=Py9laztpKzs>

150 years



We create chemistry

Upcoming GC3 Events

Green Chemistry Education Webinar:

The Role of Policy in Green Chemistry Research and Adoption, April 16

Green Chemistry and Commerce Council, 10th
Annual Innovators Roundtable, April 28-30th,
Nike World Headquarters, Beaverton, OR

To Register for both:

www.greenchemistryandcommerce.org

