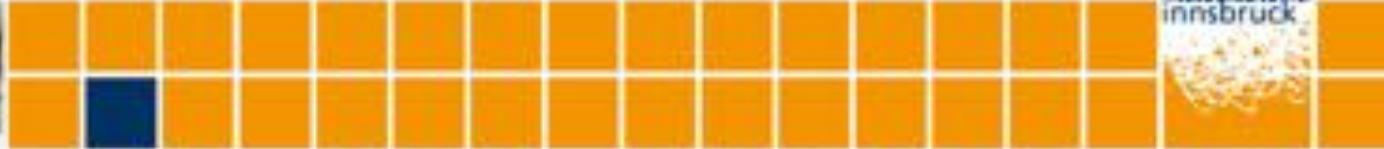




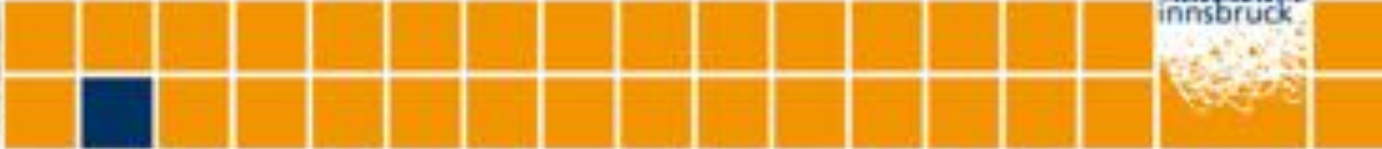
## Product Development to meet Sustainability Demands: Test Methods and Interpretation

Dr Tom Wright

Research Institute for Textile Chemistry and Textile Physics - University of Innsbruck



- About us
- Research institutes in industrial R&D
- Setting out aims based on the work
- The need for a good methodology
- Testing common-sense (nonsense identification)
- Delivery of developments



# Research Institute for Textile Chemistry and Textile Physics, University of Innsbruck

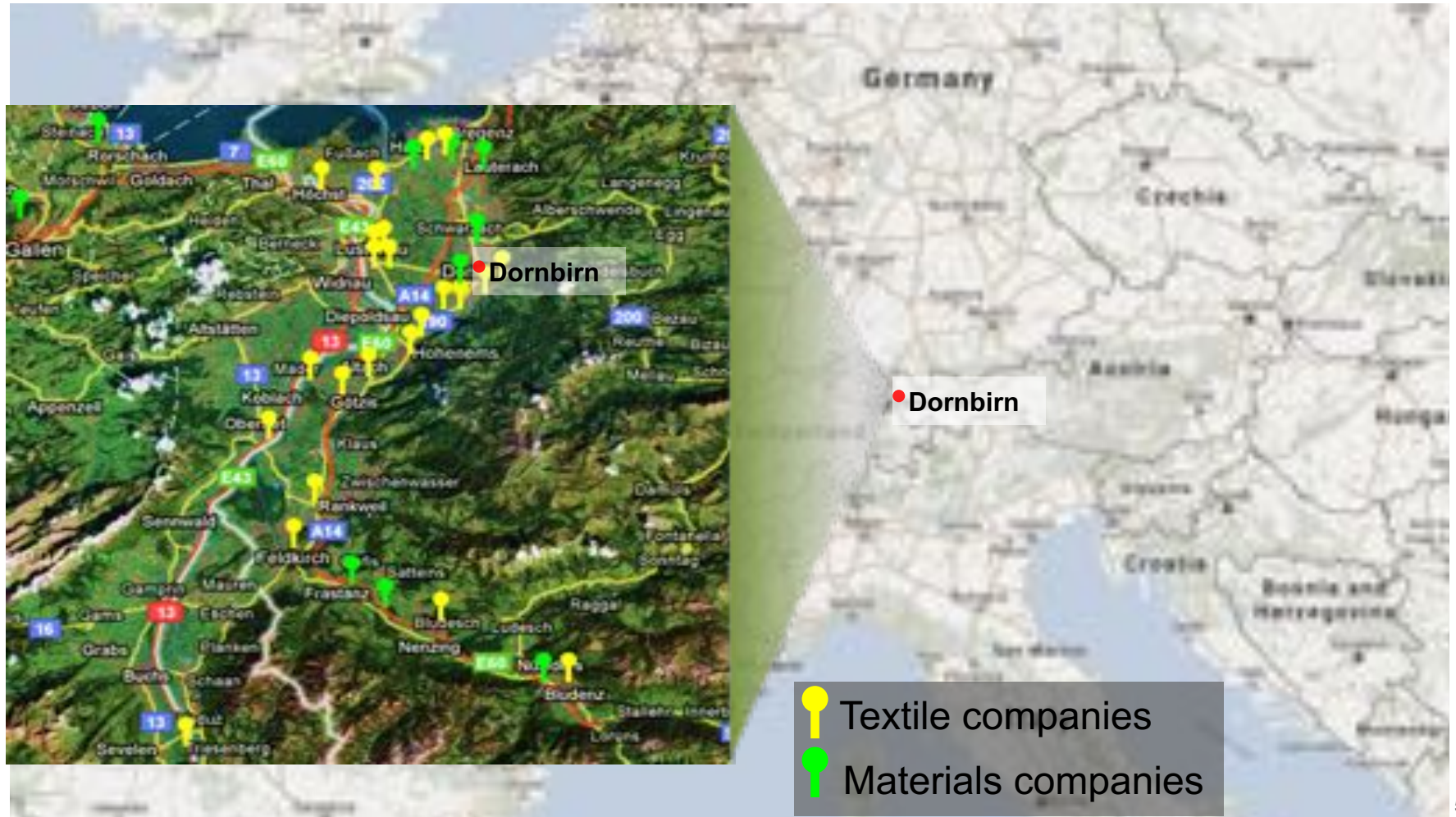


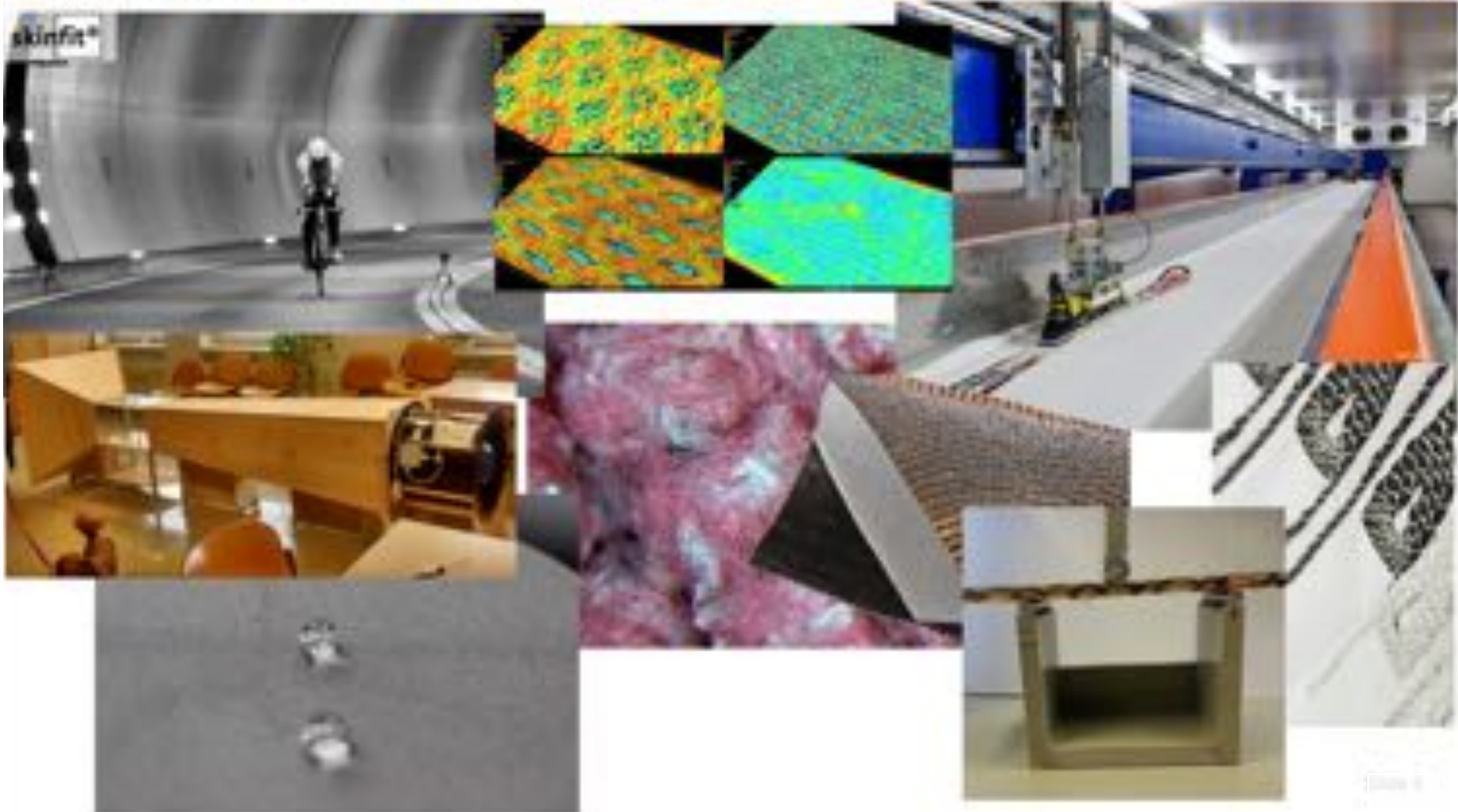
## Our stats

- Research Institute of Textile Chemistry and Textile Physics was founded in 1982
- Part of Faculty of Chemistry and Pharmacy
- Located in Dornbirn
  - Soon to be across two sites
- Total 24 members as of July 2016
- 2 Full Professors
- Total funding (3<sup>rd</sup> party) 2016-2021 c. € 10 M
- Access to testing laboratory at HTL Dornbirn
- Intensive industry co-operation











# Why might you want to develop a product?



TVB St. Anton am Arlberg

- Progress
- Legislation
- Company ethos
- New data/developments from the industry
- Change in supply
- External pressures i.e. new labelling or political pressures

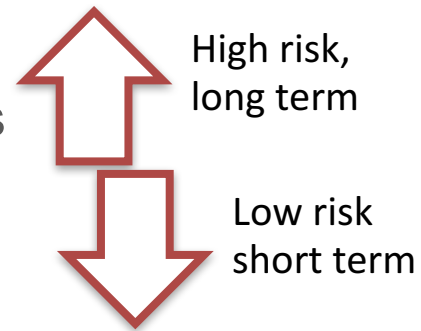
# What you might need to develop?

- Chemical content of a product
- Material selection
- Improvement of specific properties
- Design
- Special functionality
- Production methodologies

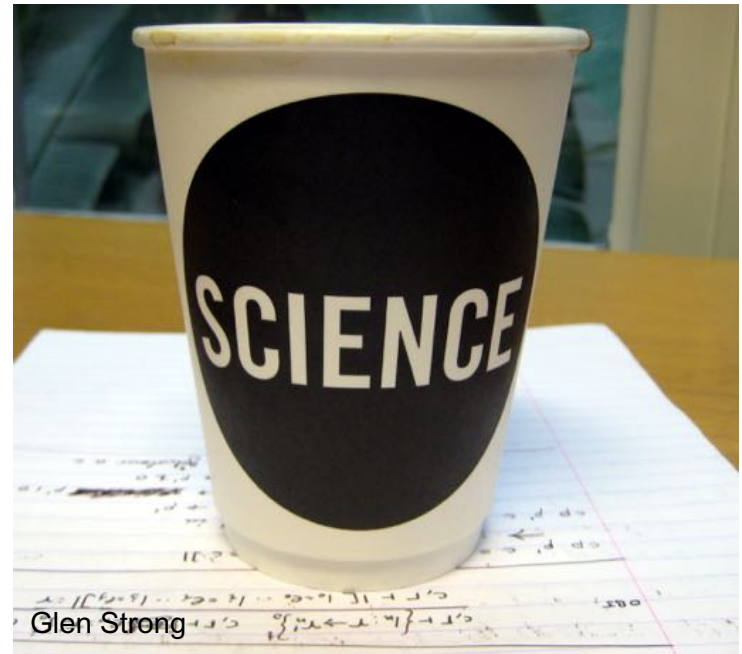


# What kind of a development is it?

- New product
- Development of a product or a process
- Satisfying standards and regulations
- Testing



# Science and industry



# Science and industry

**Researchers** (outside your normal expertise)

**goods manufacturers** (small and big)

- Quite different operations
  1. Different pressures
  2. Different goals
  3. Different resources
  4. Different market relationships

# What's the end goal? What's the final deliverable?

- From the researchers
  - New understanding, disseminated
- From the manufacturers
  - An advancement of a product
  
- Knowledge sharing
  - Testing = Data
  - Analysis = Information
  - **Reporting** = Knowledge



# Some Tips

What do you know about your product - suppliers and processes? Can you share the information?

# Setting up a work plan

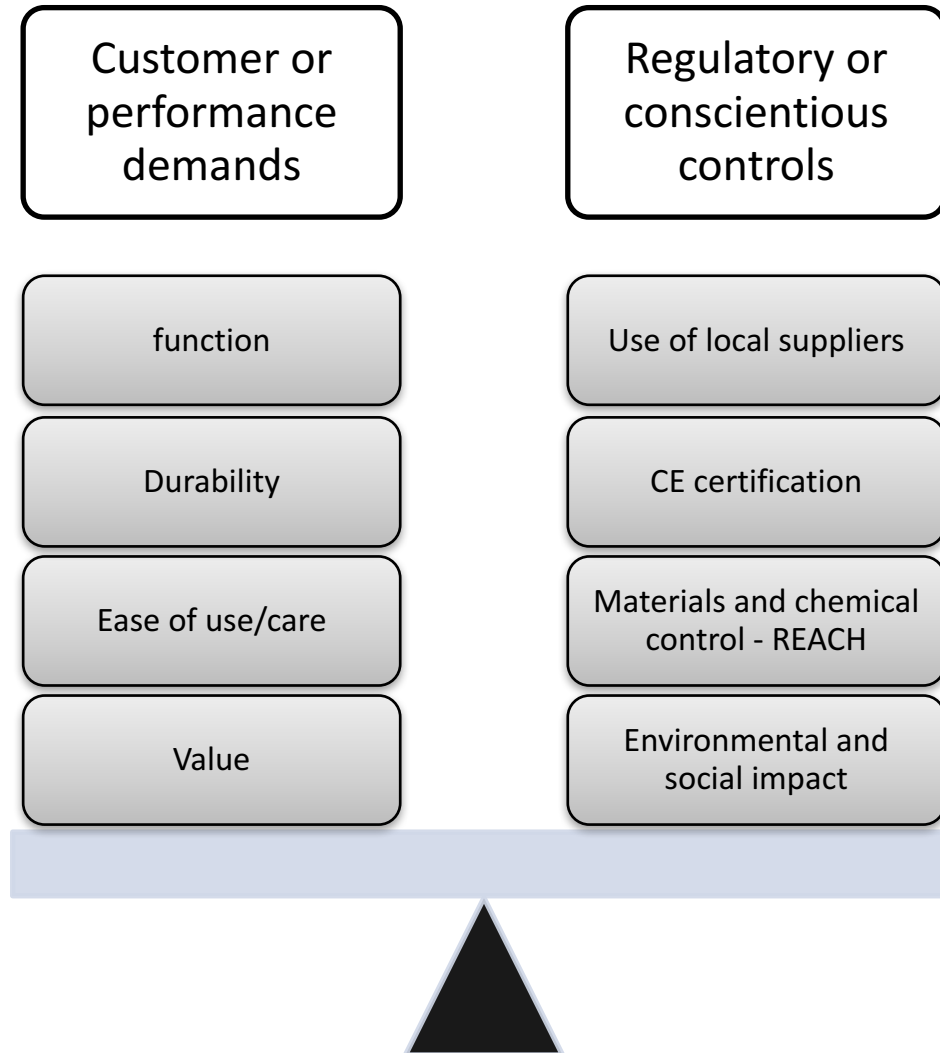


Deadlines

Milestones

Outcomes

# What are your constraints?



# Testing efficiently

- Development testing has to make sense
  - Target the properties that are likely to change with the variables
  - Try to decrease the matrix rather than the validity
  - Be methodical – compare one variable at a time if possible



# Testing efficiently

- Product testing - targeting performance
  - Chemical tests may need to be done for a label, otherwise consider if they fit with the aims
  - Performance testing should focus on the effected criteria

# Analysis

- What do you want to know?
  - If X changes what happens to Y?
  - How big is the effect
  - Can that effect be seen as an improvement in performance
- Data needs to be analysed for it to be read
- Be cautious of comparisons without error
- Show the validity and significance of the results
- Check the axis scales on comparison charts, how big are the differences?

# Reporting

- What do you want to know
  - If X changes what happens to Y?
  - How big is the effect
  - Can that effect be seen as an improvement in performance
- The language used should be professional but also comfortable to both parties using overly convoluted scientific terminology slows down the understanding
- Be consistent with terminology
- Clearly explain diagrams that don't need to be explained

# Example

- Development of a F free - Silicon DWR
  - Best water shedding
  - Best wash fastness
  - Best abrasion resistance
- 3 recipe variations solution A, B, and C
- 3 process variations Process 1, 2, and 3





# Constraints

- Minimum Bundesmann value = 4
- Wash fastness at 50 washes
- 10K rubs on the Martindale
  
- No chemicals on the SVHC list
- No materials released
- All chemicals and suppliers registered with “X”-eco label

# Meeting the industry standards

- Know your supplier – fabrics and processes
  - Chemical assessment of textiles is very time consuming and costly.
    - what about the next batch?
  - RSL should be followed
- What should you fulfil and why
  - [www.ecolabelindex.com](http://www.ecolabelindex.com)
    - 22 label for textiles
  - Wildlife protection, Carbon-free, fair trade, chlorine-free, Ocean protection, recycling, transparency
  - Blue sign, Oeko-Tex standard, Reach

# Test everything? Nope

- What are the variables?
  - A, B, and C, with process 1, 2, and 3 = 9 samples
- If you add extra variables this can change;
  - Two different membranes = 18 samples
  - 3 different seam designs = 27
  - Everything = 54 samples
- Are these variables effected by the new treatment?

# Focus the available resources that give you an understanding of the resultant effects

- Martindale
- Water shedding angle
- Wash fastness
- Hydrostatic head
- Air permeability
- Weathering (UV, humidity, moisture)
- Tensile strength – fabric, seams zips
- Rain-room testing
- Contact angle
- Crumple flex
- $R_{et}$
- $R_{ct}$
- Drape, handle, Moisture management... etc.



# Tests, conditions/new variables

Test	conditions/new variables
Water shedding angle ✓	Martindale (maybe)✓
Hydrostatic head✘	Wash fastness (maybe)✓
Air permeability✘	Weathering (UV, humidity, moisture) (maybe)✓
Tensile strength – fabric, seams zips...maybe	Crumple flex (maybe)✓
Rain-room testing ✓	
Contact angle ✓	
$R_{et}$ , $R_{ct}$ ✘	
Drape, handle, Moisture management... etc. ✘	

# Final development program

- 9 Samples
- 3 conditions + control (ageing, wear, washing)
- 1 test – Bundesmann (108 specimens)
  
- Analysis
  
- Reporting

# Summary

- Try to understand as much about your own area before meeting – researchers read!, producers check out your own products and supply chain
- Understand the mutual benefits and make sure you know the aims
- Make a working plan
- Assess the time needed for experimental work and ensure that all testing focusses on the effected properties
- If necessary reduce the variables or the range of testing (if possible) rather than making short cuts in the methodology
- Make sure results are presented clearly and ask questions