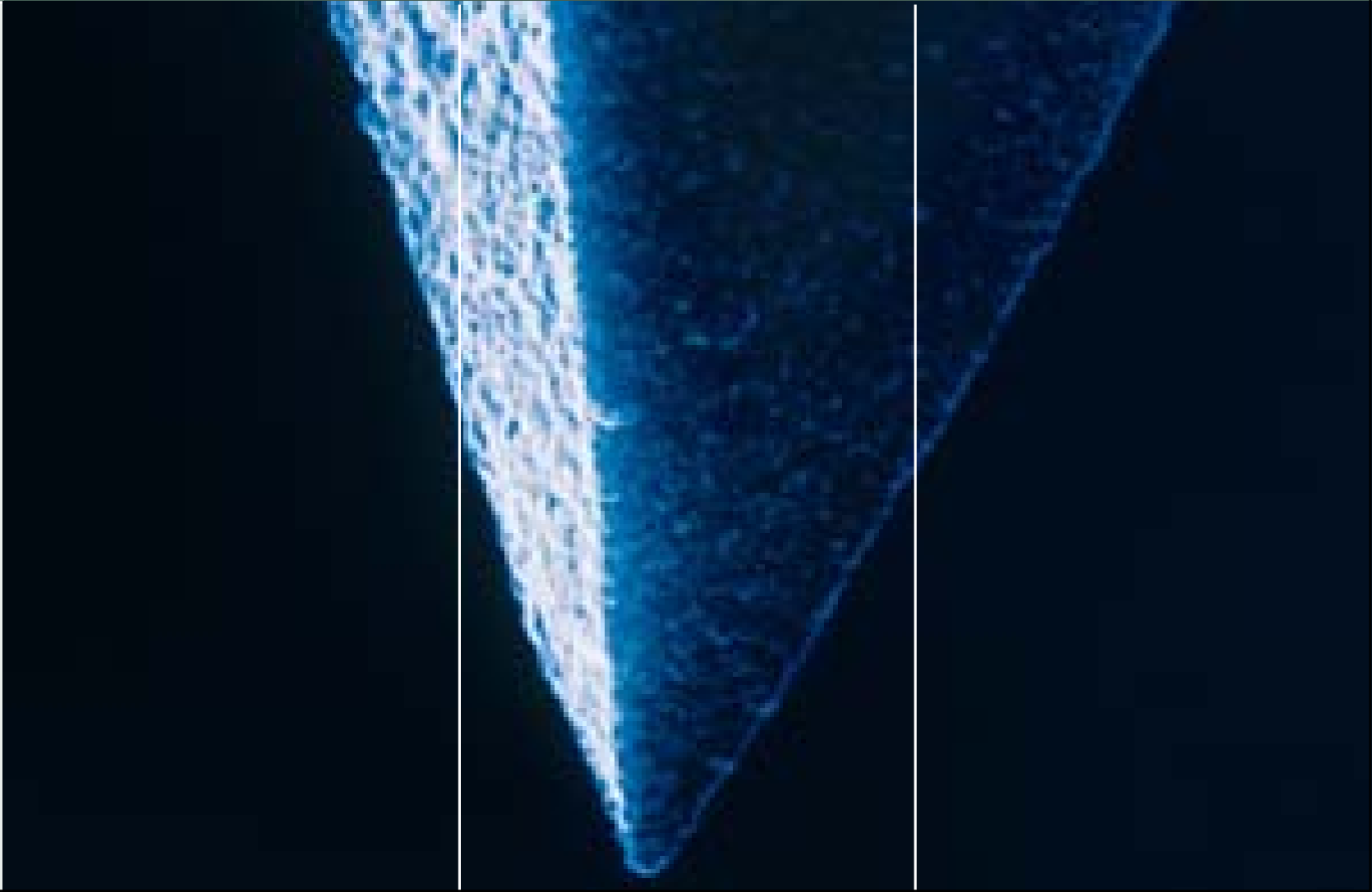
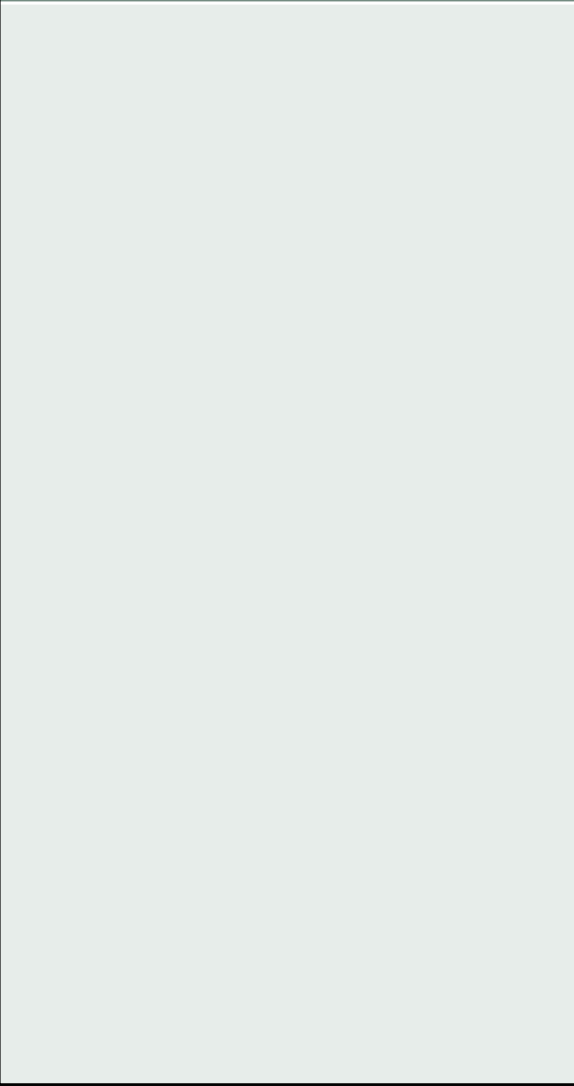




# Nanotechnology

## The insurance perspective





# Agenda

Swiss Re – A global leader in managing capital and risk

Nanotechnology – Why is it relevant for insurers?

New risks – How can they be covered by insurers?



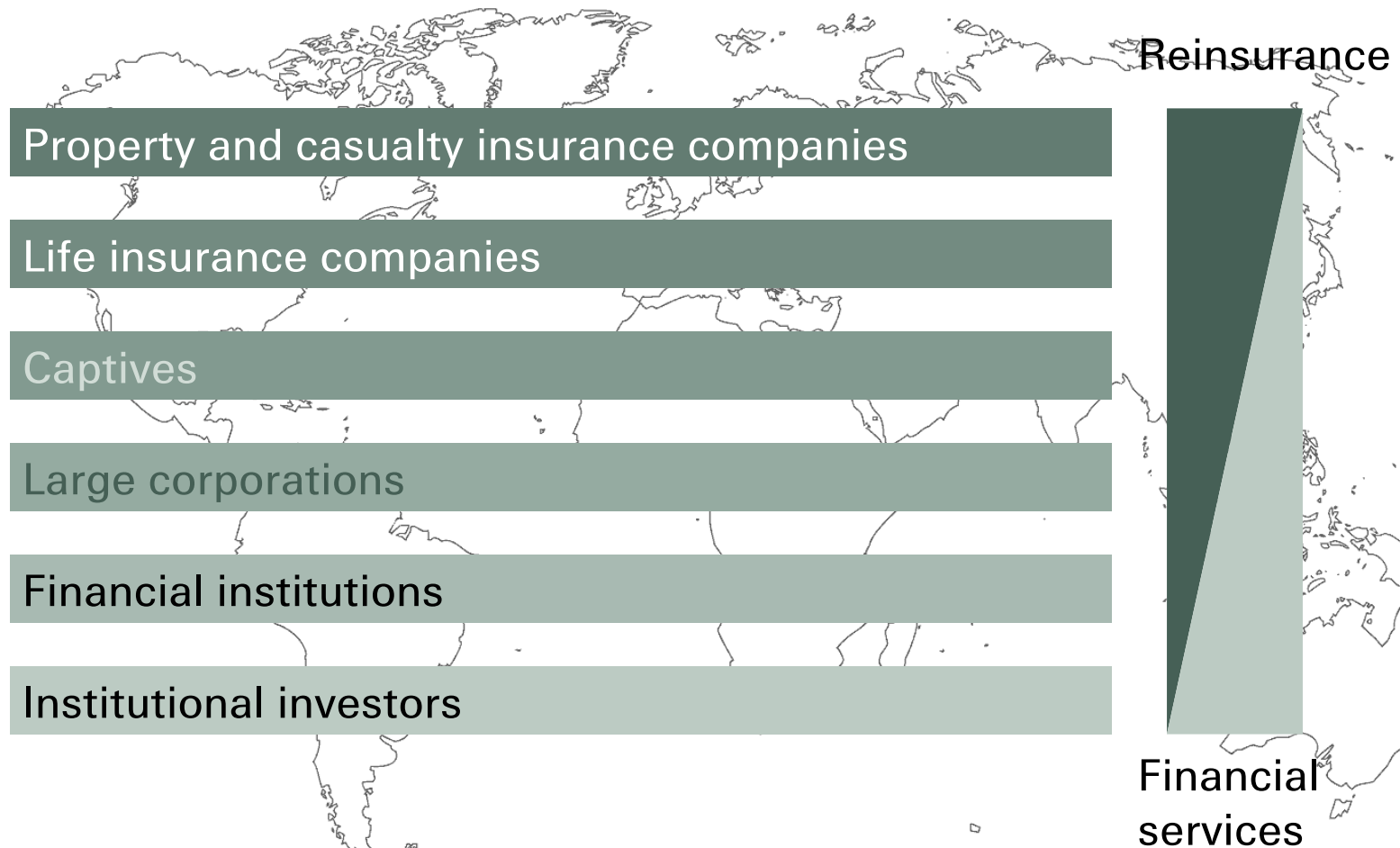
# Corporate philosophy

## Mission

To be the authority on managing  
capital and risk



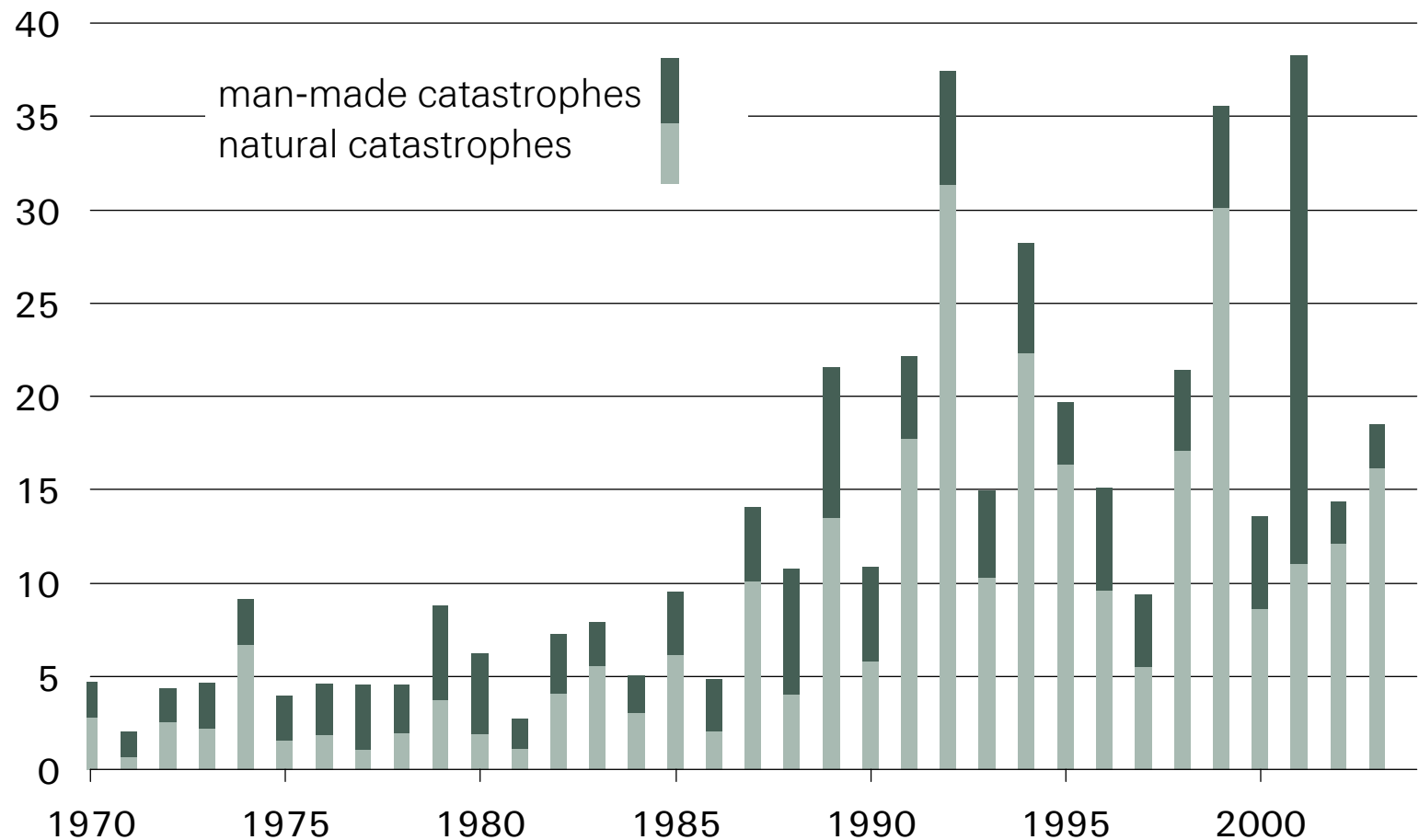
# Who are Swiss Re's clients?





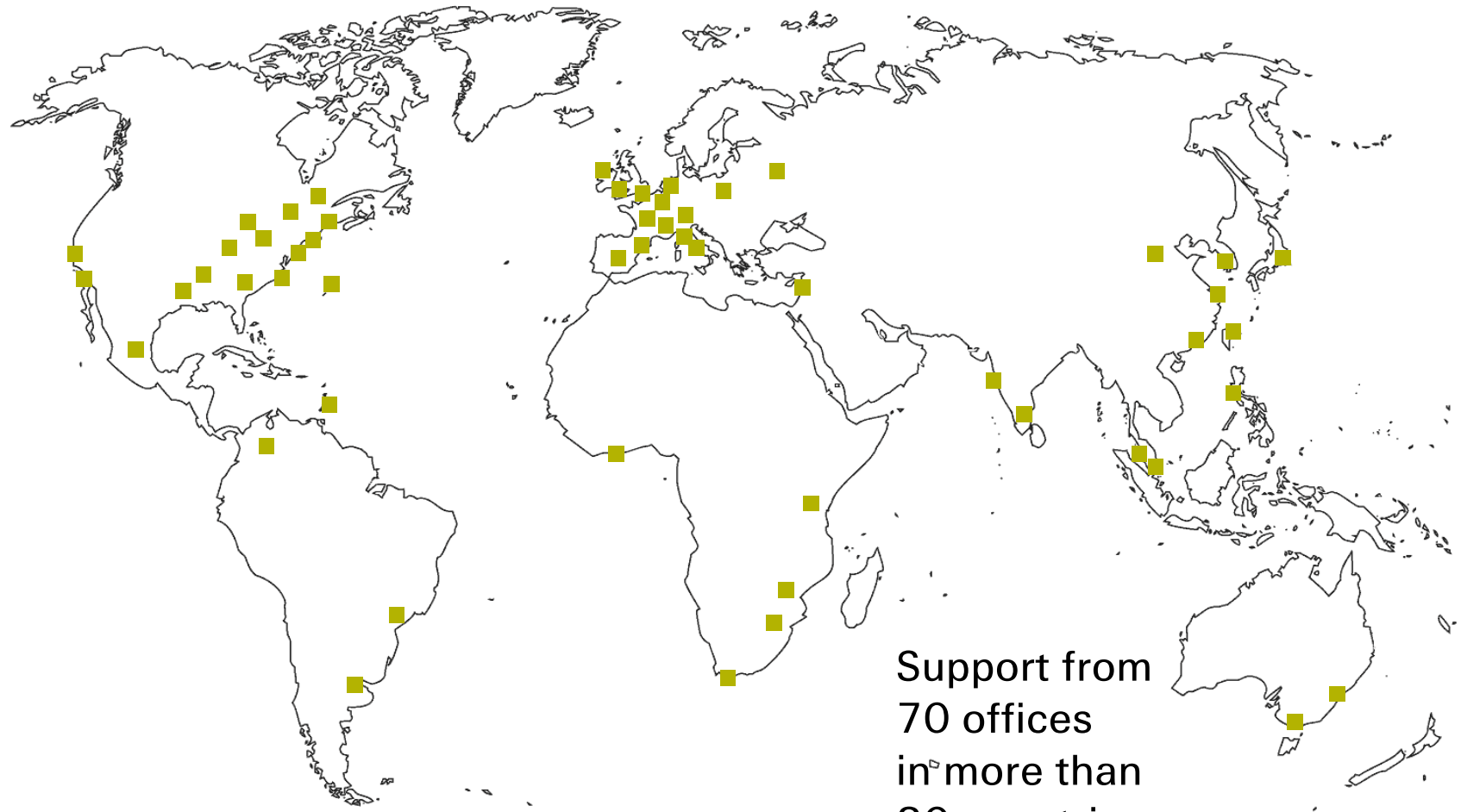
# Insured catastrophe losses 1970 -2003

USD billions





# Global presence





## Swiss Re Group at a glance

Net income amounted to CHF 2.5 billion

Premiums earned amounted to CHF 29.4 billion

Total investments amounted to CHF 98.5 billion

Leading position in P&C reinsurance: 10.5% market share\*

Leading L&H reinsurer: 22.4% market share\*

Leading provider of financial services solutions to targeted clients

Highly diversified portfolio by region and by line of business

Proven expertise in risk and capital management

Strong corporate culture based on 140 years of experience



# Knowledge

Long-established and proven expertise

Extensive research and focused innovation

Exceptional working and learning environment

## Swiss Re's publications series



*sigma* series



risk perception series



technical publications



focus reports



[www.swissre.com](http://www.swissre.com)





# Top Topics

## Current Top Topics portfolio:

Insurance-linked securities

Nanotechnology

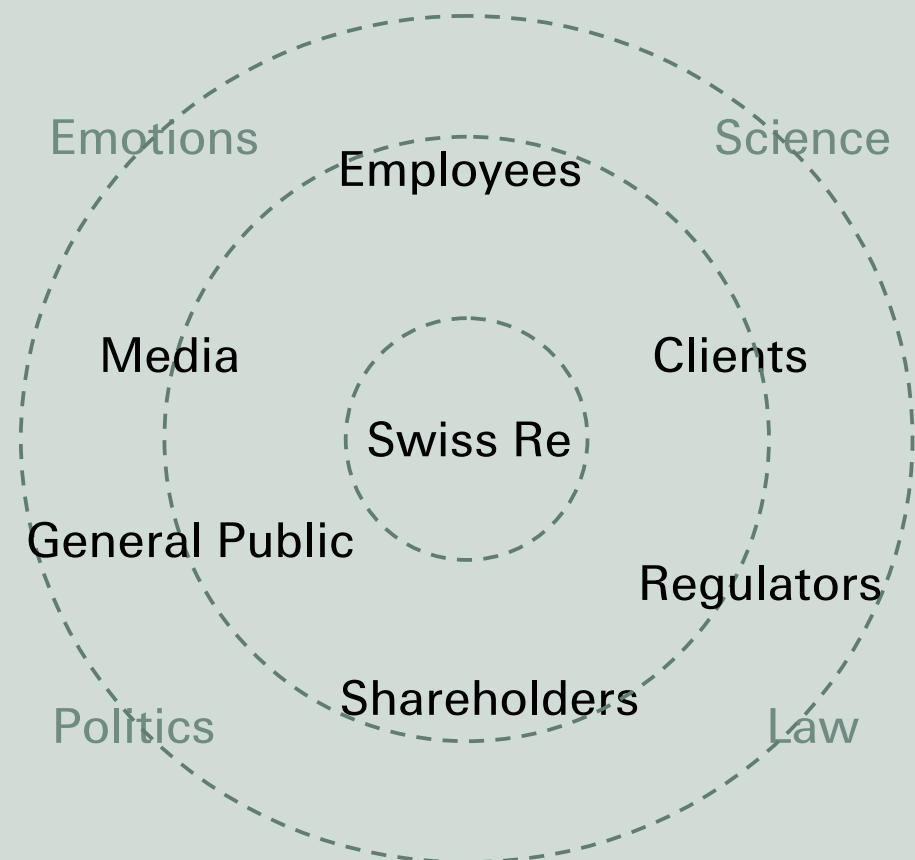
Mortality

Natural catastrophes

Sustainability

Terrorism

## Swiss Re's stakeholders





# Agenda

Swiss Re – A global leader in managing capital and risk

Nanotechnology – Why is it relevant for insurers?

New risks – How can they be covered by insurers?



## Increasing media attention

**The promise and perils of the nanotech revolution**

**Possibilities range from disaster to advances in medicine, space**

**San Francisco Chronicle** 26 July 2004

**Small matter which could turn hugely nasty**

**Firms rush to apply nanotechnology to products**

**THE DAILY YOMIURI** 24 August 2004

**Lloyd's List**

Founded 1734

**FT FINANCIAL TIMES**  
World business newspaper

**Tiny technology that may create huge problems –**

**NANOTECHNOLOGY** 2 June 2004

**Nanotech's frightening unknowns**

24 May 2004

**The Washington Post**

**Nanofear**

**Forbes**

6 September 2004

**Nanotechnology Looks to Lose Its Buckeyballs**

**THE WALL STREET JOURNAL EUROPE.**

GLOBAL BUSINESS NEWS FOR EUROPE

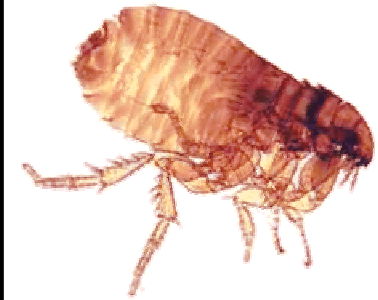
18 May 2004



# Introduction

- *nanos*: Greek term for *dwarf*
- Technology to visualize, characterize, produce and manipulate matter of the size of 1 – 100 nm.
- Small size
  - High surface to volume ratio
  - Unique properties (material strength and weight reduction, conductivity, new optical properties)
  - New entry ways (high mobility in human body and environment)

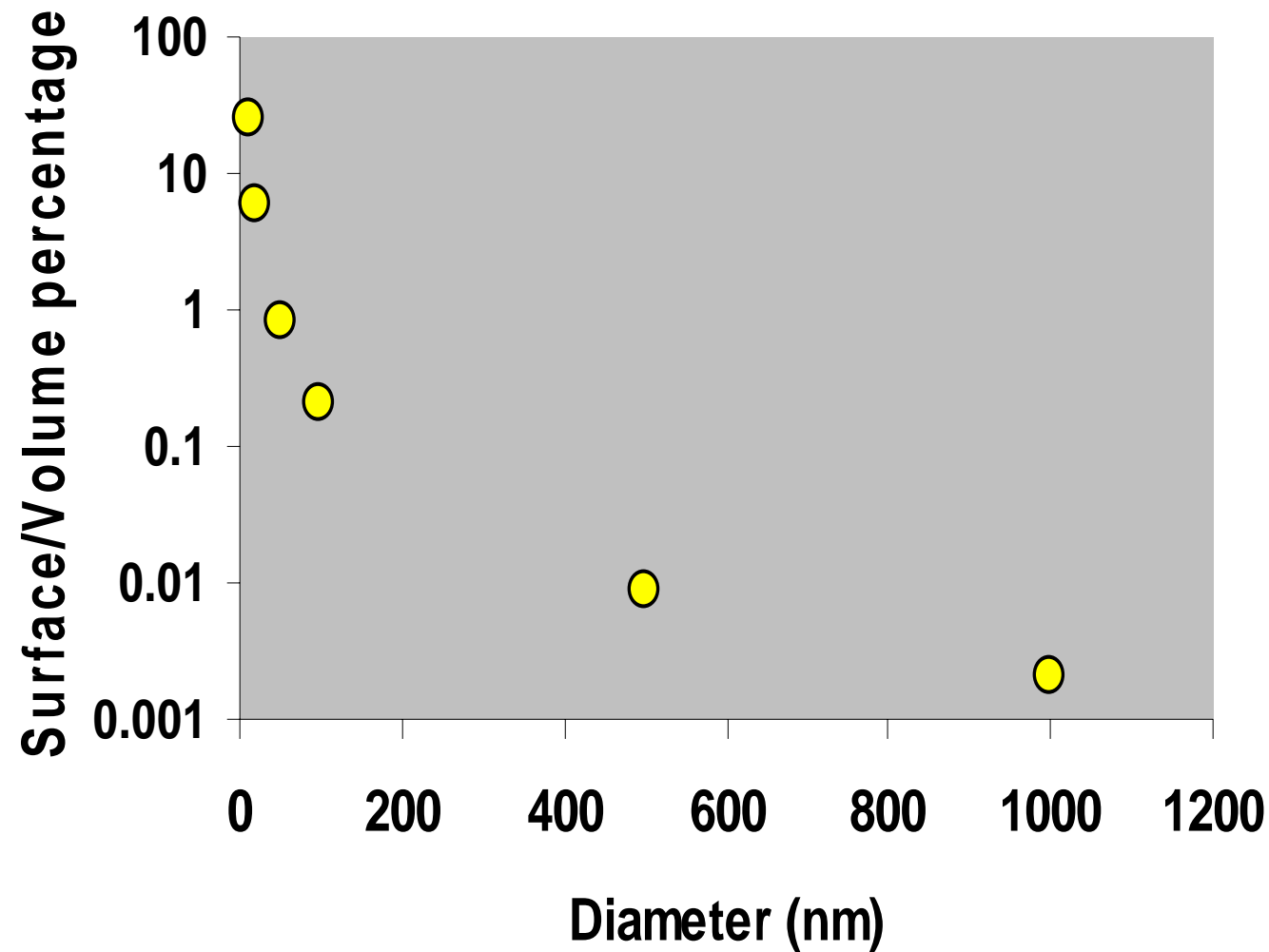
1000 000 nm



<100 nm



# What makes nanoparticles different from other particles?





# Engineered nanoparticles

## Engineered particles

- Coated surfaces
- Large volumes
- Specific properties
- Specificity



## **New materials – we cannot learn from the past**

- No long-term experience
- Few exposure assessments
- Few toxicology assessments
- No classification

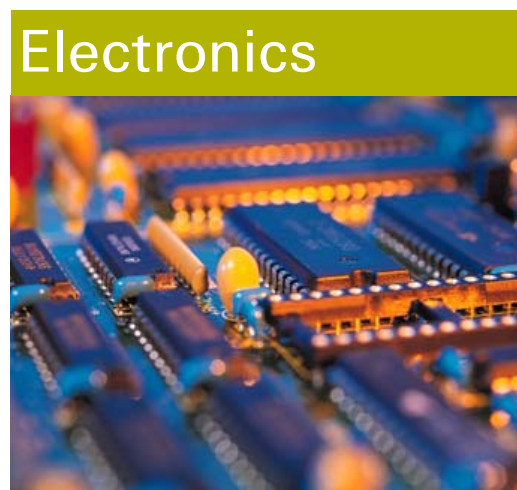


**Uncertainty**



# Nanoparticles

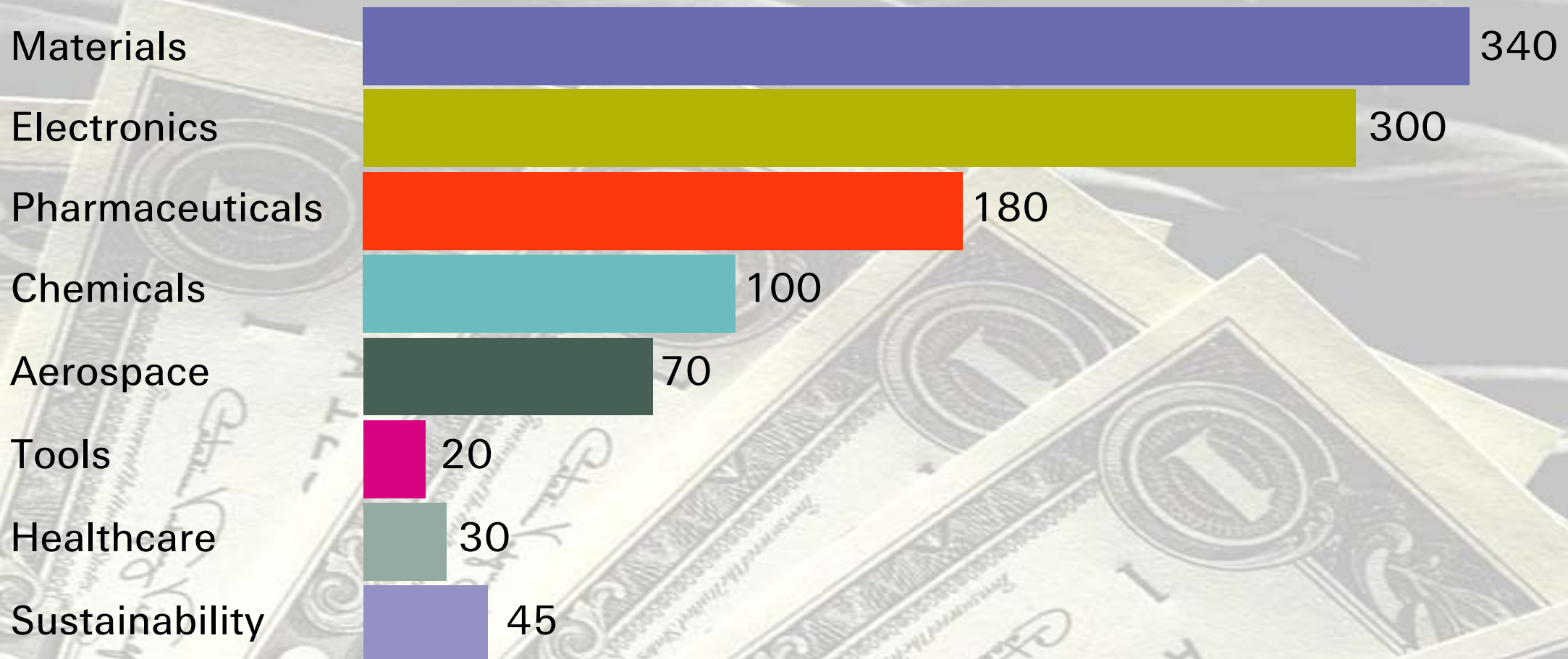
## Ubiquitous in industrial production





Estimated worldwide revenues  
exceed USD 1 trillion by 2015

### Nanotechnology revenues worldwide by 2015 (USD bn)



Source: National Science Foundation



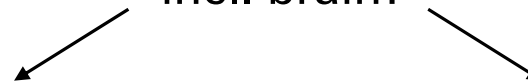


# Living organisms

**Entry into blood stream**  
via nose, digestive system, lung, skin?



**Body distribution**  
incl. brain?



**Biodegradable**

Elimination



**Acute toxicity?**

**Non-biodegradable**

Accumulation?



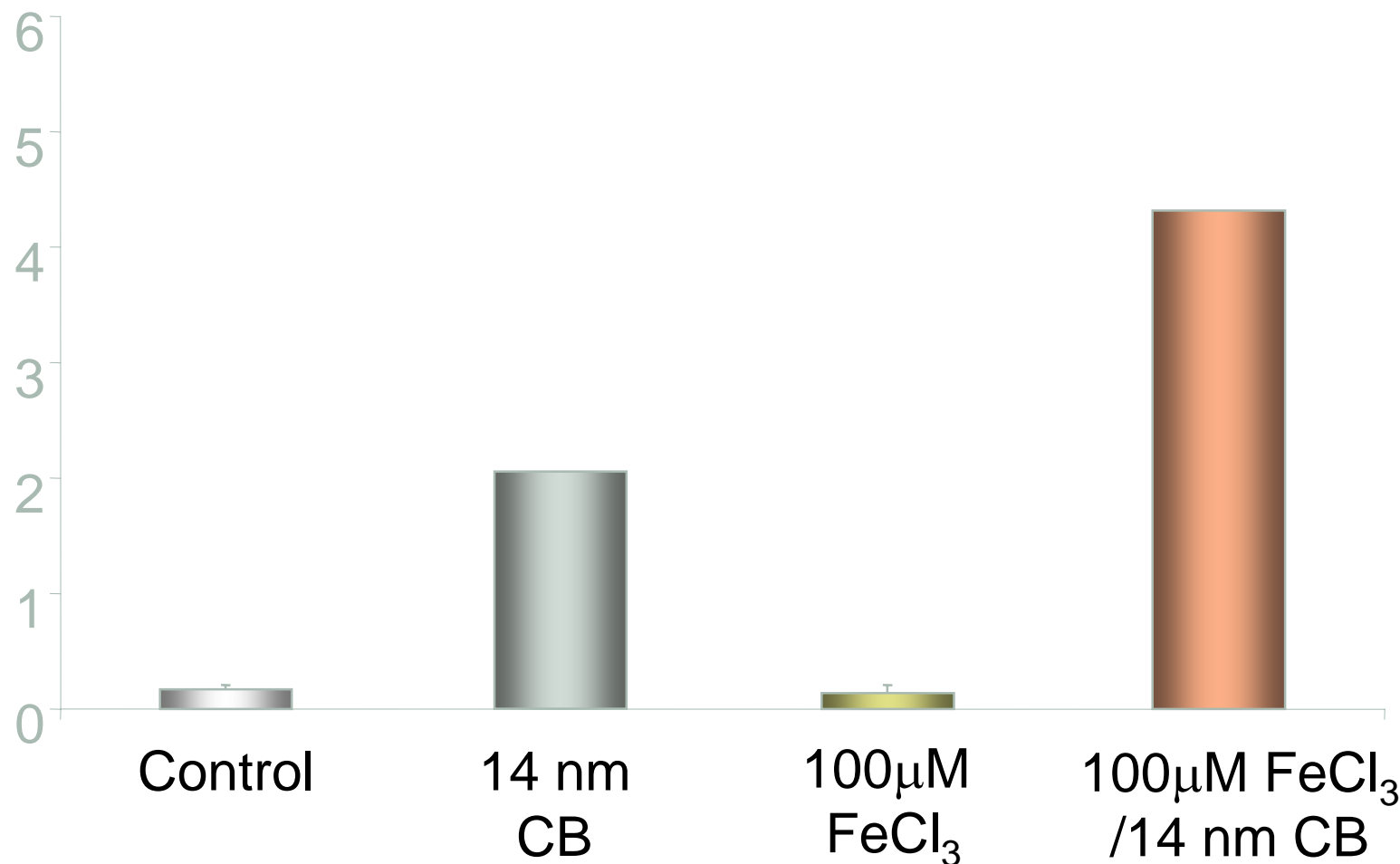
**Chronic toxicity?**



# Unexpected reactions of particles

Interaction  
between  
particles  
and metals  
*in vivo*

Neutrophils  
in BAL





## Environment

- Particles treated to avoid agglomeration
- Passage through soil, transport of contaminants (heavy metals)? → reaction with other substances?
- Ground water: drinking water quality/pesticide problem
- Absorption by plants (entry into food chain)?

Removal difficult, filters insufficient



## Regulatory environment

- FDA: “Substantially equivalent”
- EU (Scientific Committee for Cosmetic Products and Non-Food Products intended for Consumers): “TiO<sub>2</sub> is safe” (regardless of size)
- MSDS: Recommendations according to bulk material
- No disclosure obligation – exposure in products difficult to assess
- No standardisation/norms available

### Basis for:

- Comparison of scientific data
- Regulatory attempts
- Labelling issues
- Legal setup



## Public perception

- There is considerable public anxiety about new technologies that could affect the level of liability claims
- “Fear of” – Huge defence cost for insurance industry
- Public has the power to slow down/stop further developments in emerging technologies (gene technology)
- Effective, early risk communication is essential to gain trust of the public and ensure the successful introduction of nanotechnology in the market



## Challenge for the insurance industry

- No terminology
  - Basis for labelling, risk assessments, wordings etc
- Risk frequency and severity difficult to assess
- No regulatory guidelines
- Possibility of accumulation/serial claims



## Swiss Re's action on nanotechnology

- Enhance risk dialogue among business, regulatory agencies, academia and the insurance sector
- Member of international organizations (IRGC, ICON etc)
- Member of the expert group of the European Commission
- Series of internal and external events planned, including an international conference on the risks and opportunities of nanotechnology in December 2004



# Agenda

Swiss Re – A global leader in managing capital and risk

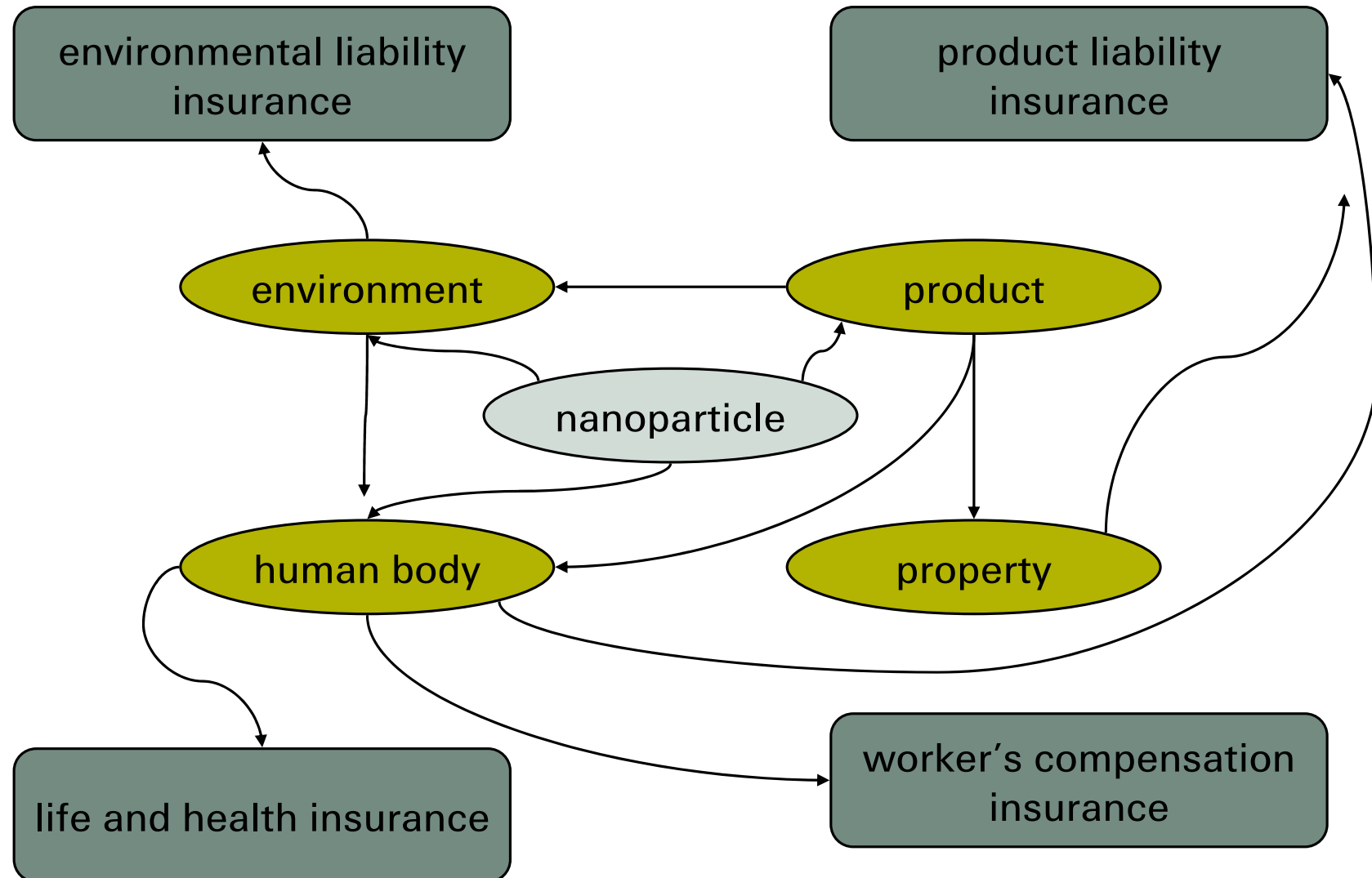
Nanotechnology – Why is it relevant for insurers?

New risks – How can they be covered by insurers?





# Insuring the potentially adverse effects of nanotechnology



only most important connections are shown



## Product liability

- Product liability insurance provides cover for
  - bodily injury claims
  - property damage claims
- arising out of
  - the manufacture and/or marketing of
  - defective or faulty products



# Insurability of risks

## **Assessability**

Probability and severity of losses must be quantifiable to calculate premium

## **Causation** (in liability insurance)

There must be a causal relationship between the action or omission of the insured and the resulting damage/injury/financial loss

## **Economic feasibility**

Insurers and reinsurers must be able to charge a premium which is commensurate with the risk

## **Randomness**

Time of insured event must be unpredictable and occurrence independent of the will of the insured

## **Mutuality**

Exposed parties must join together to build a risk community in which the risk is shared and diversified (ideally a large number; avoid anti-selection)



## Focus on assessability

- Assessability requires the quantification of risk
  - frequency
  - severity
  
- Quantification can be problematic for
  - revolutionary risks
  - risks that manifest themselves with delay (long-tail)

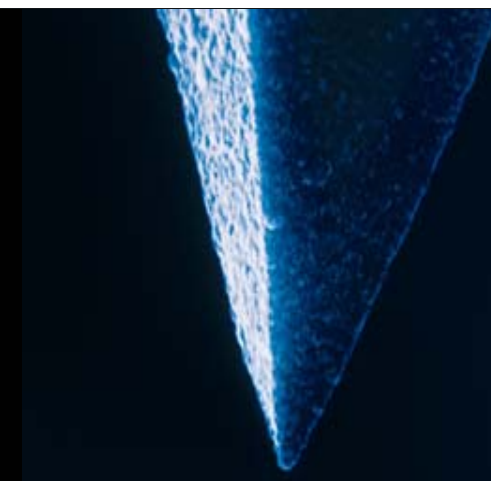


# Evolutionary vs revolutionary risks

Evolutionary  
risk



Revolutionary  
risk





## Focus on causation

- Insurance requires a causal relationship between the action or omission of the insured and the resulting damage/injury/financial loss.
- Anxiety about new technologies can affect the level of liability claims resulting in defence cost for insurance industry.
- Subjective risk perceptions can jeopardize the principle of causation.



## “Real risks” vs “phantom risks”

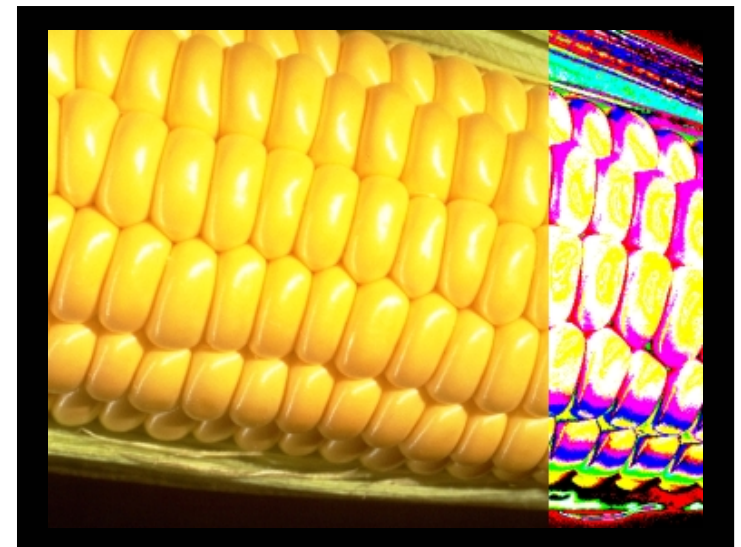
### “Real risks”

Scientifically proven  
cause/effect relationship



### “Phantom risks”

Risk perceived to be a  
threat





## Focus on economic feasibility

- Insurers and reinsurers must be able to charge a premium which is commensurate with the risk
  
- Economic feasibility can be difficult if
  - risks have the potential to cause cumulative/serial claims
  
  - risks are global in scope
  
  - risk perception of producing industry and insurers differs





# Nanotechnology: A snowball effect

**Nanoparticles**



**Companies**



**Products**



**Countries**





# Nanotechnology: Challenges for the insurance industry

- Risk is difficult to assess:
  - no long-term experience
  - frequency and severity difficult to quantify
  - delay between exposure and damage
- Cause/effect relationship may be difficult to establish
- Potentially different perceptions of risk among stakeholders
- Potential for accumulation across industries and countries



## Conclusions

- Risks must be quantifiable to offer risk transfer and adequate covers
- Lacking nomenclature and standardization are urgently needed
- Support risk dialogue among industry, regulators, scientists and society to ensure successful introduction of nanotechnology
- Insurance can only support emerging technologies if the perception of risk is similar among stakeholders (market value)