



*European Society  
for Engineers  
and Industrialists*

# 2011 International Colloquium on Nanotechnologies

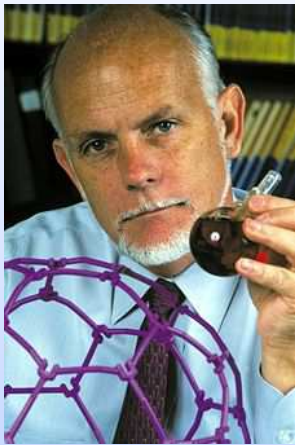
## *Nanotechnologies for Sustainable Energy Developments*

*Prof.Em. Yvan Bruynseraede  
KULeuven*



# Humanity's Top Ten Problems

## Next 50 years



Richard Errett Smalley  
1943 – 2005  
Nobel Prize 1996

1. ENERGY

2. WATER

3. FOOD

4. ENVIRONMENT

5. POVERTY

6. TERRORISM & WAR

7. DISEASE

8. EDUCATION

9. DEMOCRACY

10. POPULATION

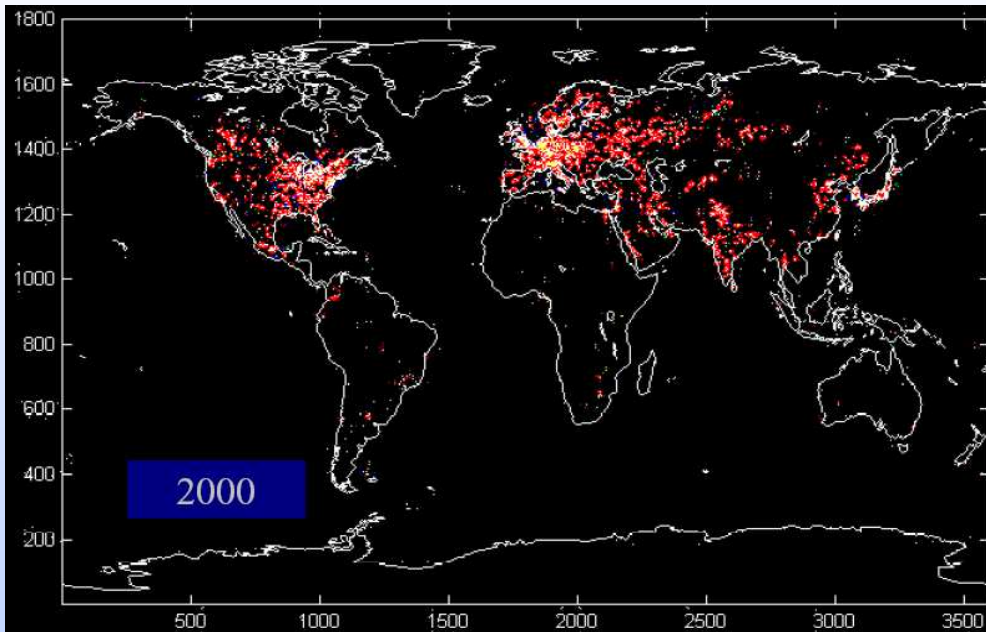


2003	6.5	Billion People
2050	8-10	Billion People

Source Richard Smalley Energy & Nanotechnology Conference  
Rice University, Houston May 3, 2003

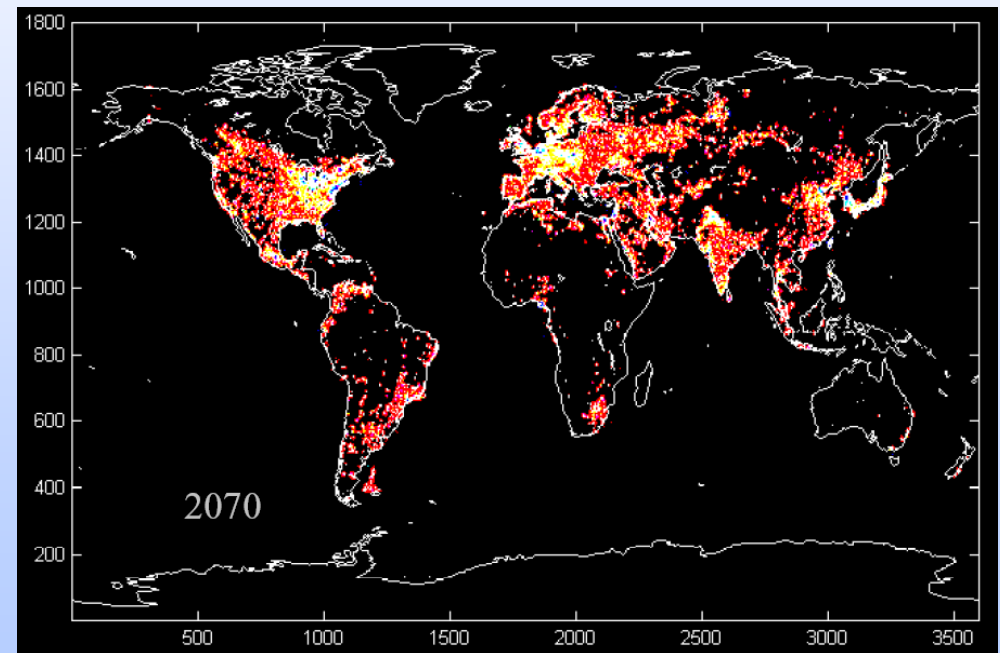
# Electrical Energy Consumption Prediction

2000



**Where there is light  
i.e. electricity  
there is prosperity !**

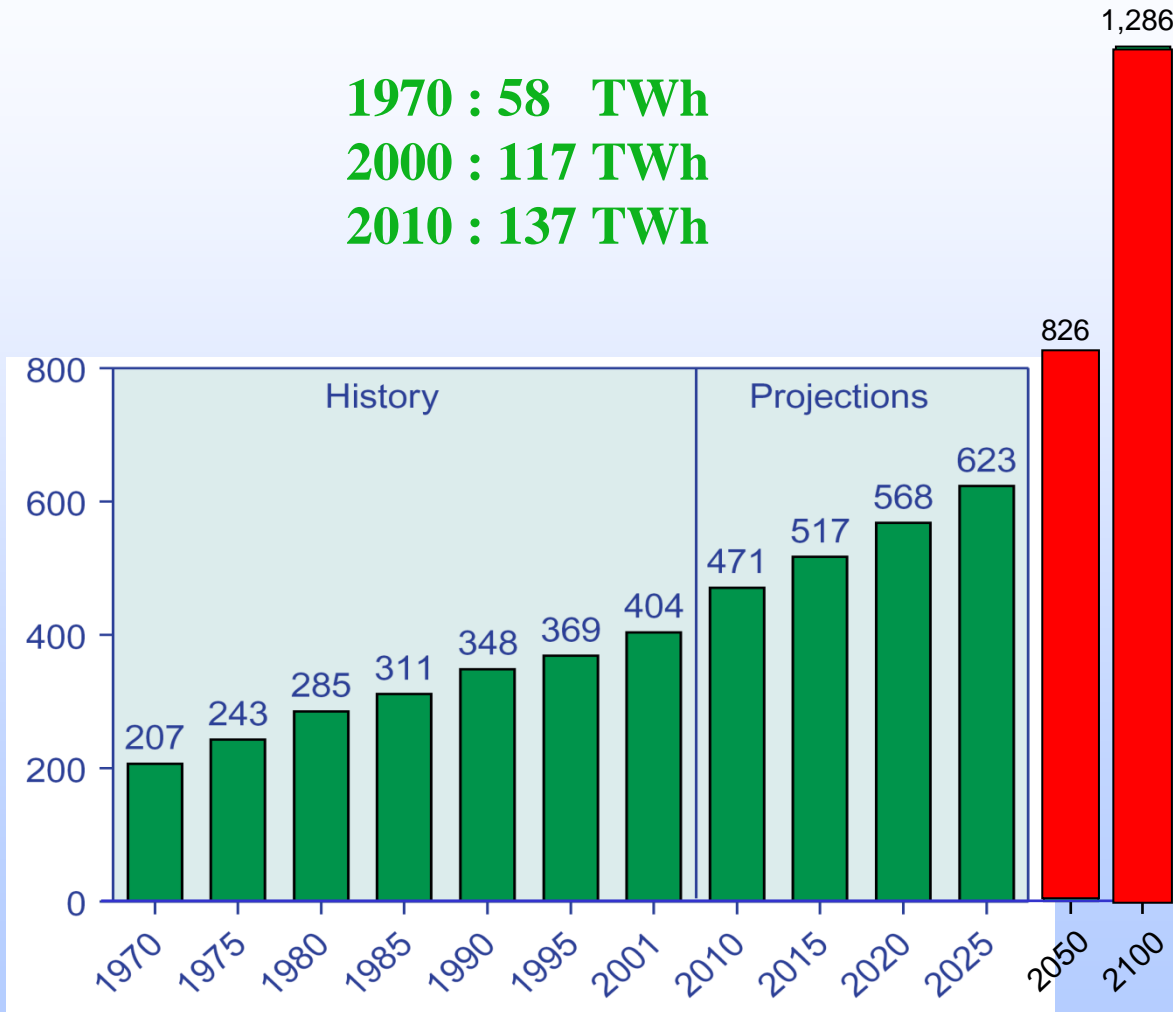
2070



# World Energy Consumption History and Projections

**1970 : 58 TWh**  
**2000 : 117 TWh**  
**2010 : 137 TWh**

**2050 : 240 TWh**  
**2100 : 375 TWh**



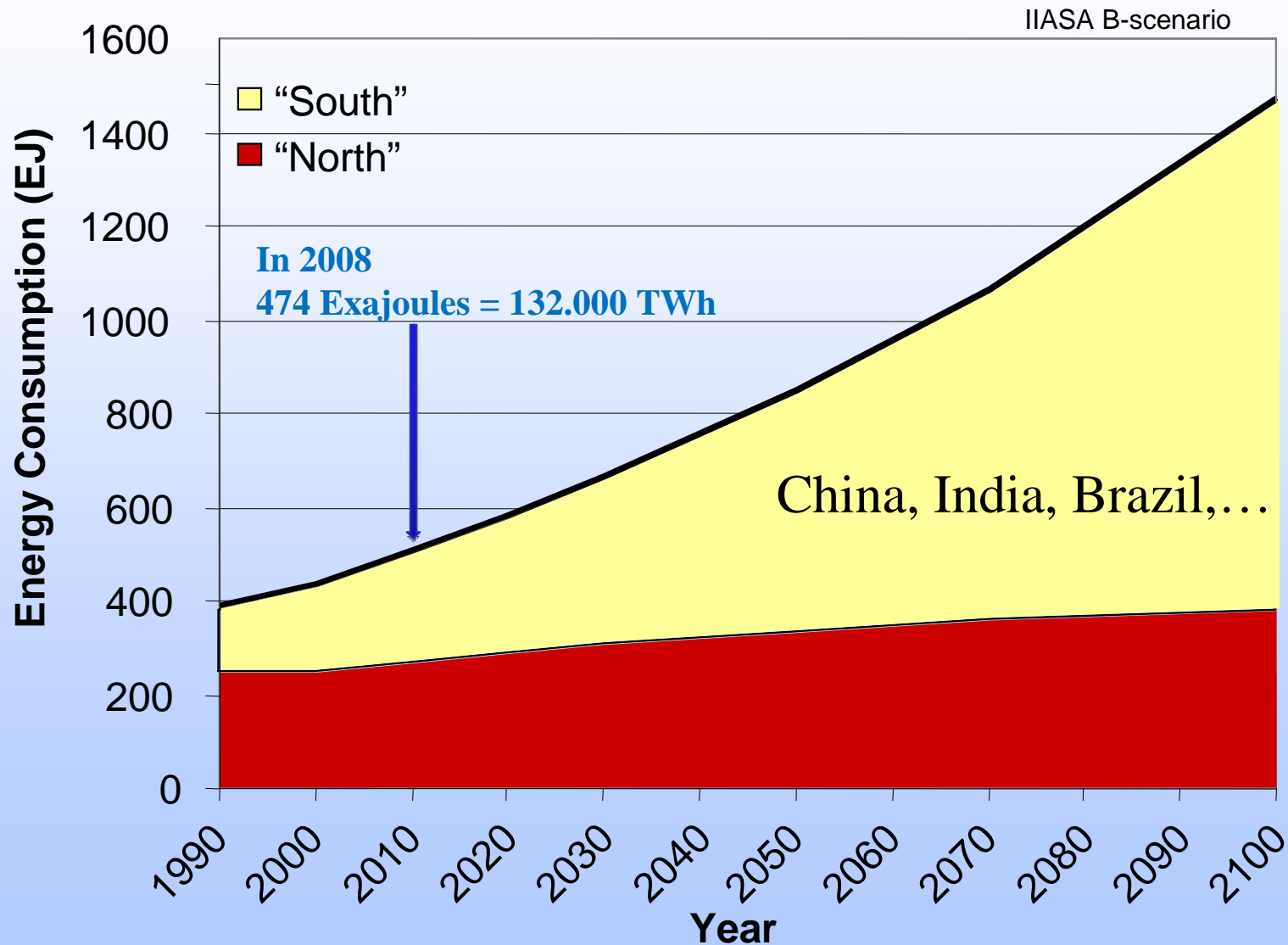
Projections to 2025 are from the Energy Information Administration, International Energy Outlook, 2004.

Projections for 2050 and 2100 are based on a scenario from the Intergovernmental Panel on Climate Change (IPCC).

1 Quad = 293 GWh ; 200 Quad=58TWh ; 470 Quad = 137 TWh

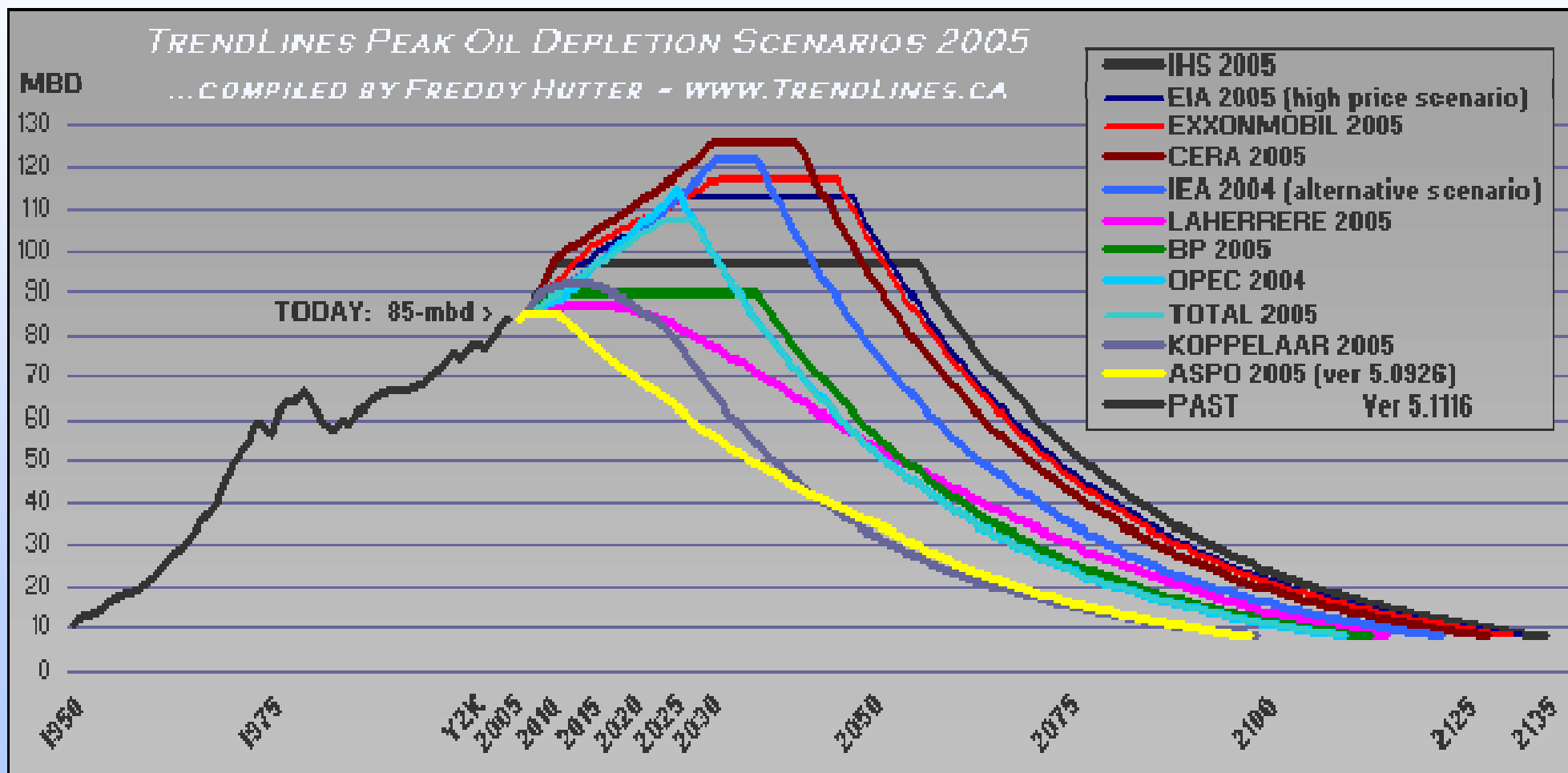
# World Energy Consumption

## “South” – “North”



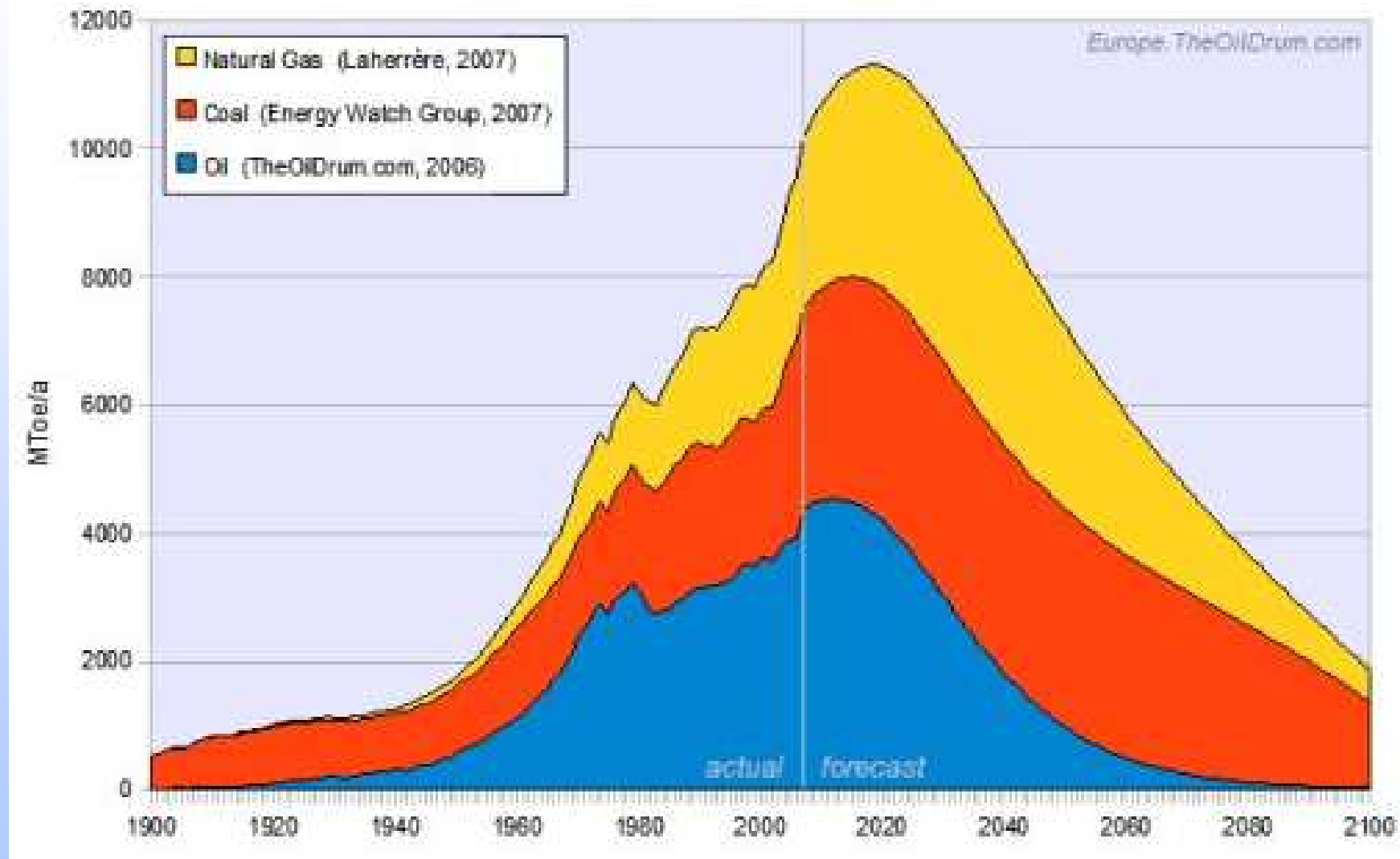
# World Energy Consumption

## Predictions “Peak Oil” – 50 Years Difference



# World Energy Consumption

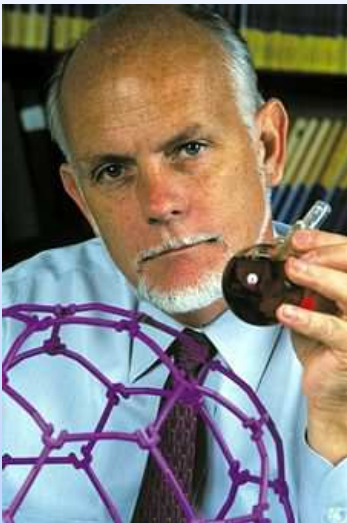
## 2020 : Cumulative Peak of Fossil Fuel Energy



Source: "Olduvai Revisited 2008" *The Oil Drum*, by Luis de Sousa and Euan Mearns.

# Nanomaterials to the Rescue?

## Growing Awareness



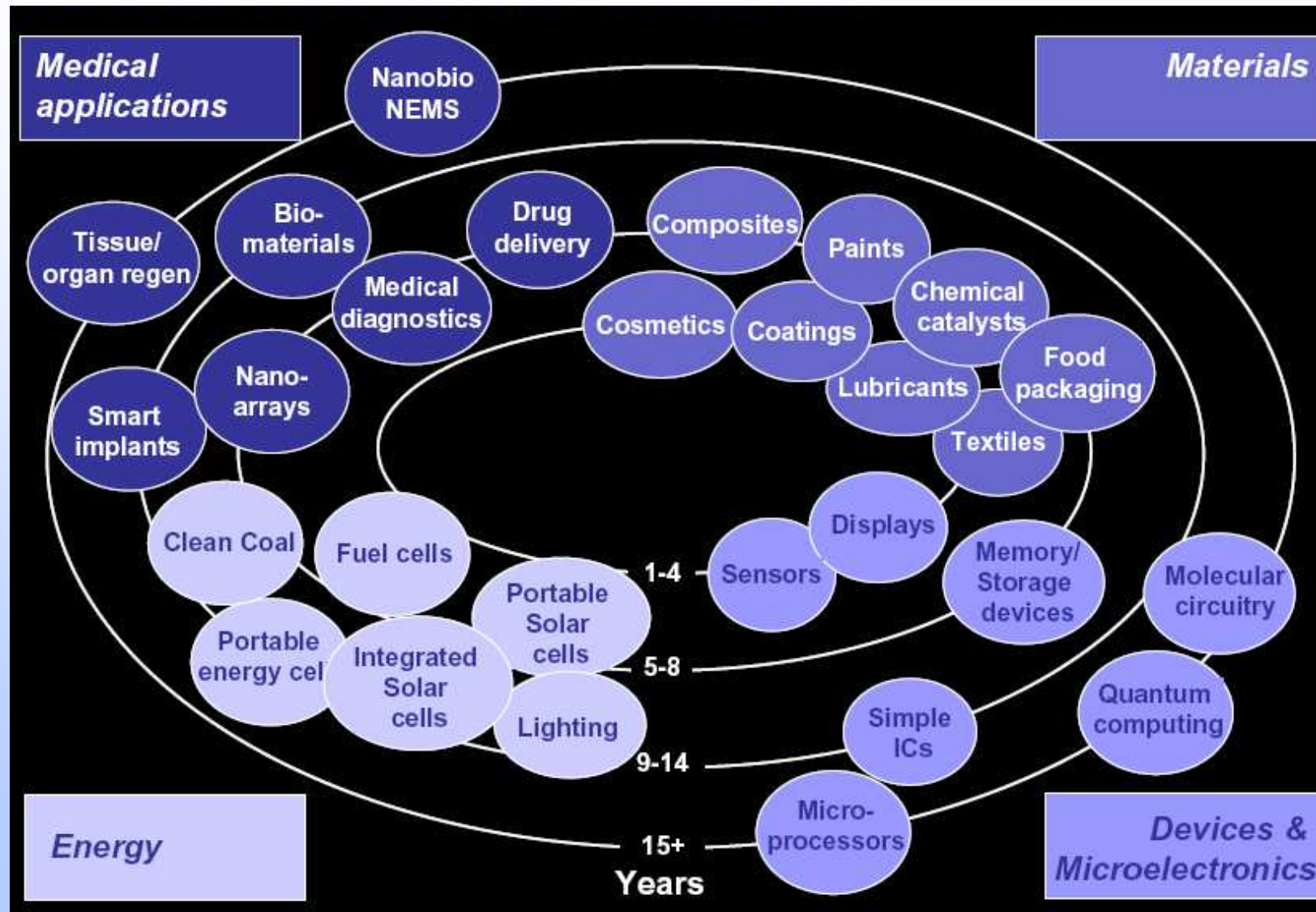
Richard Errett Smalley  
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“There is a growing awareness that nanoscience and nanotechnology can have a profound impact on energy generation, storage, and utilization. Nanotechnology-based solutions are being developed for a wide range of energy problems such as: solar electricity, hydrogen generation and storage, batteries, fuel cells, and thermoelectrics”



# Nanomaterials to the Rescue ?

## Overall Impact in Energy (2006 – 2020+)



# The Use of Nanotechnologies in the Field of Energy



**Dr. Hélène BURLET is an International Expert in Materials at CEA, Grenoble**

**After a PhD degree in Materials Sciences at the “École des Mines Paris”, she joined the Laboratory of Innovation for New Energy Technologies and Nanomaterials ( LITEN) of CEA. She is currently the CTO, more specially in charge of the evaluation of nanomaterials and nanotechnologies potential benefits for energy devices. She is a member of the Material and of the Nanoscience Committees, and of the Scientific Council of CEA.**

# Linking Nanoscale to Gigawatts : Nanotechnology in Photovoltaics



**Dr. Jef POORTMANS is an International Expert in Photovoltaics at IMEC, Leuven**

**He is currently Director of the Strategic Programme and the « Solar and Organic Technologies Department » at IMEC. He is also part-time Professor at the KULeuven. He is responsible at IMEC for advanced solar cells, particularly thin-film crystalline Si solar cells, an activity for which he became cluster coordinator of European projects.**



BE A SCIENTIST -- SAVE THE WORLD