

A wonderful journey with process systems engineering

- **Coordinates of the journey**
- **The journey**
- **The journey continues?**
 - **New coordinates**

What is Process Systems Engineering?

Takamatsu, Sargent (1972), PSE-series (1982), PSE-China(1979)

Sargent (1988): Process systems engineering is all about the development of systematic techniques for process modelling, design and control.....

Some formulate their problem, or some useful simplification of it, in precise mathematical terms, then seek to exploit the mathematical structure to obtain an effective algorithm, while others seek insight on the problem structure from physical intuition.

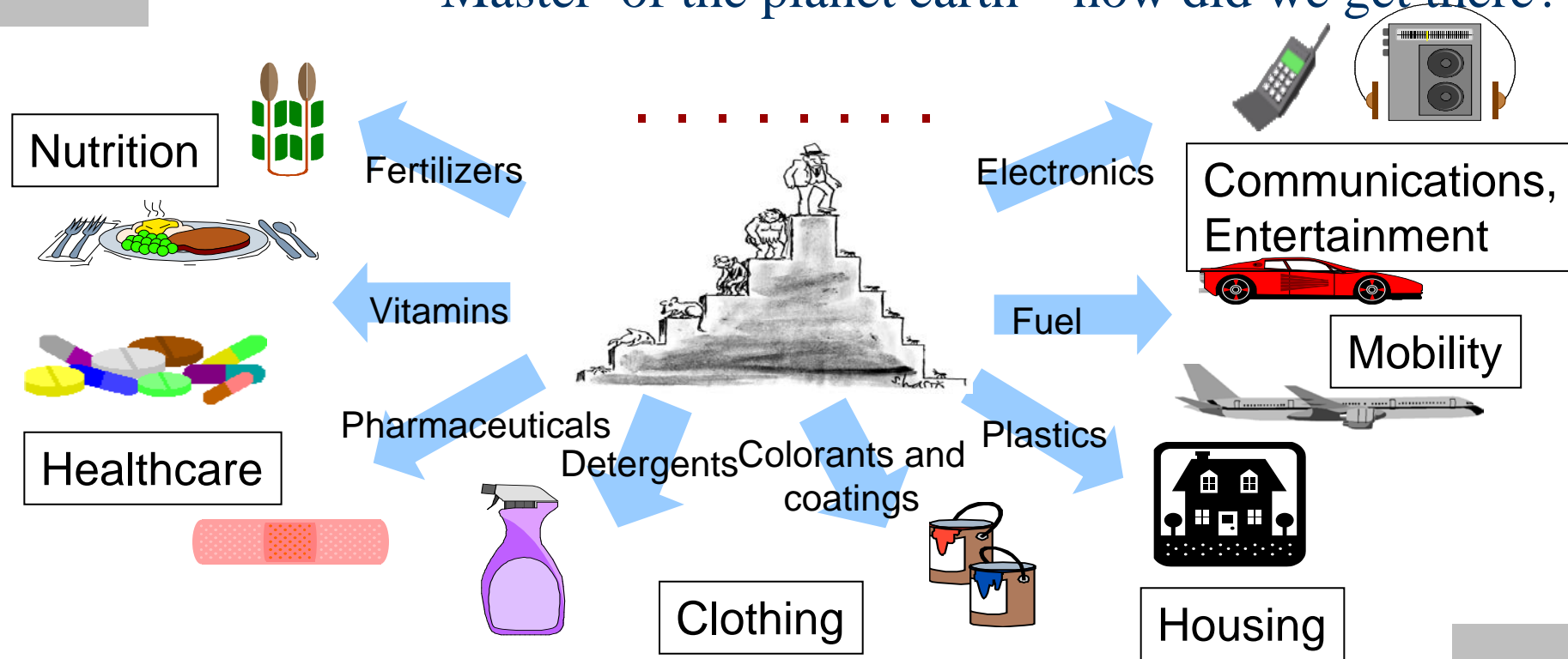
What is Process Systems Engineering?

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PSE: Use of a systematic approach to problem solving! Also, Use of computer aided and systematic approach to solving process engineering problems!

Scope & Significance of PSE/CAPE is potentially very large and depends on the application range of the developed solution approaches.

Master of the planet earth – how did we get there?



Survival of the modern society depends on the products from ChE

SPEED The journey - 1

DTU,
Lyngby



PSE (Modelling, product synthesis-design; process synthesis-design; computer aided systems)



PLAPIQUI,
Bahia
Blanca



PSE (Modelling; CAMD; process synthesis-design)



Imperial
College,
London



PSE (Modelling)



BUET,
Dhaka



Chem Eng

DTU,
Lyngby



PSE (1. Modelling, 2. product synthesis-design; 3. process synthesis-design; 4. computer aided systems)

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Dhaka



Chem Eng

PhD-students (59 defense; 19 countries)

1. Ruiz; Sorensen; Perregaard; Thomson; Tessendorf; Abildskov; Balchen; Sales-Cruz; Gonzalez-Villalba; Heitzig; Hukkeriker; Cunico; Fedorova

2. Harper; Sune; Satayanarayana; Conte; Yunus; Mattei, Kalakul

3. Bossen; Jaksland; Peres-Cisneros; Bagherpour; Schenk; Takano; Hostrup; Bek-Pedersen; Eden; Ramirez-Jimenez; Papaeconomou; Wen Li; Soni; Mitkowski; Rashed; Singh; Carvalho; Alvarado-Morales; Samad; Mustafa; Al Haque; Lutze; Padrell; Fu; Babi, Anantpinijwatna, Papadakis,

4. Hytoft; Jensen; d'Anterrosches;; Morales-Rodriguez; Hamid; Diaz-Tovar; Martinez; Quaglia; Hansen; Meisler; Mansouri, Tula

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Lyngby



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Collaborations:

Academia: Achenie; Assabumrungrat; Bogle; Brignole; Cameron; Cerriani; Chen; Elbashir; El-Halwagi; Georgiadis; Gorak; Grossmann; Hungerbühler; Kang; Kravanja; Lee; Lien; Linninger, Marquardt; Matos; Ng; Mavrantzas; O'Connell; Paloschi; Pilavachi; Pistikopoulos; Ramzan; Romagnoli; Srinivasan; Stephanopoulos; Venkakasubramanian; Yuan,

Industry: Bell; Buck; Cordiner; Crafts; Dada; Frenkel; Ishikawa; Nakata, Jiménez-González; Meier; Piccione; Pinsky, Sarup; ten Kate; (Wiebe), Wu,

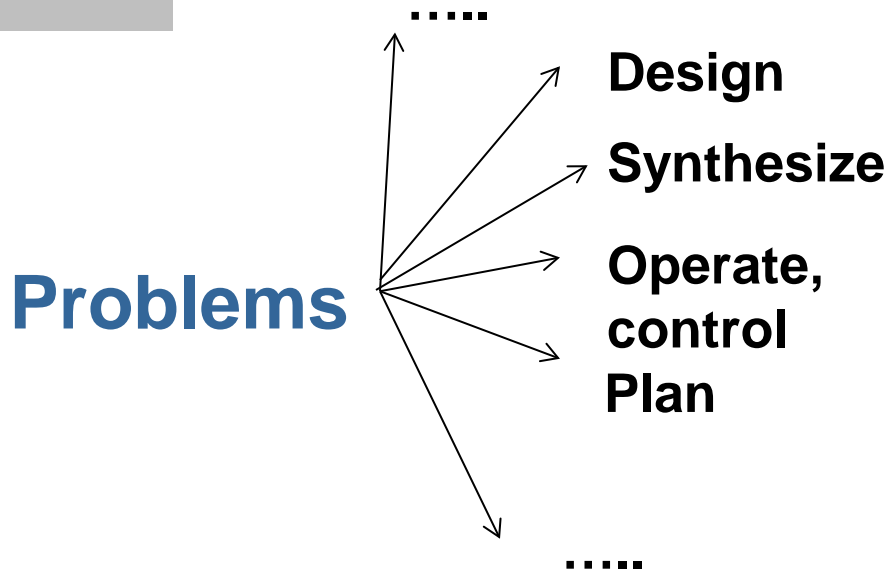
- 1. Modelling → Process; property; product; product-application
- 2. Product synthesis-design → CAMD; solvents; fluids; blends; formulations, devices
- 3. Process synthesis-design → Separation; solvent-based; driving-force based; CAFD; reaction-separation
- 4. Integrated systems → Design-control; product-process; methods-tools; process intensification; sustainability

Model-based computer aided systems:

ICAS; ProPred; ProCAMD; SolventPro; SustainPro; ECON; MoD-Tem; LCSoft; ProCAFD; VPPD-lab (ProCAPD);

The future scenario – is it sustainable?

- World population stabilizing at 9-10 billion
- 6-7 X world GDP growth over next 50 or so years (in constant dollars)
- 5-6 X existing production capacity for most commodities (steel, chemicals, lumber, etc.)
- 3.5 X increase in energy demand (7X increase in electricity demand)
- Increase in water demand
- Costs related to CO₂ emissions (7 GTC/yr to 26 GTC/yr)



Problems defined by

- System boundary
- Models (of different types, sources,)
- Data (from different sources,)
- Multi-objectives & multi-disciplines
-

PSE best suited to provide the needed generic methods & tools that can handle the challenge (manage the complexity!)

- I have notified the administration that I am stopping my career at KT-DTU from 31 December 2017 (it has been accepted!). I joined DTU in 1985
- I will continue a "free lance" career, working as a visiting professor in different universities & countries
- I have formed a company "**PSEforSPEED.com**", with some of my ex-PhD-students in Thailand (Bangkok)
- I thank you all for your help, support, motivation, interest, hard work,it has been a pleasure to work with you all
- I wish you all the best & a successful KT Consortium