17th Workshop on the Developments in the Italian PhD Research on Food Science, Technology and Biotechnology

Opportunities, Challenges and Innovation Pathways for Building the Future: A Personal Outlook ("La Vie en Rose")

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2,200 Students, 15 Programs 500 courses. 1,400 Undergraduates, 400 M.Sc., 200 Ph.D. 200 DVM, 100 Faculty & 200 Adjunct teachers

Outline

- Highlighting selected major driving forces impacting FS&T domain
- Depicting few challenges & opportunities
- Specific recommendations on what **YOU** can do to make it “La Vie en Rose”

A personal view based academic & industrial life experience (Israel, Europe & US).
Major Driving Force #1:

World Population Growth & Aging
World Population Growth\(^1\) (1950–2050)

Billions

\[ \begin{align*}
1950 & \quad 1.0 \\
1960 & \quad 1.3 \\
1970 & \quad 1.6 \\
1980 & \quad 2.1 \\
1990 & \quad 2.6 \\
2000 & \quad 3.3 \\
2010 & \quad 4.0 \\
2020 & \quad 4.8 \\
2030 & \quad 6.0 \\
2040 & \quad 7.1 \\
2050 & \quad 8.3 \\
\end{align*} \]

Less developed countries

More developed countries

World Population by 5 Year Age Groups (millions)

Note: The dependency ratio is the number of people aged 65 and older for every 100 people in the workforce-age segment.
Major Driving Force #2:

“Digital Universe”, “Big Data” & Informatics
Digital Universe and “Big Data”  
(Extracting Value From Chaos, 2011¹)

- **Information:**
  - **Exponential growth:** doubling in less than 2 years
  - **Overload:** average person receives 63,000 words (≈ full novel) every day (B. Sheridan 19/6/12; BloombergBusinessweek)

- **Data (created & replicated; estimation, 2011):**
  
  1.8 ZB (zettabytes = $10^{21}$ = trillion GB)
  
  - Equivalent to: 200 billion 2 h HD movies!

- **Real time & unstructured data floods.**

Finding answers where there are yet to be questions.

Social networks: >1.5 billion users globally (80% of total online users). $900 Bn to $1.3 Trillion. McKinsey Global Institute 7/2012

Major Driving Force #3:

Personalization
Food Health & Wellness

The Era of the Knowledgeable Consumer
Start filling in the gaps with your DNA

“Because I had given my doctor information from 23andme, he got to a diagnosis much faster. 23andme saved my life.” Kirk C.

$99* Our new low price for all! Was $199

Order Now »

1 Get Your Kit 2 Provide Saliva 3 Learn About Yourself 4 Get Monthly DNA Discoveries

Type 2 Diabetes

What’s your genetic risk?

see more

AS LOW AS 8 % AS HIGH AS 52 %

New results available!
Advancing Personalized Medicine and Nutrigenomics to fit Genetic Predisposition

http://www.sciencedaily.com/releases/2012/02/120224152755.htm

Imaging techniques such as fMRI measure blood flow through the brain.

They want your mind not only your money (Thompson, J. The Independent. 11.9.2005)


Emotional map
Nestlé Plans Push into Functional Foods - The Swiss food maker says it’s putting about $500 million towards research into functional foods and drinks over the next decade, creating two new units to “develop products that may prevent and treat chronic ailments such as diabetes, obesity and Alzheimer’s disease.”

“Let your medicine be your food, and your food medicine” Hippocrates (5th Century BC)
Personalized H&W foods

Specialoffers@PeakHealthAdvocate.com
Major Driving Force #4:

Environment, Food Security & Sustainability
Environment, Food Security & Sustainability

- **Environment:**
  - Water scarcity & management (withdrawal could exceed natural renewal by 60%, by 2030)
  - Farmland diminishing
  - Energy sustainable supply, storage, transport, renewable & alternative resources

- **Food security:** safe, nutritious food ➔ feed the world (1.3 Bn suffer chronic hunger vs. obesity)

- **Sustainability,** green technologies, processes for less developed regions, waste reduction.
Major Driving Force #5:

Innovation Ecosystem
Open Innovation & Partnerships
Innovation - Definition

The application of an:

- idea, invention, technology, process

to a product/service that will satisfy a specific need, and can be replicated at an economical cost.
**Typical innovation types**

**Scope:**
- a. Innovation of product/service
- b. Process innovation
- c. Organizational innovations

**Market impact:**
- a. Incremental or evolutionary
- b. Radical or disruptive (novel product/service)

**Origin:**
- a. Science/Technology driven
- b. Attracted by the market

**Novelty:**
- a. Relative (new to the company)
- b. Absolute (new to the market)
Open Innovation

Henry Chesbrough (2003, 2006) Haas School of Business, UC Berkeley

Stolen with pride from Prof Henry Chesbrough UC Berkeley, Open Innovation: Renewing Growth from Industrial R&D, 10th Annual Innovation Convergence, Minneapolis Sept 27, 2004
In the next 10 years who will drive innovation the most? (GE, 2011)

- Individuals: 19%
- Large Companies: 27%
- Government: 40%
- SMEs: 3%
- Universities: 3%
- Others: 5%
- Partnerships: 3%
Quo Vadis: Challenges & Opportunities

“*We are living on the edge of the future in a crazy place called now*”
Scott Berkun (2010) – “*The Myths of Innovation*”

1. Exciting times: Food & Health ‘*Enginomics*’

2. Innovation & Partnerships ➔ Quadruple Helix

Opportunity #1:

Food & Health: ‘Enginomics’
“Outside the Box” ➔ Inside Food & Body

- From: ‘Think outside the box’ a creativity & innovation cliché

➔ Inside food & body: Food & Health ‘Enginomics’

- Food (properties, structure, material science, renewal ingredients +..)
- Human internal processing (inner unit operations, gastric, targeting, bioavailability + ...)
- Manufacturing (processing, waste reduction, water reduction, environment, regulations +...)
- Health & Wellness (medicine, brain, biology, biota, pro & pre-biotic, nanotechnology, biotechnology + ...)
- Nutrition (DNA, personalization, satiety + ..)
- Consumers (special needs, emotions, pleasure +...)
- Social responsibility (food security, feeding the world +)
Inside the Body: Micro-processing, Modeling, ...

Modular Microreaction Toolbox

Mixers
Reactors
Heat exchangers
Neutrals, Bows, Filters

Sensors, Actuators

Easy to assemble and to clean!

Gastric Digestion of Foods—Challenges and Opportunities for Food Engineers

R. Paul Singh
Professor of Food Engineering
University of California, Davis

http://www.healinglightseries.com/tutorialdigestion.html
Opportunity #2: Innovation Partnerships: The Quadruple Helix
Crossing the “Valley of Death”
(Merrifield, BD, 1995 Technology Management 2(2): 73-83)

Academia

Regional & Government

Industry

Collaboration and funding

Business model(s)

News Features Translational Research
Nature 453 (12 June) 2008

Declan Butler asks how the ground shifted and whether the US National Institutes of Health can bridge the gap.
The Big Picture: The Quadruple Helix

1. **Government/State:** Guarantor of society's rules, business support, regulations,

2. **University:** Generator and transmitting knowledge

3. **Industry:** Generating productive activities

4. **The Quadruple Helix:** Private businesses & Equity, Banks, VC, Angels

...
Academia Roles: From Invention & Discovery ➔ Innovation, Collaboration & Relevance

- **Basic Research:**
  - Foremost objective, excelling is paramount.
  - Not sustainable by itself anymore!

- **Applied Research:**
  - Enhances research, teaching and students exposure
  - Increases resources, collaboration
  - **Innovation & relevance.**

- Become KT ambassador, promote innovation, collaboration, multidisciplinary and entrepreneurship.
Industry Role: Embracing Academia

- Partner/embrace academia (i.e., make it organic part of your R&D team)
- Promote internships/theses in industry
- Proactive-role (e.g., teach course(s) at the U).
- Long-term vision and support
- Implement ‘Sharing-is-Winning’ principles (Traitler & Saguy, 2009): 1. start a dialog; 2. form trust; 3. build goodwill; 4. create value.
Regional/Government Role

- Resources
- Create academia-industry sustainable bridges
- Eradicate "VoD"
- Short-range: funding for proof of concepts, small/large projects, pilot-plant facilities, …
- Long-range: commitment (education, science, technology, innovation, entrepreneurship).
Opportunity #3:

Social Responsibility
Social Responsibility

For a business to create value for its shareholders over the long term, it must also bring value to society.

Continuous evolving process
Social responsibility

- Recent economics has produced ever widening inequities:
  - 20% of the world’s people consume 86% of its goods, 84% of its paper, and 87% of its cars
  - 20% of the poorest consume 1% or less of each and emit only 2% of the world’s greenhouse gases.

- Unsustainable premise of limitless growth.

- Global economic system is deteriorating (e.g., 2008 financial crisis, EU debt crisis, ....).
“We live in a country divided into workaholics who have more money than they know what to do with and millions of unemployed and under-employed citizens struggling to make ends meet on the proceeds of work in the informal economy or claiming state benefits.”

We should concentrate much less on making money, and much more on cultivating the things that matter: family, leisure, knowledge, friendship.
Happiness vs. GDP
47-Nation Pew Global Attitudes 2007 Survey

West Europe

Italy, Germany
What **YOU** can do?

A personal outlook
La Vie En Rose ("Life in Pink")
Louis Guglielmi (music) & Edith Piaf lyrics

- Performed live in concert for the first time in 1946.
- The biggest-selling single of 1948 in Italy.
Recommendations

- Pursue your dreams
- Grow your knowledge (Life Long Learning, ISEKI Food 4)
- Love affair with your profession
- Ethics, values and professionalism
- Collaboration & partnerships
- Balance your life (family, friendships, leisure, happiness, vs. work & income)
- Social responsibility: Make a difference! “..it's not about how much money you make, it's about the difference you make in peoples lives” Michelle Obama (4/9/12)
- Don’t (ever) retire
- It is **YOUR** mission to paint your “**vie en rose.**”
Sail the unchartered oceans of knowledge to reach the harbors of your dreams

Thank you
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Good Luck