



Innovative Medicines Initiative

VISIONEN UND SICHTWEISEN

-

DIE ERNEUERTE STRATEGISCHE FORSCHUNGSAGENDA

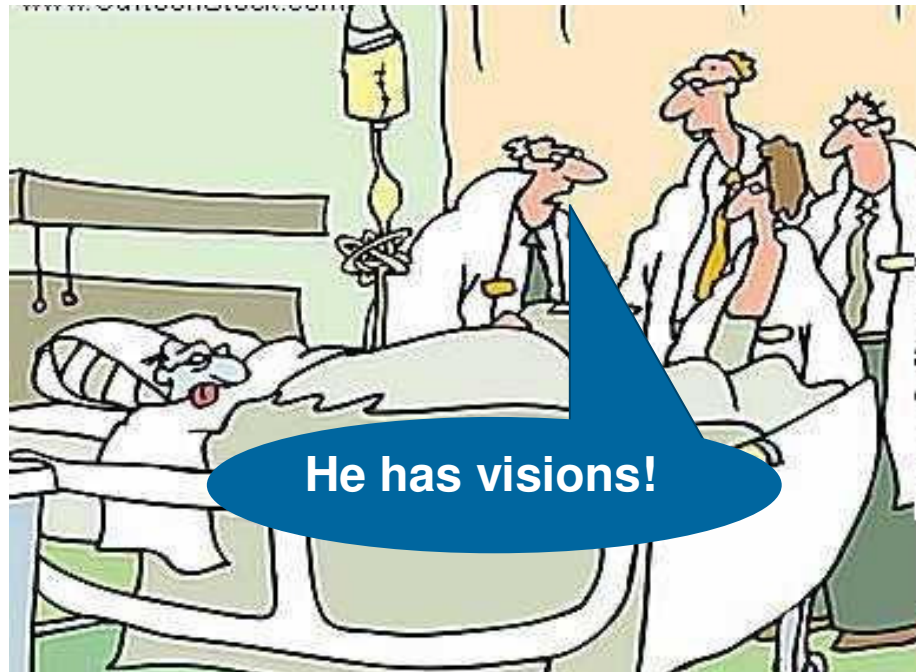
Christian R. Noe

Chair of the IMI Scientific Committee



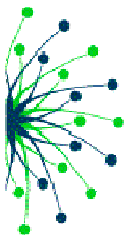
efpia

On Visions



If somebody has visions, he needs a medical doctor!

Franz Vranitzky, Chancellor of Austria



On Views and Visions



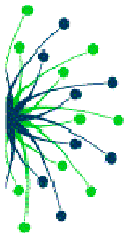
**A view on the fortune
of a scientist**

**Views provide
information!**

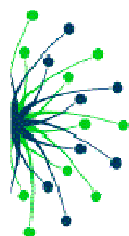
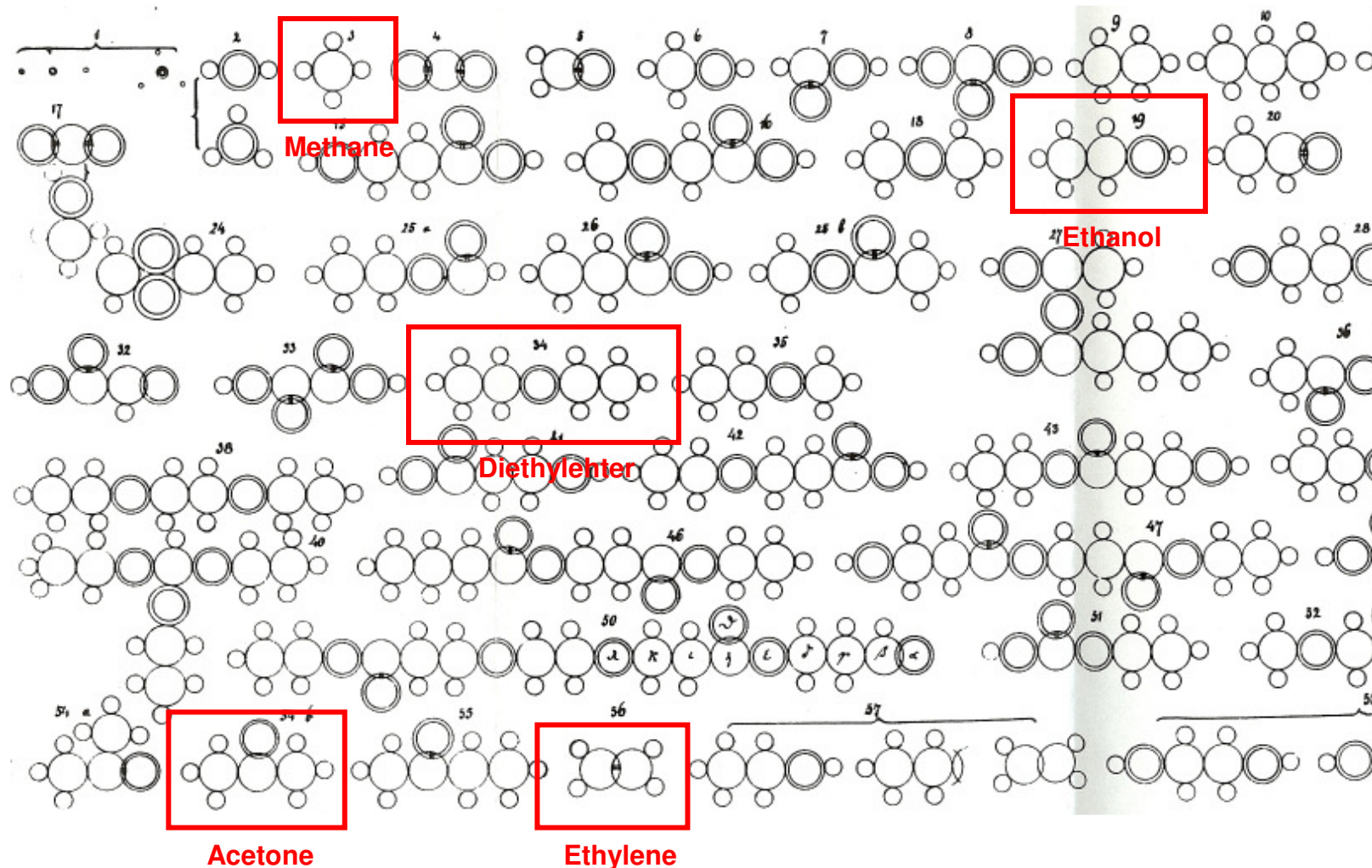


**A vision of a young scientist
on his future fortune**

**Visions provide
inspiration!**



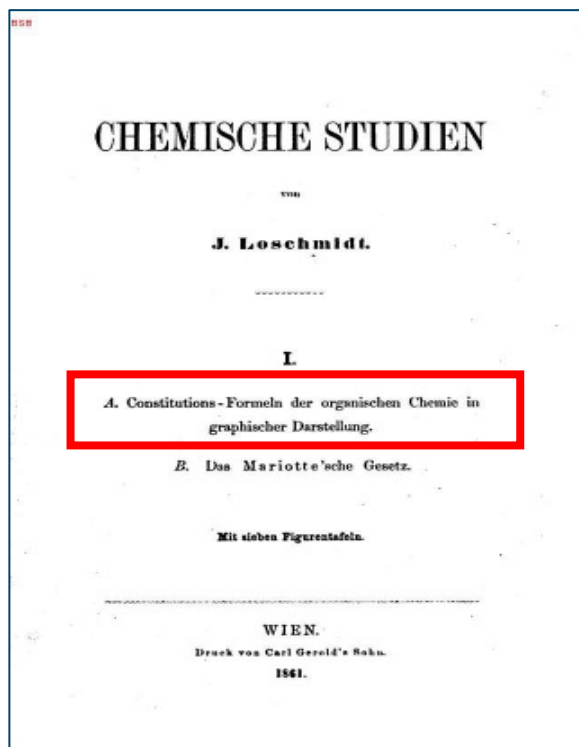
150th Anniversary of a Great Vision



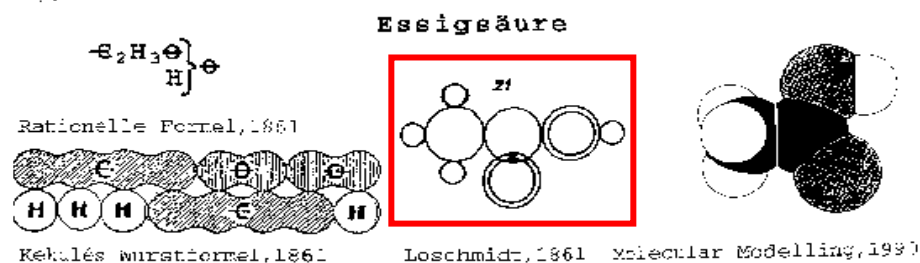
The Constitution of Matter



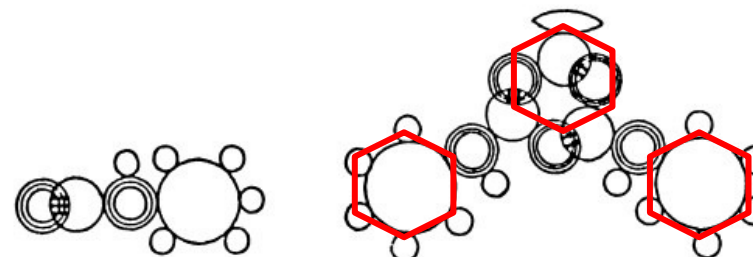
A vision on the shape of molecules



Josef Loschmidt

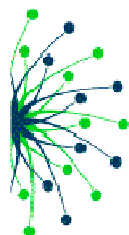


nylcyanamid sch. 238, und beim Einwirken von Chloreyanur $\text{C}_2\text{N}_3\text{Cl}_3$ auf zwei Äquivalente Anilin das Diphenylchlor-



Schema 238, 239.

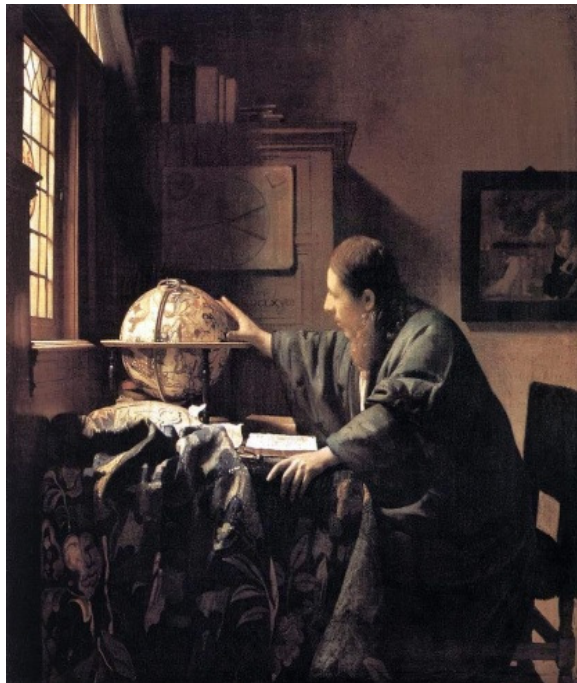
cyanurdiamin¹⁵⁴) $\text{C}_{15}\text{N}_5\text{H}_{12}\text{Cl}$, Sch. 239. Wirkt hingegen Chloreyan auf zwei Äquivalente Anilin, so erhält man Meta-



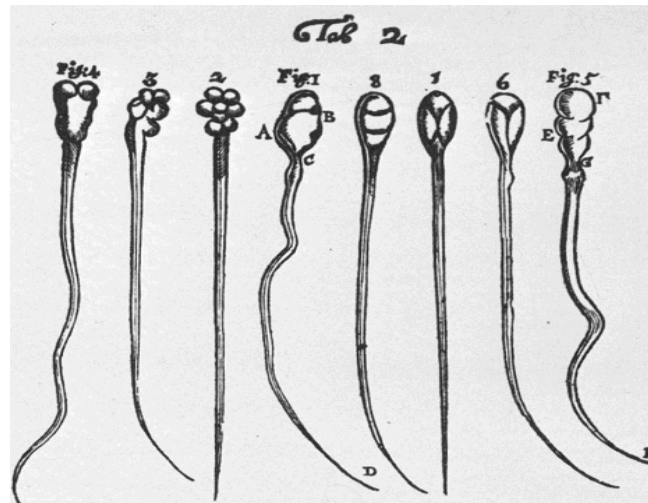
Expanding the Scale of Views



Antoni van Leeuwenhoek
1632 - 1723

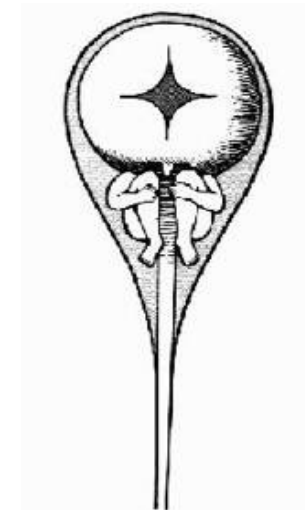


By Jan Vermeer

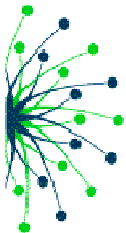


**A view on spermatozoa
under the microscope**

**A vision with
consequences**



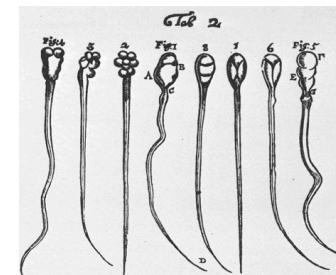
**Homunculus -
Nicolas Hartsoeker**
1656 - 1725



The “Nanoscalar Gap”



A lack of understanding of dynamics at subcellular levels



Interactions at the molecular level

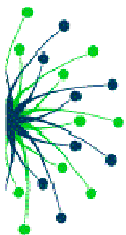
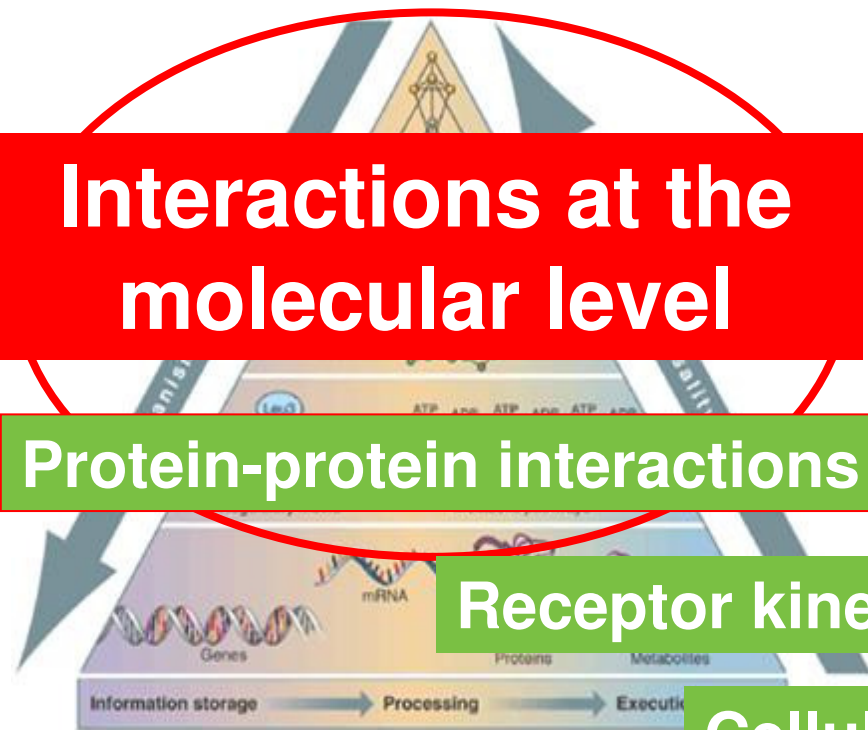
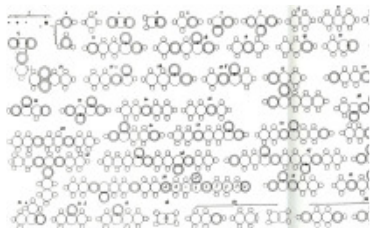
Downscaling views

Upscaling visions

Protein-protein interactions

Receptor kinetics

Cellular imaging



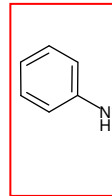
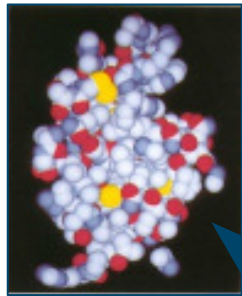
Vision: Personalised Medicine



View: The attrition rate of the reductionist R&D process is too high!

Substance Library

HTS



**IMI Phase 1:
Drug Safety
Drug Efficacy
Biomarkers**

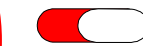


- *in silico*
- *in vivo*
- *in vitro*

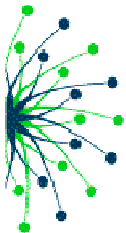
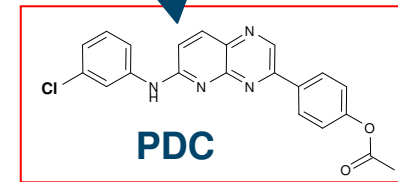
Coping with regulatory and legal hurdles

Functional Genomics

The Patient



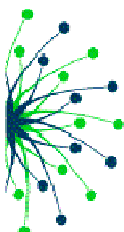
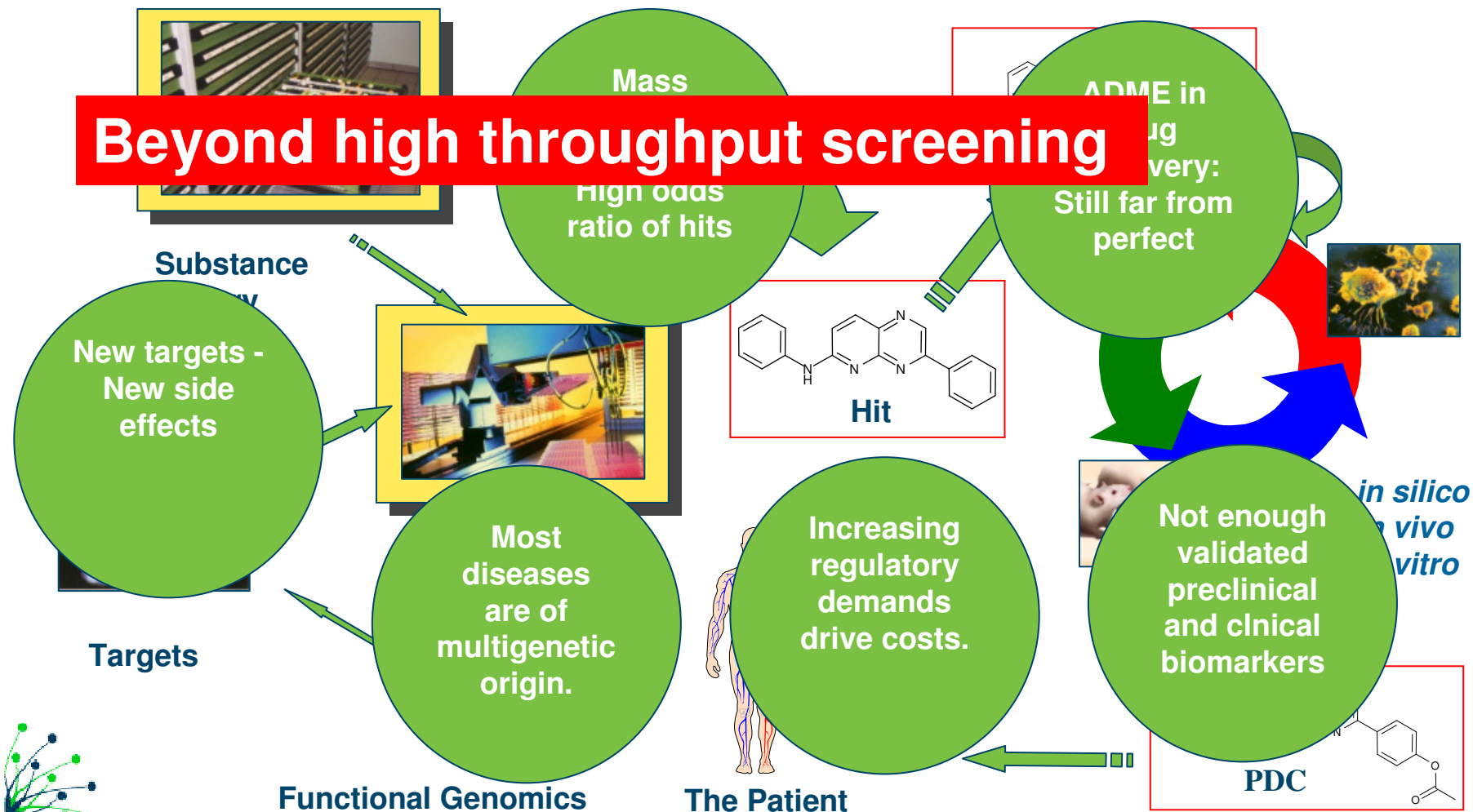
Medicine



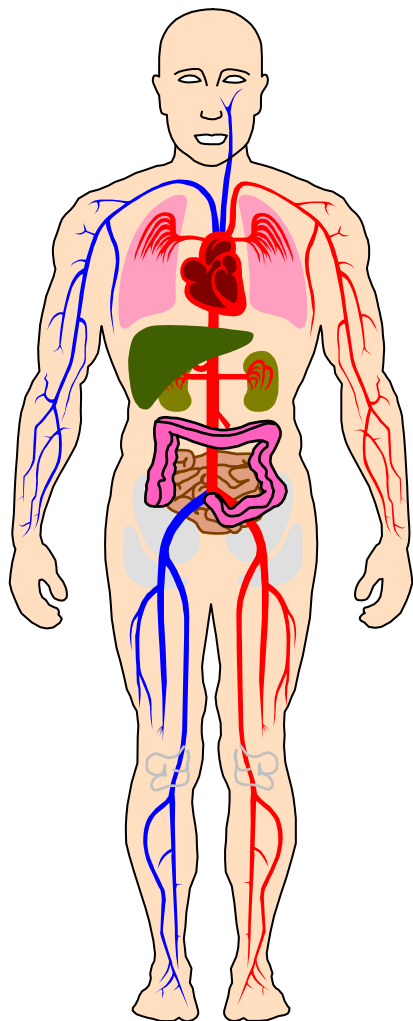
Created to remove bottlenecks:



Beyond high throughput screening

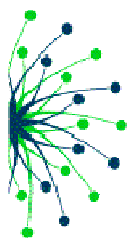


Vision: The Patient in the Focus

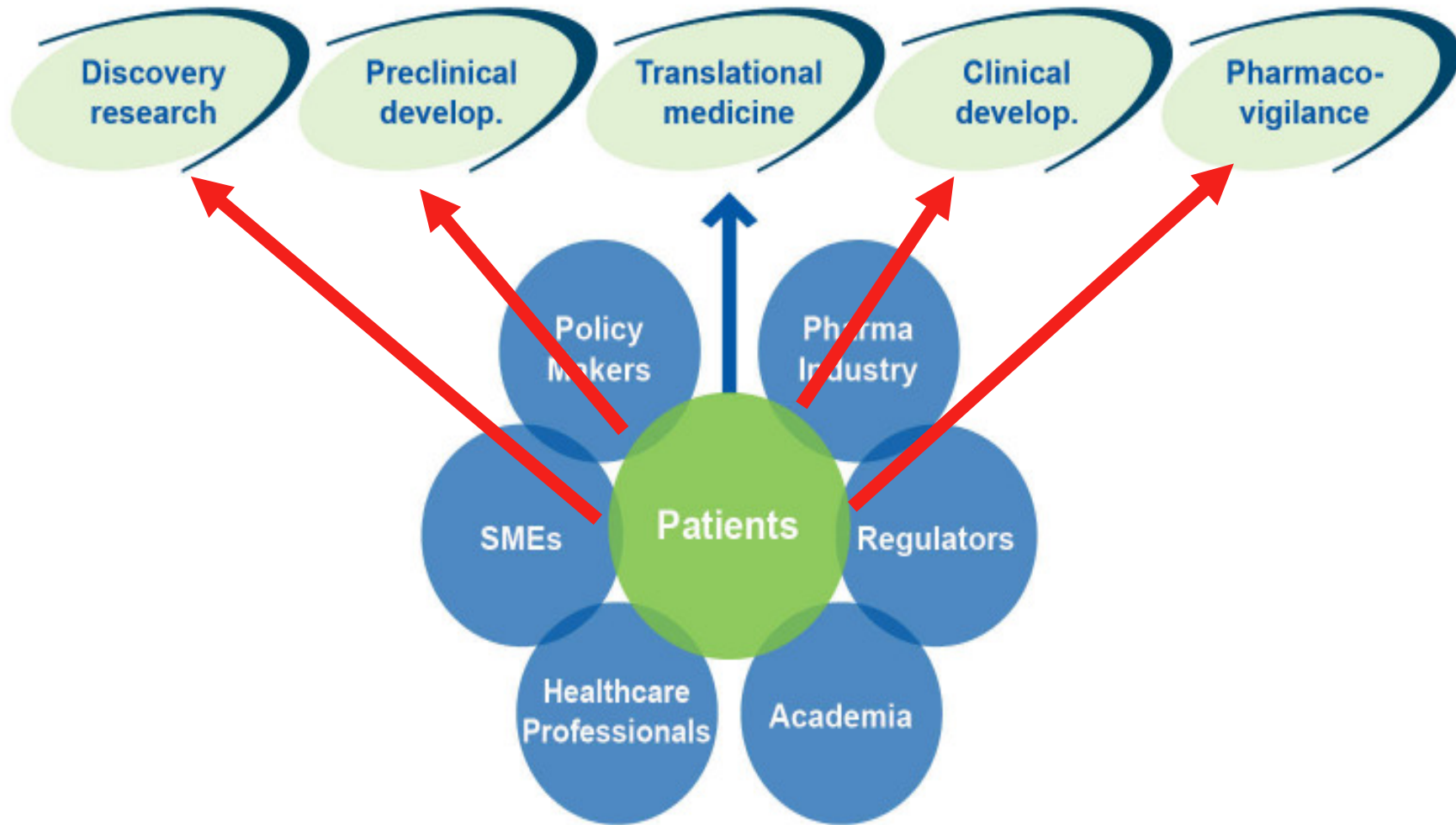


**Pharmacogenetics and
taxonomy of
human diseases**

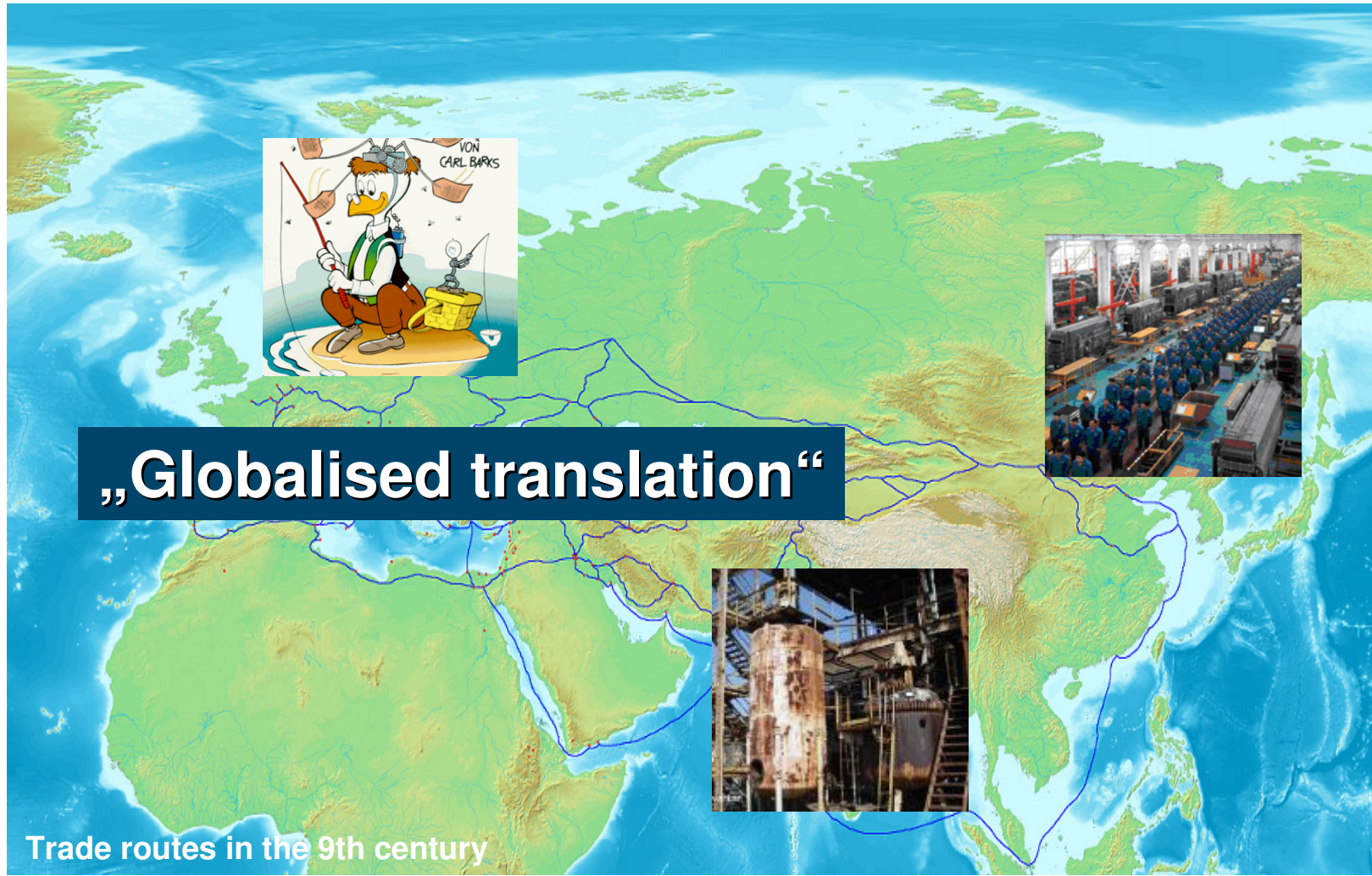
**Rare diseases
and
stratified therapies**



Translational Sciences: Wider Scope



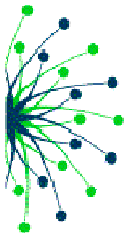
Vision: Post-industrial Europe



„Globalised translation“



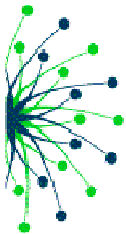
Trade routes in the 9th century



View: The World Today



Trade routes in the 9th century



From synthesis to industrial process



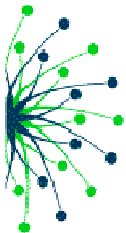
Translational sciences needs an industrial environment



**API technology
(Drug compound development)**



Advanced formulations



A Paradigm Change

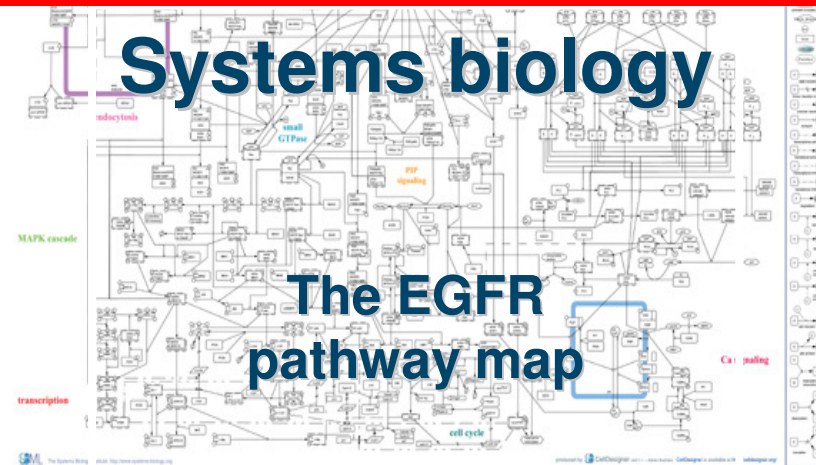


From reductionist concepts to systems approaches

Decoding of the human genome

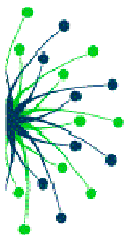
G. Venter, 2000

Milestone of great expectations and at the same time end of exaggerated expectations.



Contains a total of 219 reactions and 322 species.

Oda et al., Molecular Systems Biology
1 doi:10.1038/msb4100014 published online: 25 May 2005



Science is reductionist!



The history of strong analgesics

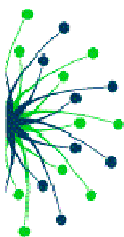
From religion to recipe

From bulk material to structural details

Antagonist

Agonist

1 2 3

The collage includes: a yellow rubber glove; a field of pink flowers; a botanical illustration of a plant; a yellow rubber glove; a botanical illustration of a plant; a piece of ancient parchment with handwritten text; a large, rough, grey rock; a glass jar containing a white powder; a 3D molecular model of a protein structure with a grey ligand; a 3D molecular model of a protein structure with a red and yellow ligand; and a 3D molecular model of a protein structure with a red and yellow ligand.

Vision: Individualised Drugs



Fundament:

Systems pharmacology

Disease understanding at cellular and molecular levels

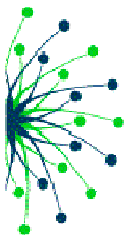


Approach:

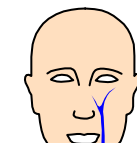
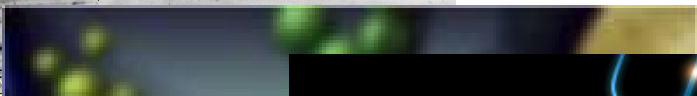
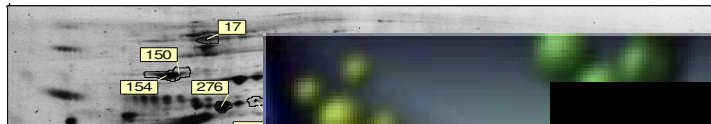
Network based discovery

Combining reductionist and systems approaches

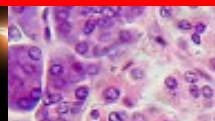
Receptor subtypes, pathways, multi target design,
systems of networks



Tools and Techniques



Stem cells for R&D and toxicity studies



Integration of imaging into drug R&D

Proteins

Compartement

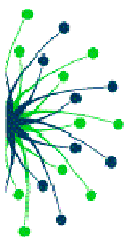
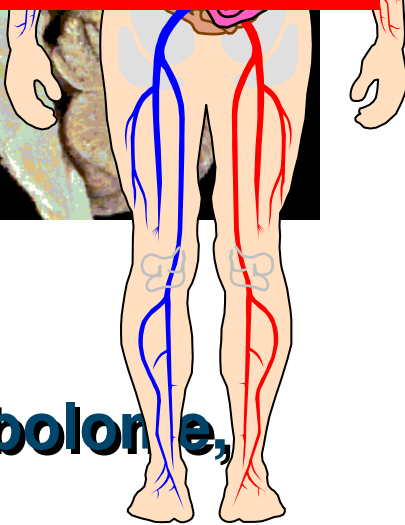
Cell

Tissue

Organ

Systems – Levels of description

Genome, Transcriptome, Proteome, Metabolome, Physiome etc.



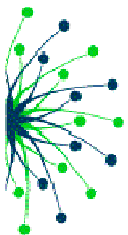
From reductionist to systems approaches in evolution research



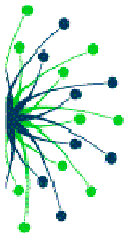
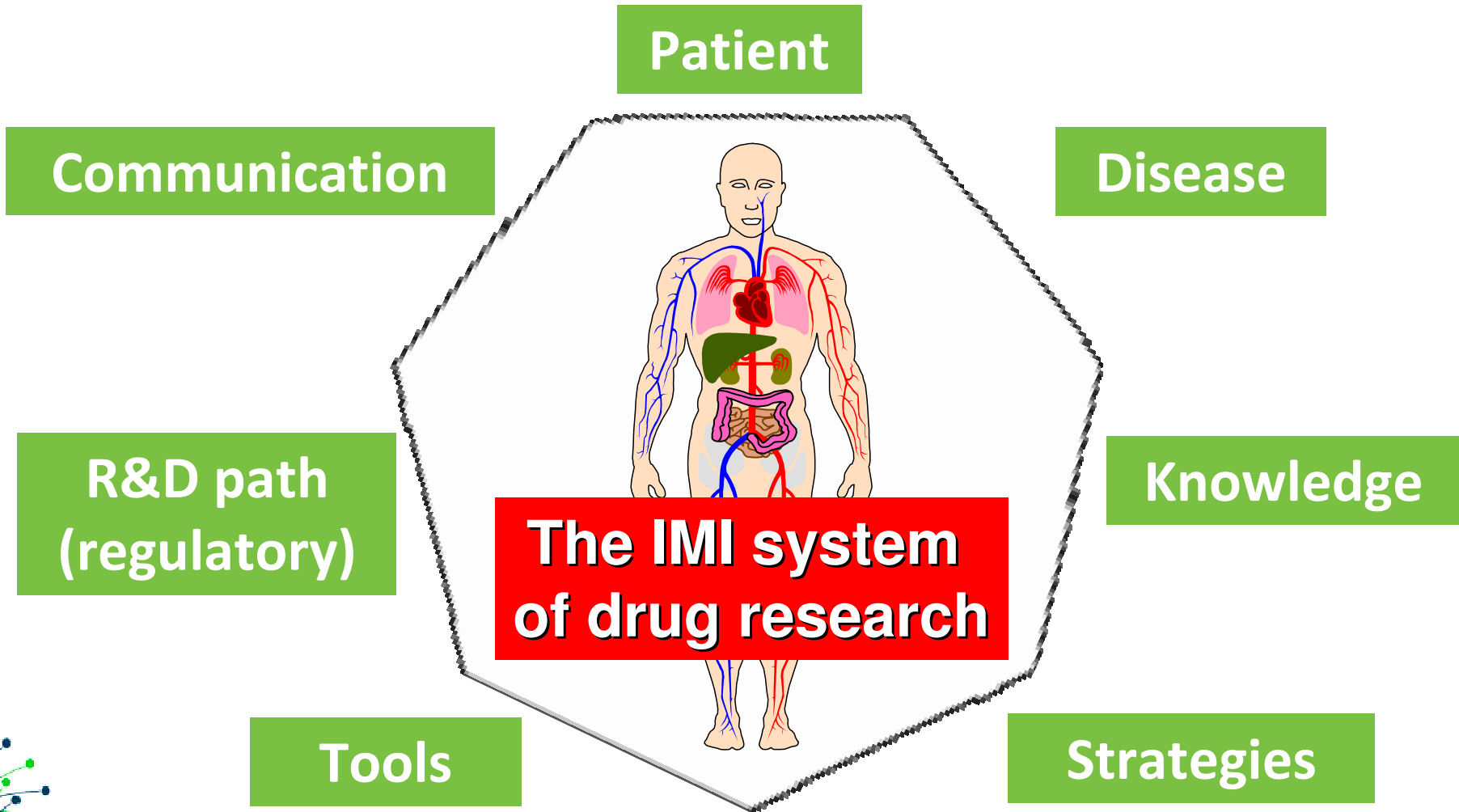
**The fittest systems survive.
Co-operation is the solution!**

**Formation of consortia,
knowledge management and
education and training are
central tasks of IMI.**

**An important aspect to overcome the
„translational crisis“**



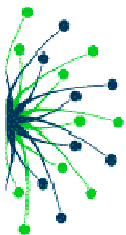
Areas of Research Interest



New Key Research Priorities



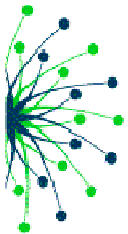
1. Pharmacogenetics and taxonomy of human diseases
2. Rare diseases and stratified therapies
3. Systems approaches in drug research
4. “Beyond high throughput screening”
Pharmacological interactions at the molecular level
5. API technology
(Drug compound development)
6. Advanced formulations
7. Stem cells for drug development and toxicity screening
8. Integration of imaging techniques into drug research



The IMI Scientific Committee



An important task is to
transform





Thank you!

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