Human Cytome Project Initiative

Valet G, Murphy RF, Robinson JP, Tarnok A, Kriete A

Max-Planck-Institut für Biochemie, Martinsried, Germany
Carnegie Mellon University, Pittsburgh, PA, USA
Purdue University, Lafayette, IN, USA
Pediatric Cardiology, Heart Center Univ.Hospital, Leipzig, Germany
Drexel University, Philaldephia, PA, USA

Why
do we need a human cytome project ?

Resolution of Biocomplexity: bottom-up

- current vision
  - molecular biology/proteomics: elucidation of the organisation of genetic networks and protein pathways and of their contribution to cellular and organismal phenotype (Collins FS et al Nature (2002) 422:835)
  - systems biology: iterative & integrative study of biological systems in response to perturbation (C Auffray C.R.Biologics (2003) 326:879)
- problem: high complexity, long time frame with 30-40.000 genes
- examples:
  - 3D protein structure

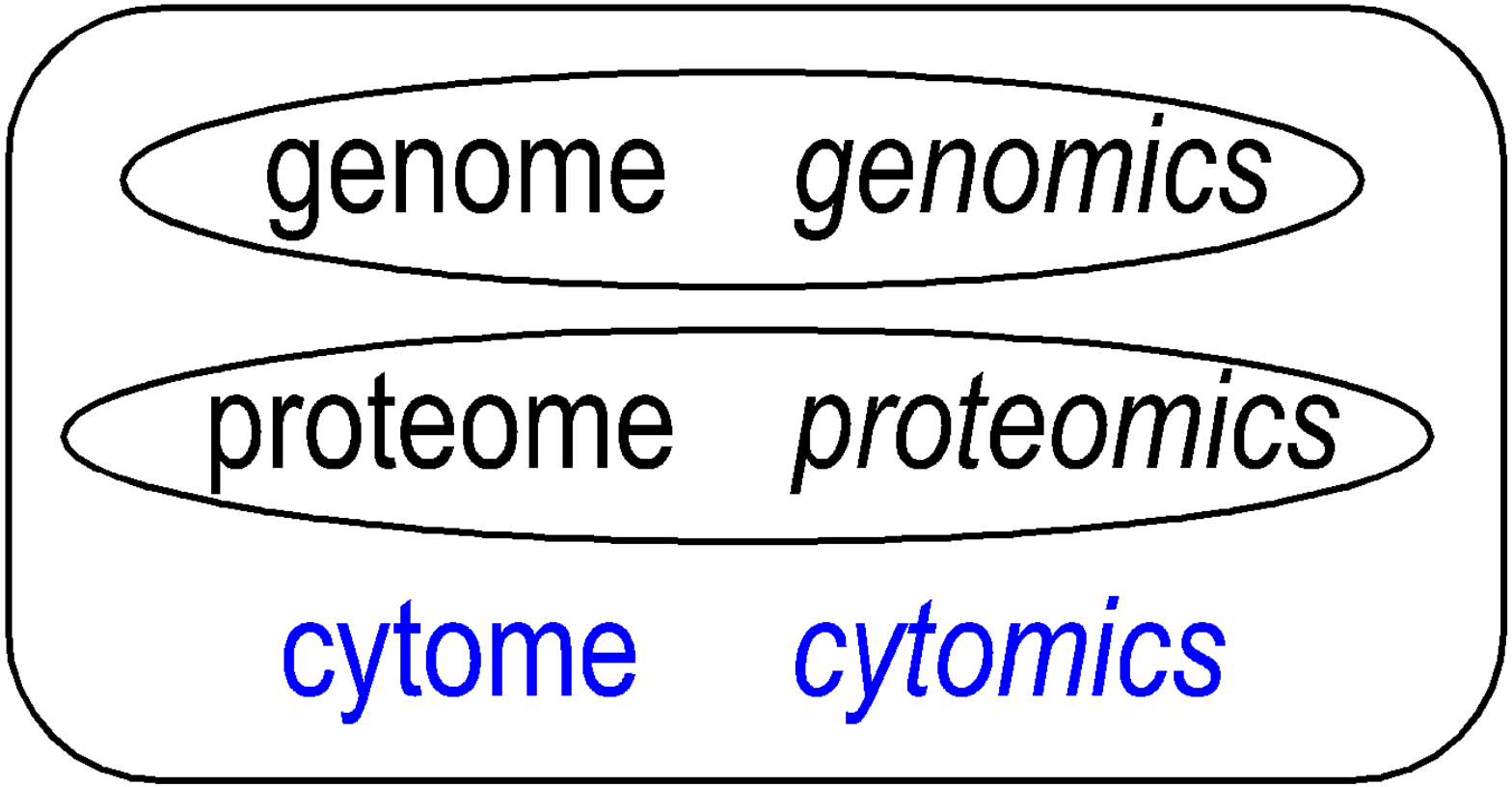
    30 years of research do no permit to exactly predict 3D protein structures from amino acid sequences (20 amino acids)
  - pharmaceutical industry

    investment doubling during last 10 years provided only half as many new candidate substances than during preceeding 10 years

Resolution of Biocomplexity: top-down

- shortcut: human cytome project
  - evaluation of disease processes as nature induced differentials
  - differential screening of molecular single cell phenotypes like diseased versus healthy or differentiated versus undifferentiated
  - molecular hotspot identification by standardized relational classification
- advantage: immediate application potential
  - predictive medicine by cytomics for personalized medicine
  - identification of new drug targets using retrograde pathway modelling of molecular hotspots by systems biology
  - relevant information is collected at reduced complexity

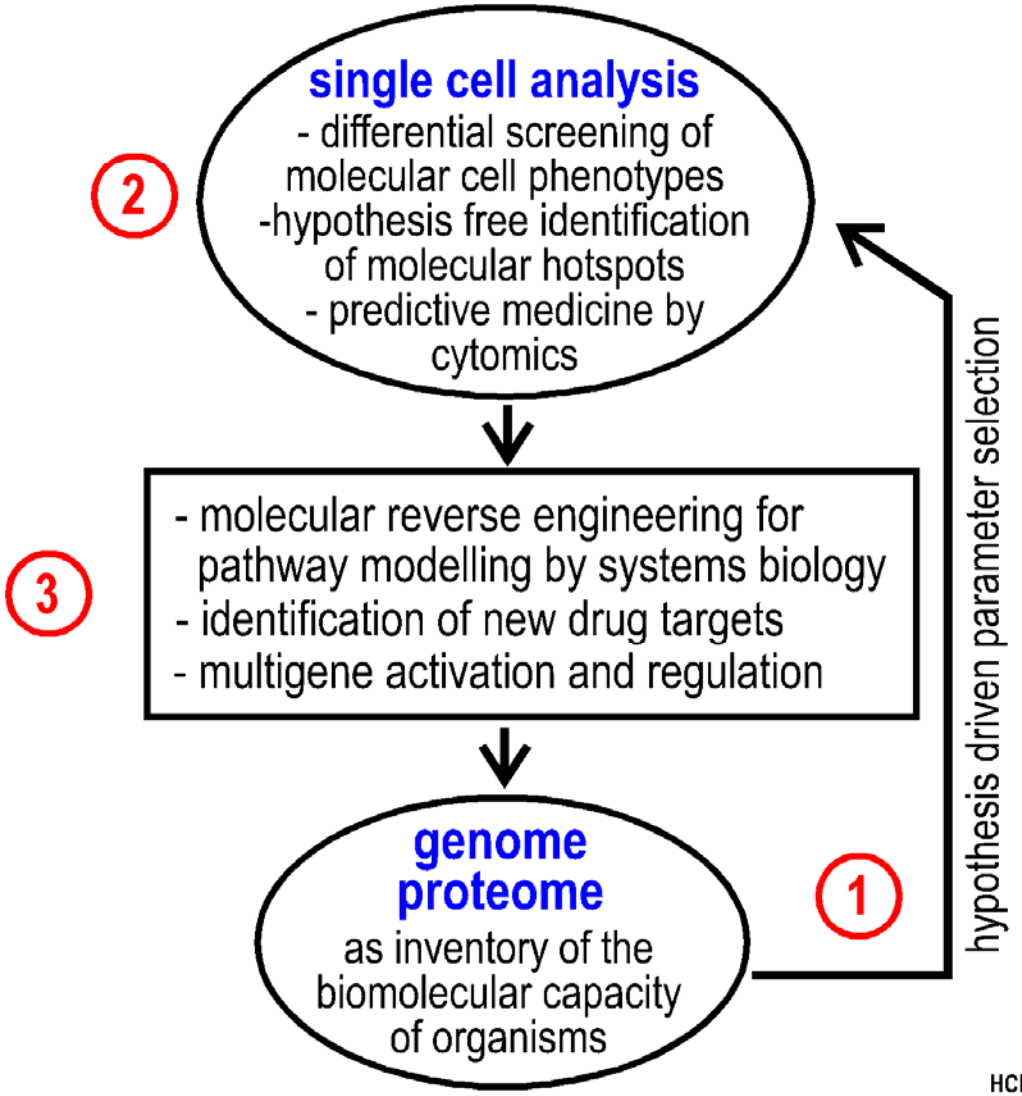
Categories



- cytome: cellular network (cell system, organ, organism)
- *cytomics:* analysis of cytome heterogeneity by multiparametric single cell molecular phenotyping in combination with exhaustive bioinformatic knowledge extraction.

Human Cytome Project

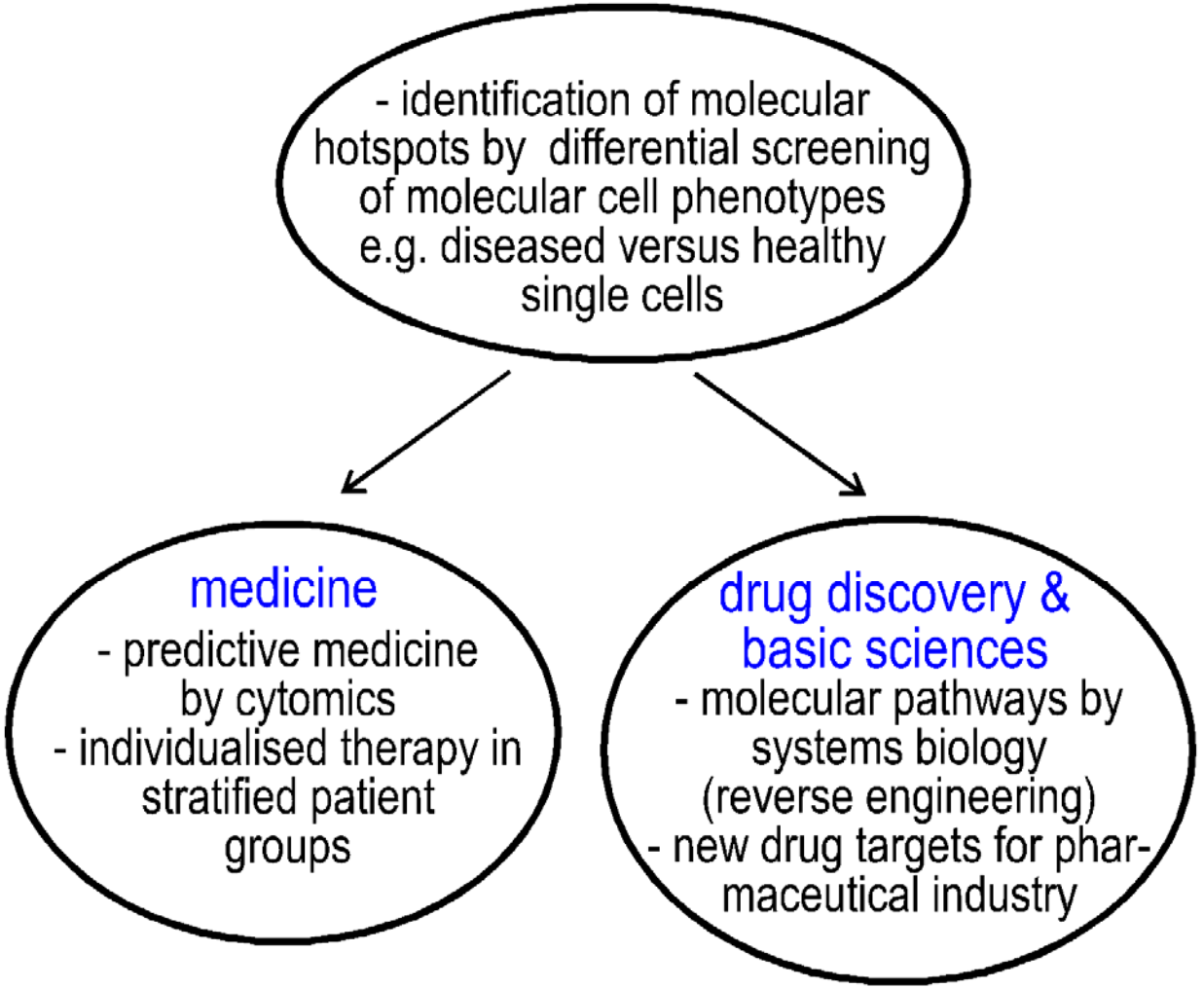
- top-down approach with
- cells as elementary units



HCP-V

Human Cytome Project

cells instead of biomolecules as elementary units



Human Cytome Project
proposed milestones: medicine

- leukemia/lymphomas:	stem cell transplantation versus chemo-therapy
- rheumatoid diseases:	early identification of high and low therapy requiring patients
- allergies:	detection of predisease sensitization for asthma, neurodermitis, ekzema a.o. in risk families for early preventive therapy
- infections:	prediction of infection and disease course in newborn, intensive care and elderly patients to apply early preventive therapies

Human Cytome Project
proposed milestones: cytome characterization

- stem cell differentiation & cell cycle:	relationally standarized description of differentiation and cell cylce phases
- cell proteomics:	molecular topology of intracellular proteins
- cell organelles:	systematics of molecular organelle function
- drug target identification:	retrograde pathway modelling of molecular hotspots

Conclusions

1. molecular cell phenotypes resulting from genotype and exposure can be *top-down* analyzed by single cell *flow* and *image* cytometry, using for example differential screening of diseased versus healthy cytomes.
2. discriminatory molecular hotspots are obtained in this way. *Reverse-engineering* of these hotspots by systems biology may be used to find *disease* inducing molecular pathways and new *drug targets*.
3. a human cytome project will favor the more detailed understanding of medically relevant *genome realization* mechanisms. Furthermore *patients* in everyday medicine will profit from individualized disease course *predictions* through individually tailored therapy schedules. HCP-V

From Fascination to Finances

Indiana University

Dec 16, 2004

http://newsinfo.iu.edu/news/page/normal/1770.html

METACyt project:
- metabolomics
- cytomics

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Indiana University will use $53 million Lilly Endowment grant to boost life sciences in Indiana

BLOOMINGTON, Ind. -- Indiana University President Adam W. Herbert announced today (Dec. 16) that the Lilly Endowment Inc. is giving IU Bloomington $53 million to broaden and intensify its life sciences research, retain its distinguished scientists, attract new world class scientists and contribute to the state's economic development by transferring technology to new and existing life science businesses. The grant is the largest IUB has ever received.

These funds will be focused on metabolomics and cytomics, emerging fields that are bringing an explosion of genetic information to bear on scientists' understanding of metabolism and the inner workings of cells. The new Indiana Metabolomics and Cytomics (METACyt) Initiative will build on the foundation of genomic and proteomic research already taking place at IUB and complements the 2001 Indiana Genomics Initiative at

Human Cytome Project

further details at:

https://www.classimed.de/cytompr1.html
https://www.classimed.de/concept1.html
https://www.classimed.de/cellbio.html