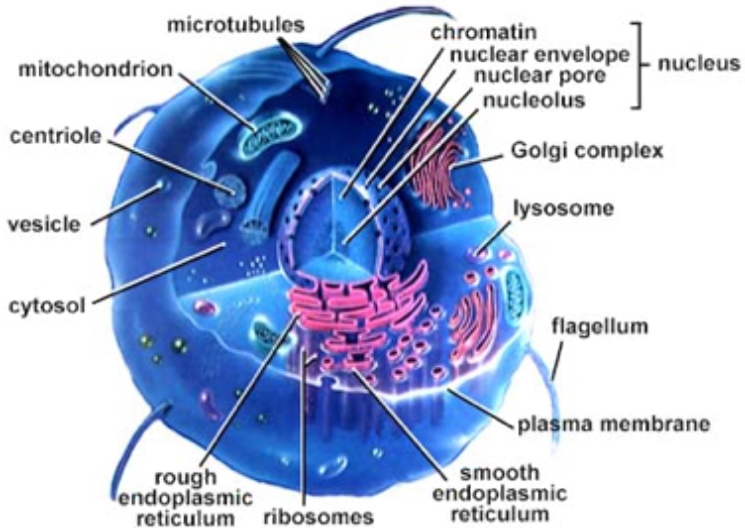
LIFE SCIENCES (MAC4)

CWI

Gunnar Klau



CWI GROUP

Modeling for systems biology

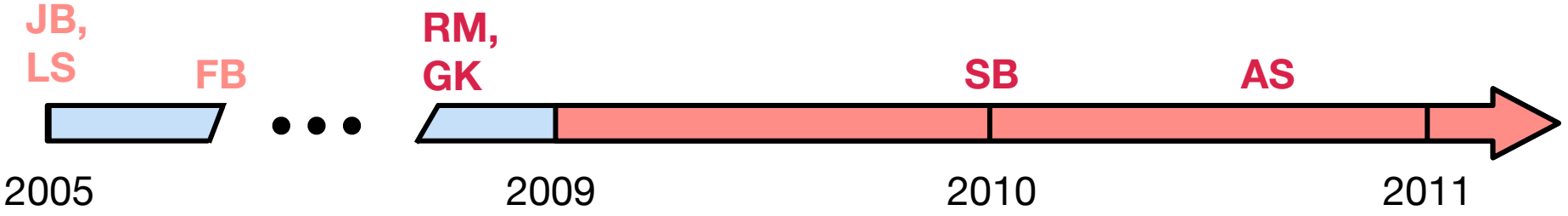
- Joke Blom (JB)
- Frank Bruggeman (FB, )
- Roeland Merks (RM)

Combinatorial and statistical algorithms

- Leen Stougie (LS, )
- Alexander Schönhuth (AS)
- Gunnar Klau (GK)

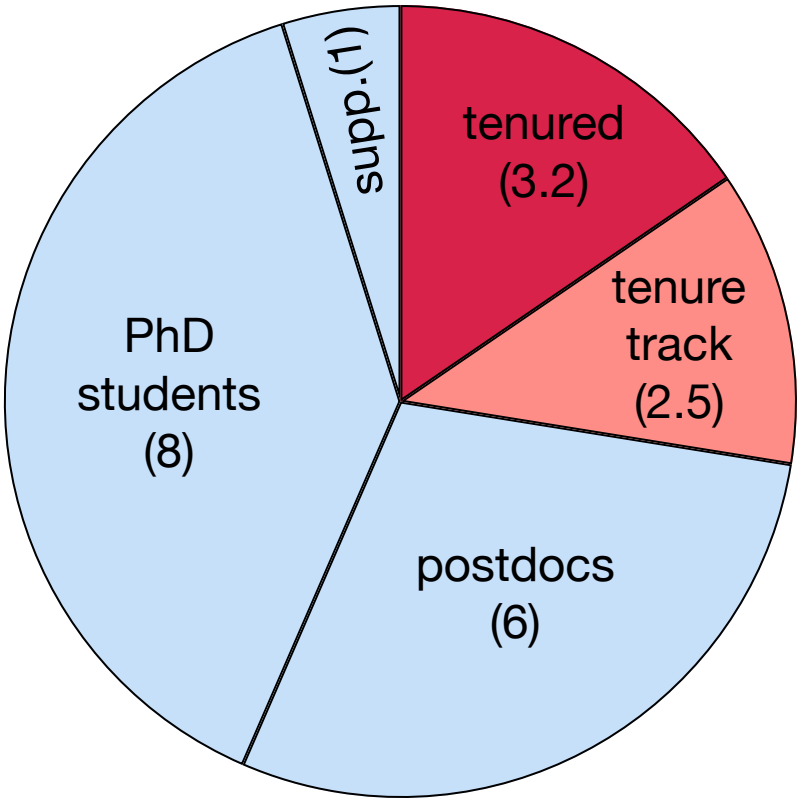
Neuroinformatics

- Sander Bohte (SB)

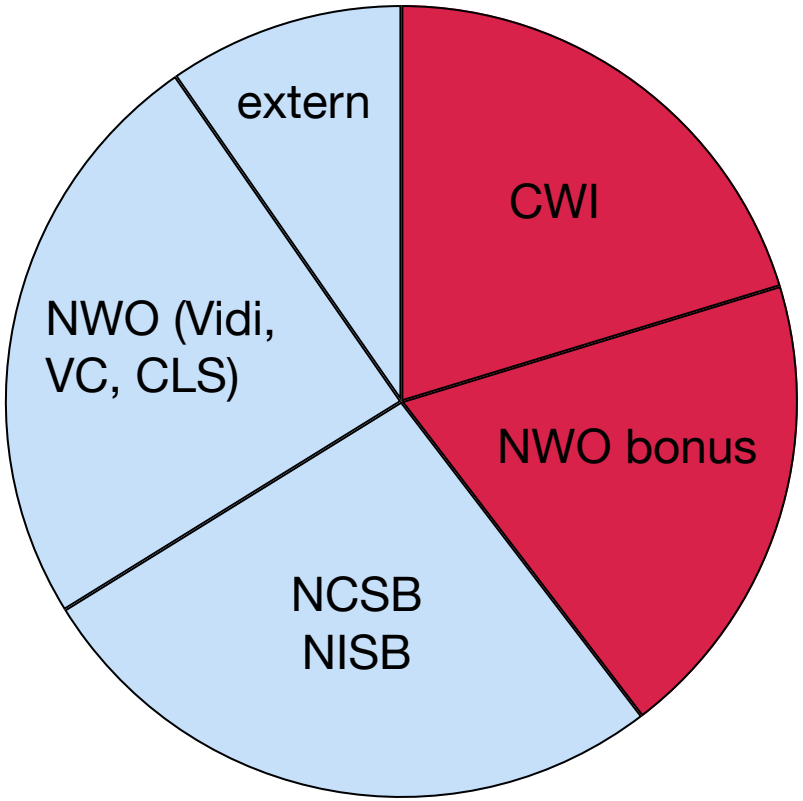


COMPOSITION AND FUNDING 2011

22 people (20.7 fte)



composition

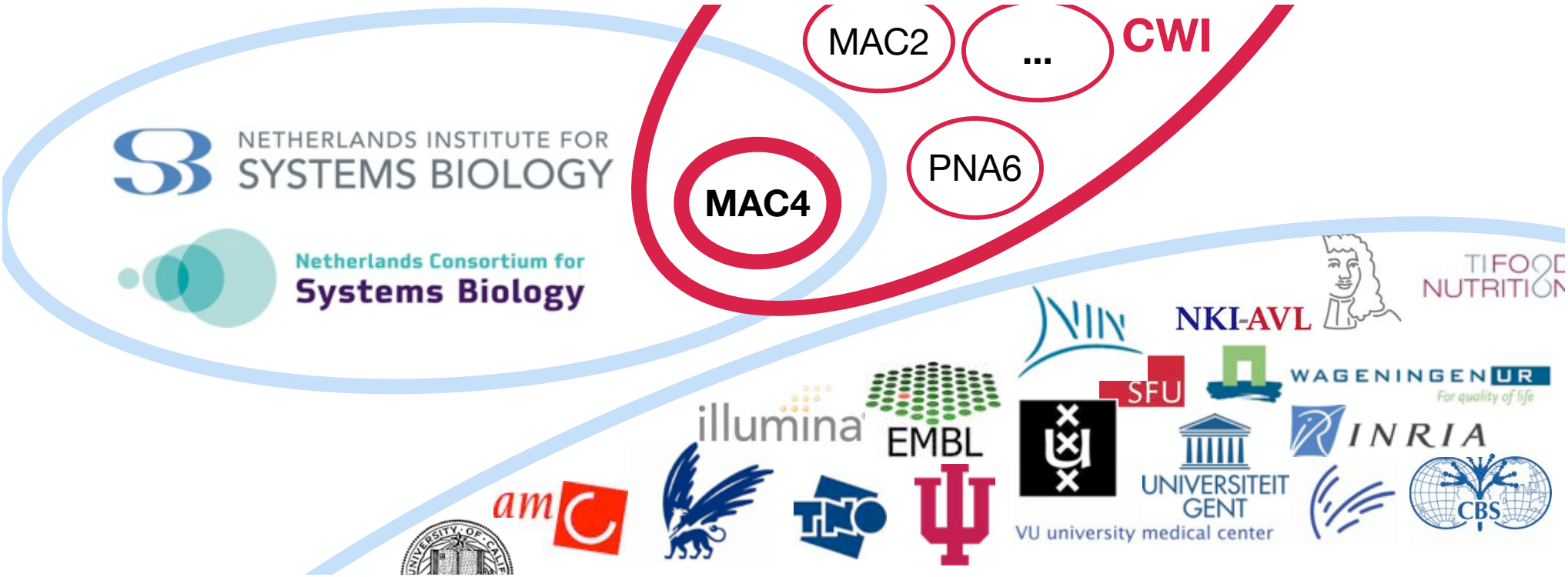


funding

RESEARCH AREA

Mathematical and computational techniques → **Modeling, analysis and simulation of biological processes**

In close cooperation with partners from biology and medicine

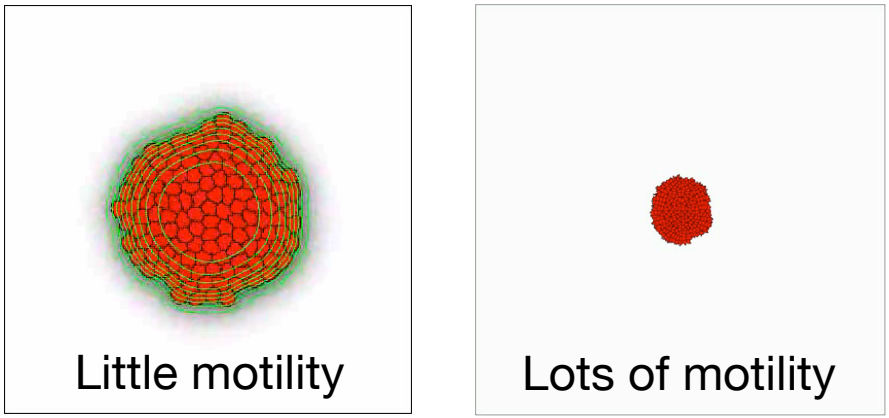


RESEARCH ACTIVITIES & CHALLENGES

Multiscale modeling of multicellular systems (Merks)

- core modeling group of NCSB
- models, simulation tools and model definition languages to answer biological questions
- applications: angiogenesis, plant development, gut microbiota

Results



- stochastic cell motility induces blood vessel sprouts
- amplitude determines sprout width

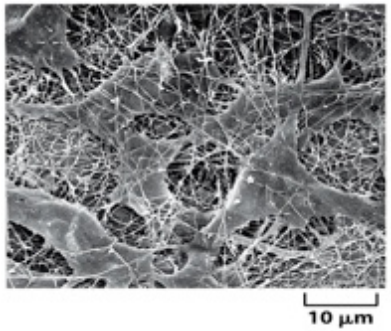
[Merks et al. PLoS Comp. Biol., 2008]

RESEARCH ACTIVITIES & CHALLENGES

Multiscale modeling of multicellular systems (Merks)

Challenges

- couple metabolism and gene regulation to multicellular structure and function
- model extracellular matrix accurately



Long term goals

- explanatory, 3D models of development
- models at the bench to guide experiments

Highlight

- NWO Vidi grant 2010

RESEARCH ACTIVITIES & CHALLENGES

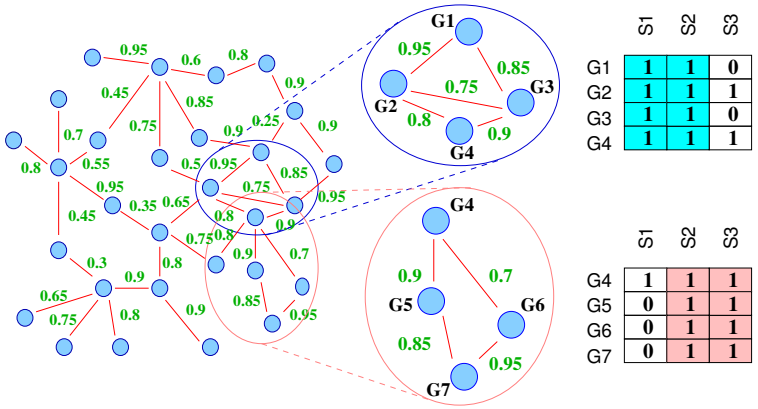
Classification of cancer (Klau/Schönhuth)

- Functional modules (phenotypic)
  - understand disease mechanisms
  - develop robust markers for classification

NKI-AVL

Results

- density-constrained bi-clustering
- optimal subnetworks



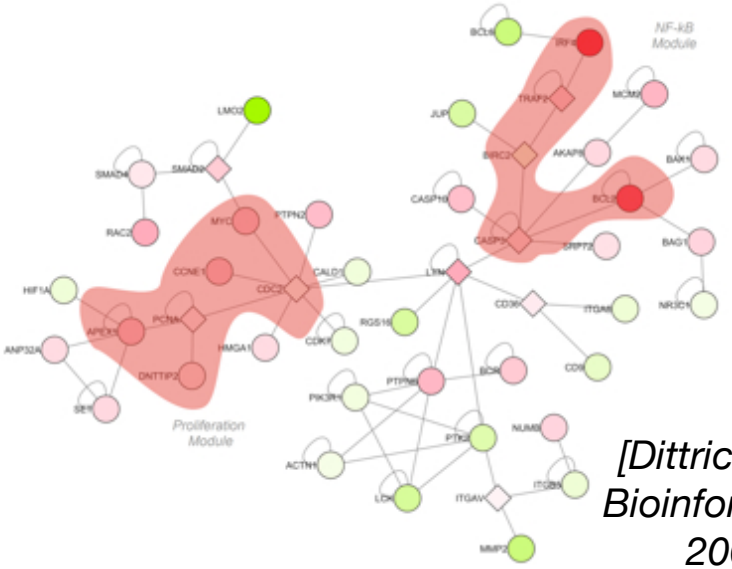
	S1	S2	S3
G1	1	1	0
G2	1	1	1
G3	1	1	0
G4	1	1	1

	S1	S2	S3
G4	1	1	1
G5	0	1	1
G6	0	1	1
G7	0	1	1

[Dao et al. Bioinformatics, 2010]

Highlight

- best paper award ISMB 2008

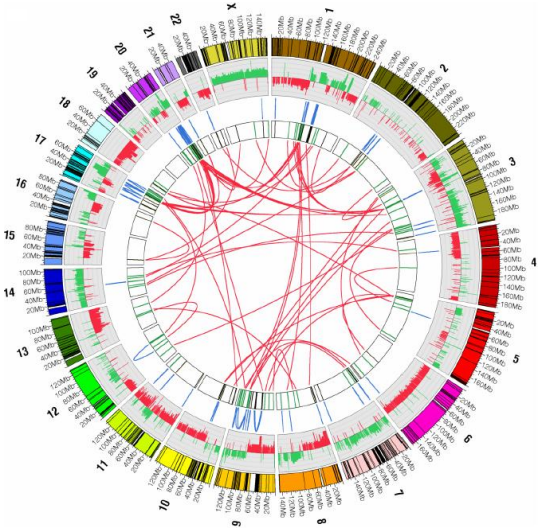


[Dittrich et al. Bioinformatics, 2008]

RESEARCH ACTIVITIES & CHALLENGES

Classification of cancer (Klau/Schönhuth)

- Structural variations (genotypic)
  - analysis of next-gen. sequencing data
  - combined statistical and combinatorial approach



Challenges

- how do networks help predict?
- data integration, network statistics, evaluation standards

Long term goals

- integrate genotypic and phenotypic levels
- increased role of maths in cancer research

SWOT ANALYSIS, STRATEGY

Strengths. Good funding record. Diversity

Weaknesses. Diversity. Junior group

Opportunities. More collaborations. European funding

Threats. Interdisciplinary funding may dry out. Become “service” department

Strategy

- more cooperations, joint research
- keep focus on fundamental contributions

Successes

- first joint projects (even cross-discipline)
- first new kind of students