Two branches

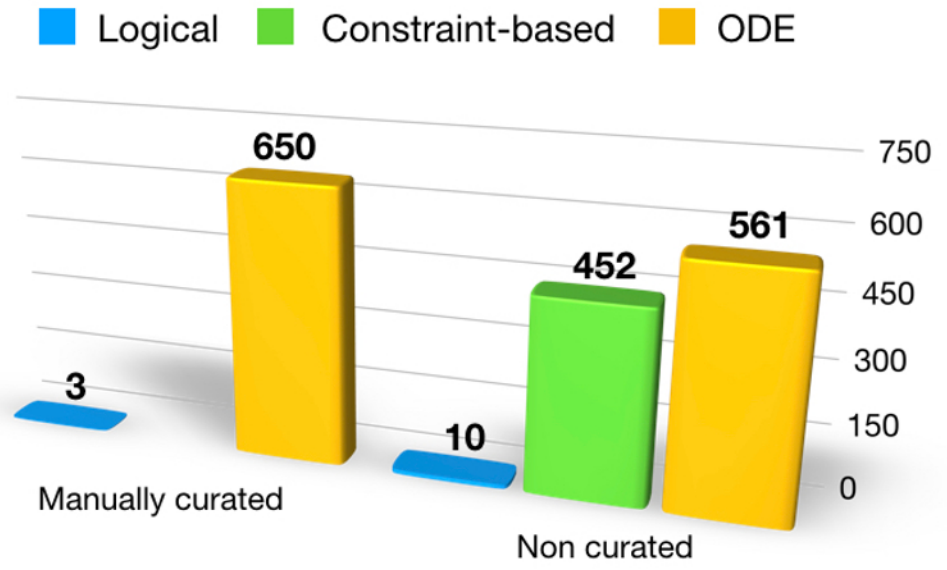
- ☑ Manually curated
- ☑ Non curated

Model formats

- ☑ SBML
- ☑ CellML
- ☑ Matlab
- ☐ …

Modelling approaches

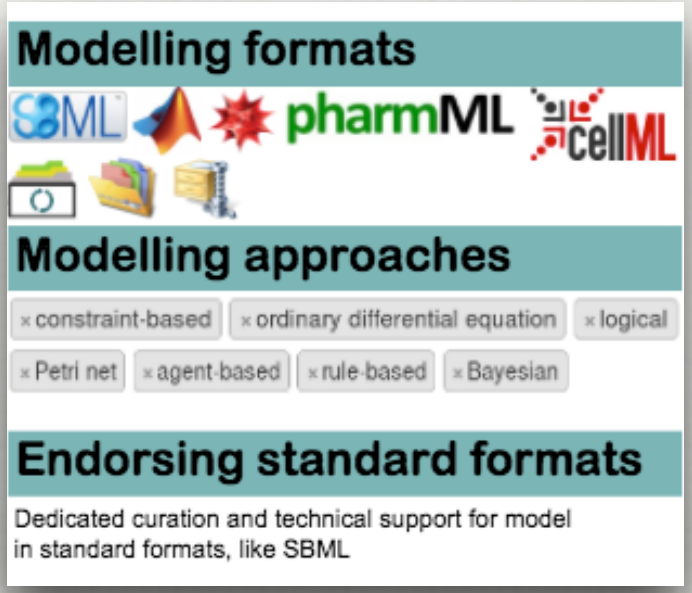
- ☑ Ordinary Differential Equation
- ☑ Logical
- ☑ Constraint-based
- ☐ …



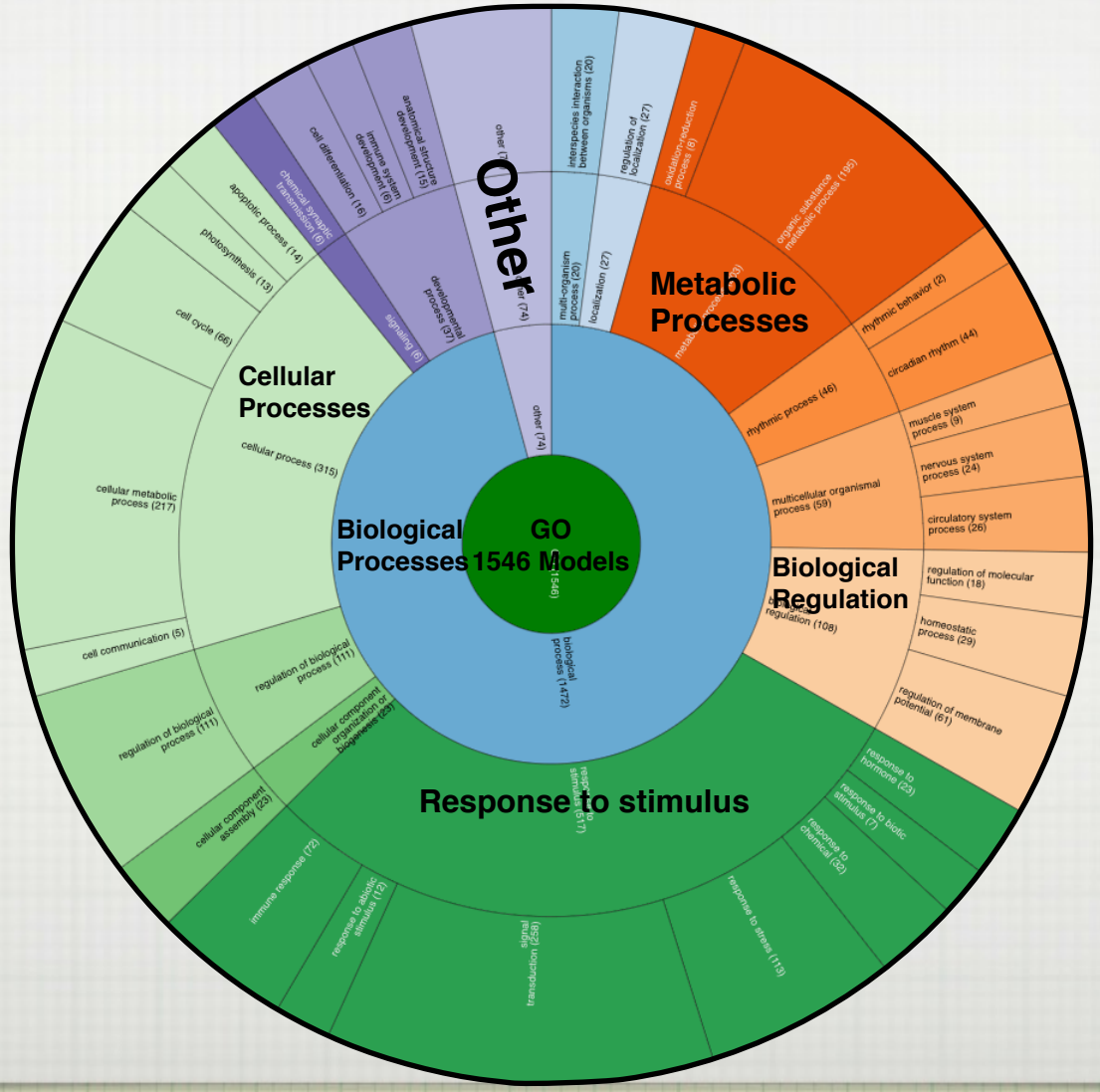
BioModels

Biomodels Database

- Repository of published models
  - MIRIAM compliant, SBML standard format
- Provides reproducible, high-quality, freely-accessible models
- Some useful features:
  - Pathway Map Generation
  - Online converters
  - Advanced filtering
    - Modeling approach
    - Organism
    - Disease
    - Gene Ontology



Available models based on GO



Examples of Models

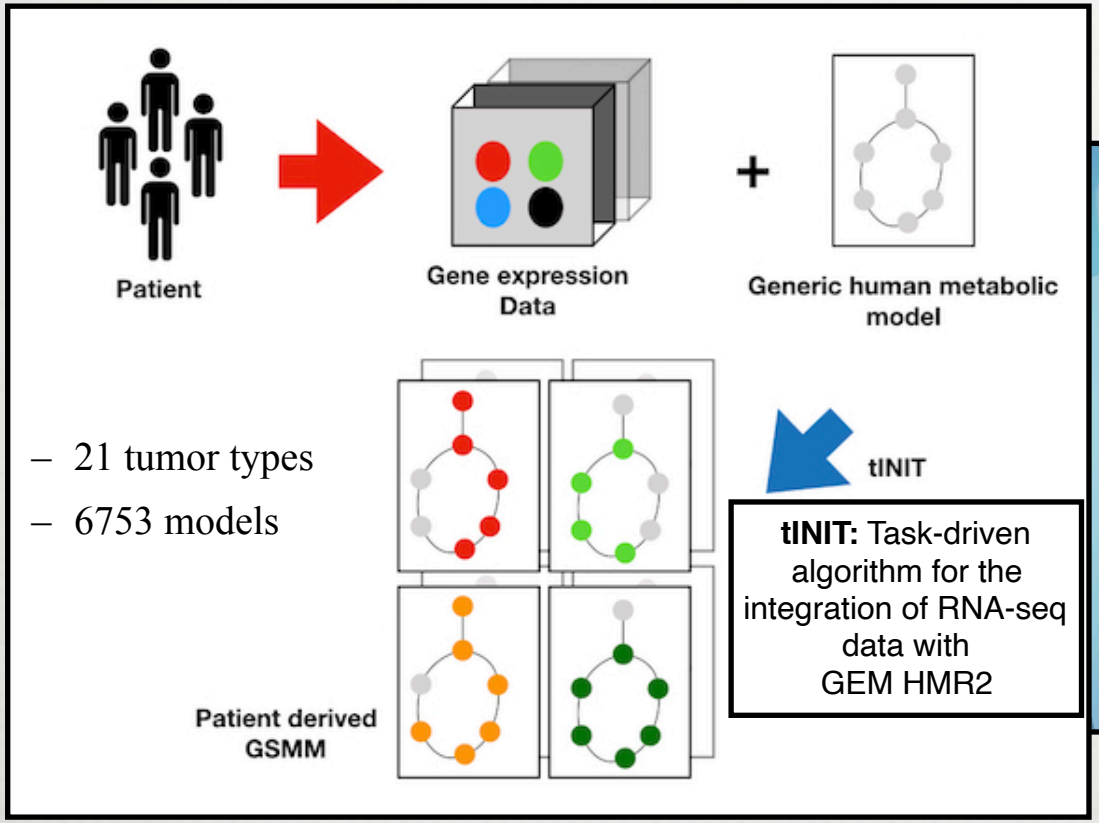
- *Homo sapiens* (7225+ models)
  - iAB-RBC-283 (RBC Metabolic Network)
  - Blood stem cell regulatory network (LMPP Network)
  - ~455 Patient specific Kidney Renal Clear Cell Carcinoma models
  - ERK, P13K/Akt and Wut Signaling network models (Normal and 6 different mutations)
  - Stochastic model of Alzheimer's disease
  - Integrated calcium homeostasis and bone remodeling

Examples of Models

- *Patient-derived GEMs*
- *Neurodegenerative disease processes*
- *Complex Plant Circadian Clock*
- *Meiotic initiation in S. cerevisae*
- $\alpha\beta$ *Immunization in Alzheimer's disease*
- *Zombie Apocalypse*

PDGSMM

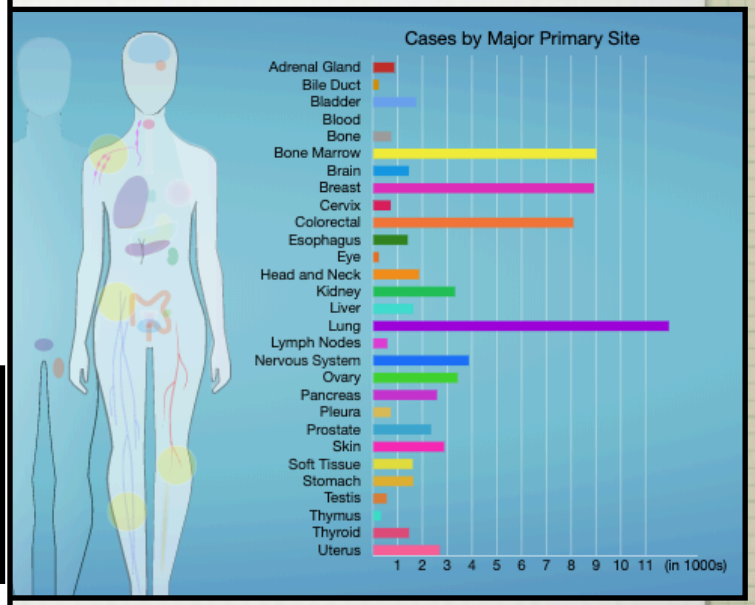
Patient Derived Genome Scale Metabolic Models



- 21 tumor types
- 6753 models

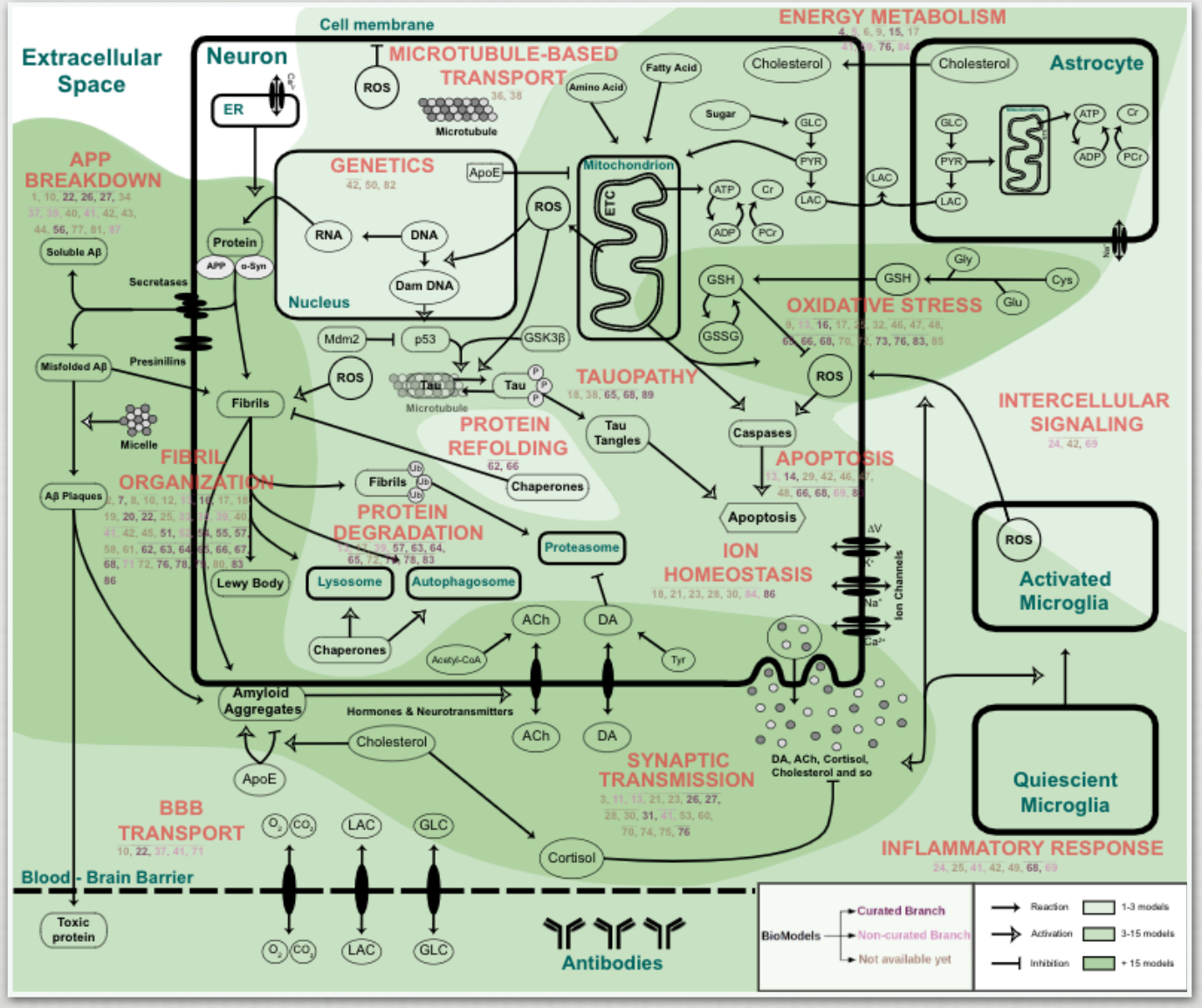
tINIT: Task-driven algorithm for the integration of RNA-seq data with GEM HMR2

The Cancer Genome Atlas (TCGA)

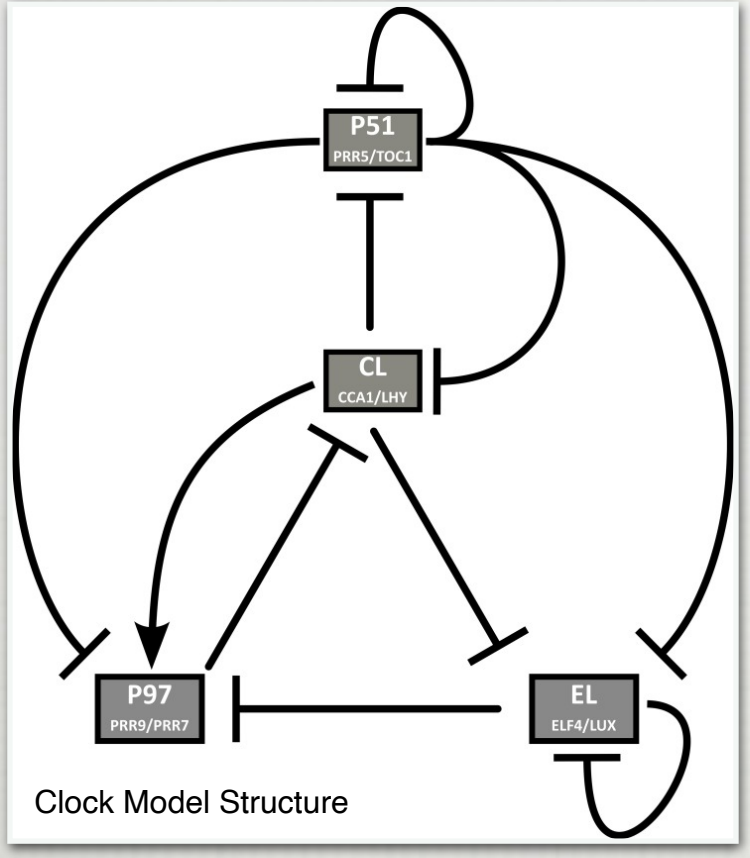


https://portal.gdc.cancer.gov/

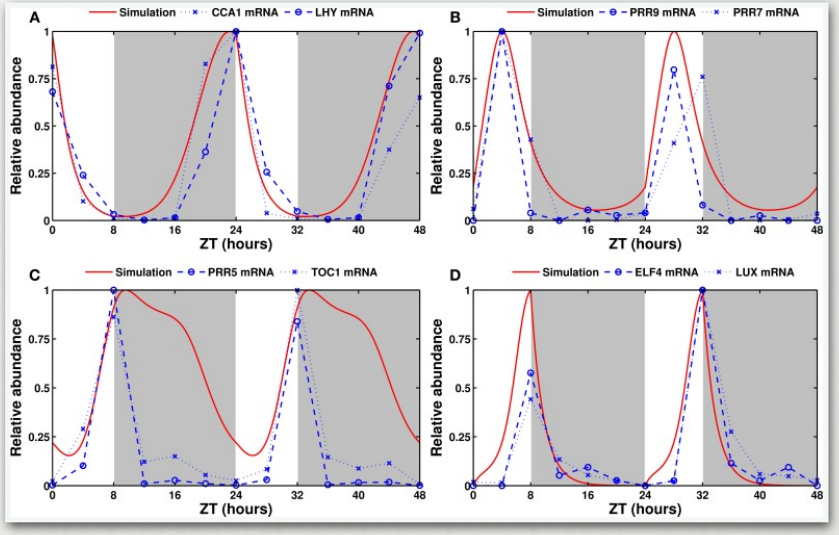
Neurodegenerative disease processes

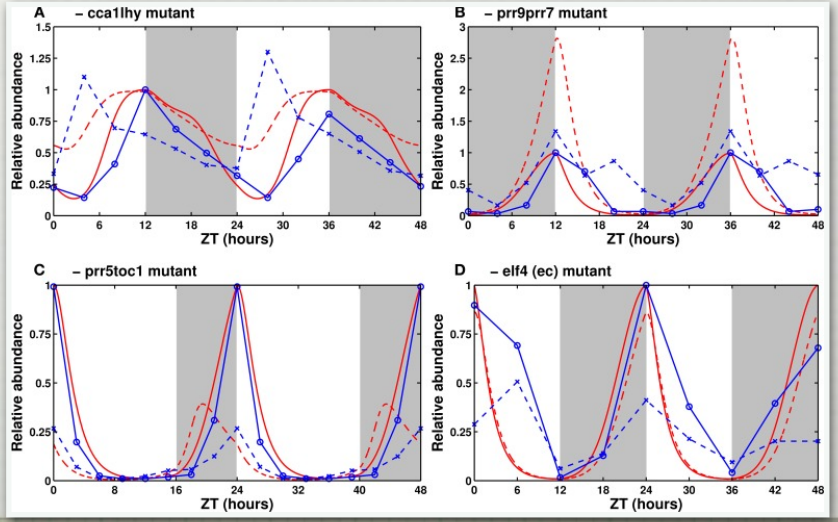


Complex Plant Circadian Clock



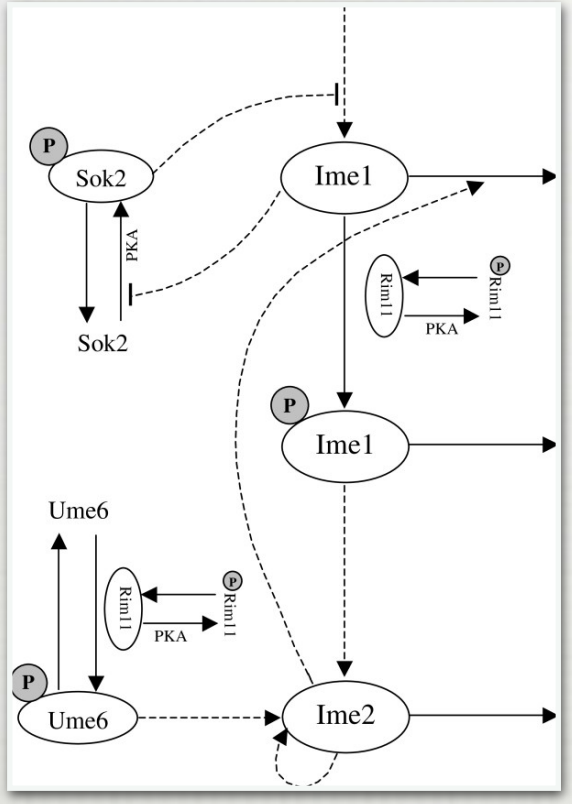
Clock Model Structure

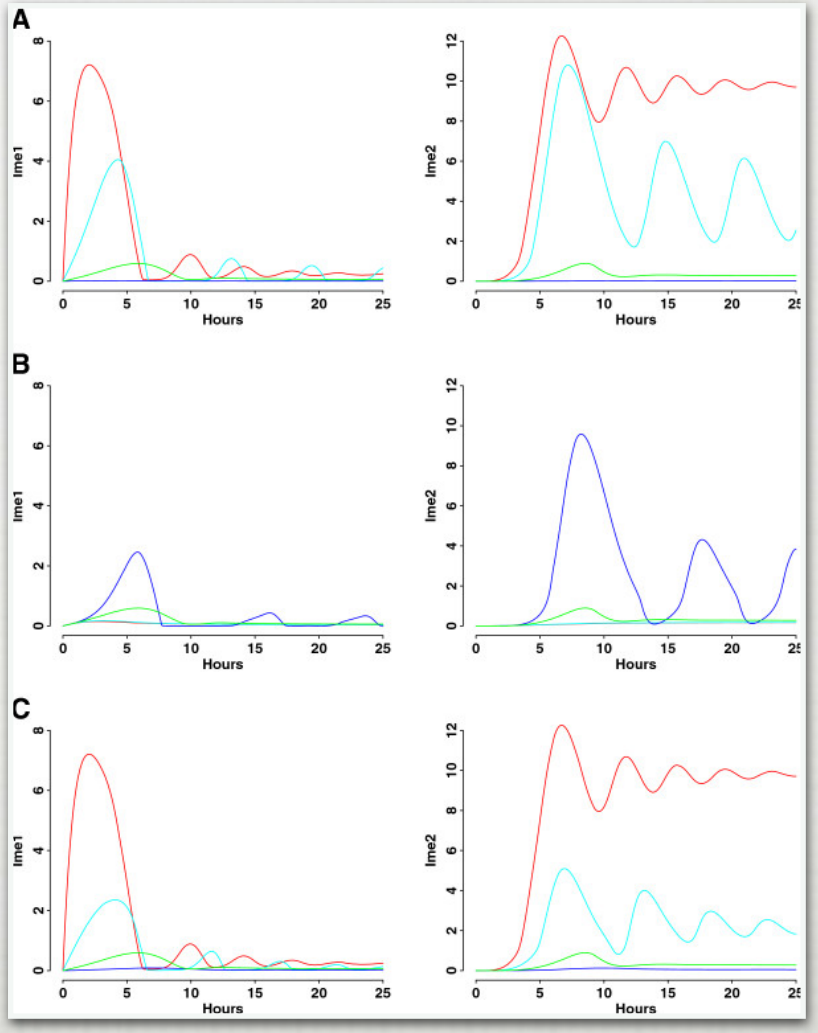




De Caluwé J, Xiao Q, Hermans C, Verbruggen N, Leloup J-C, Gonze D. A Compact Model for the Complex Plant Circadian Clock. *Frontiers in Plant Science*. 2016;7:74. doi:10.3389/fpls.2016.00074.

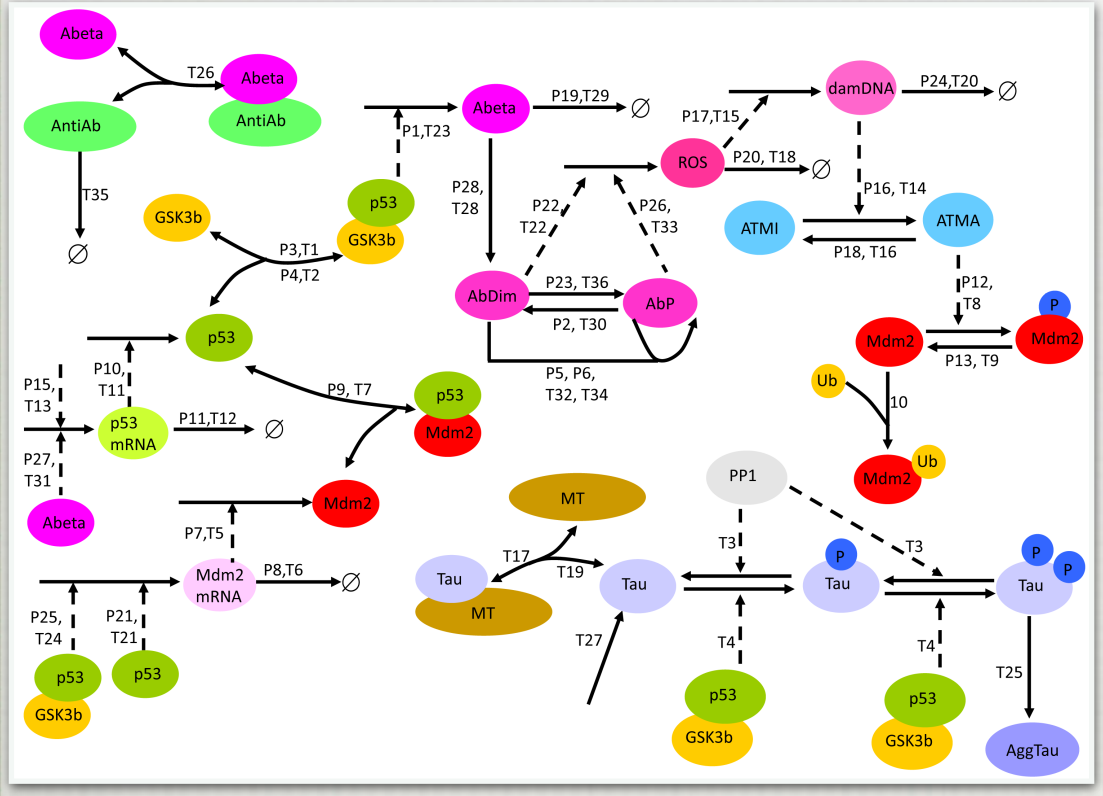
Meiotic initiation in *S. cerevisae*

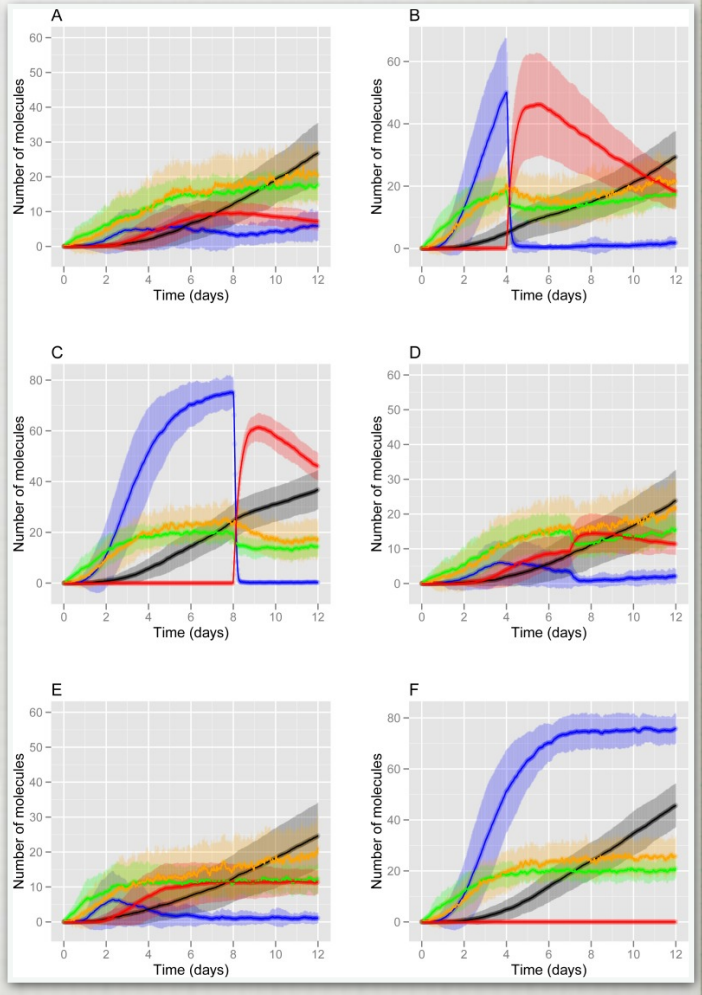




Ray D, Su Y, Ye P. Dynamic modeling of yeast meiotic initiation. *BMC Systems Biology*. 2013;7:37. doi: 10.1186/1752-0509-7-37.

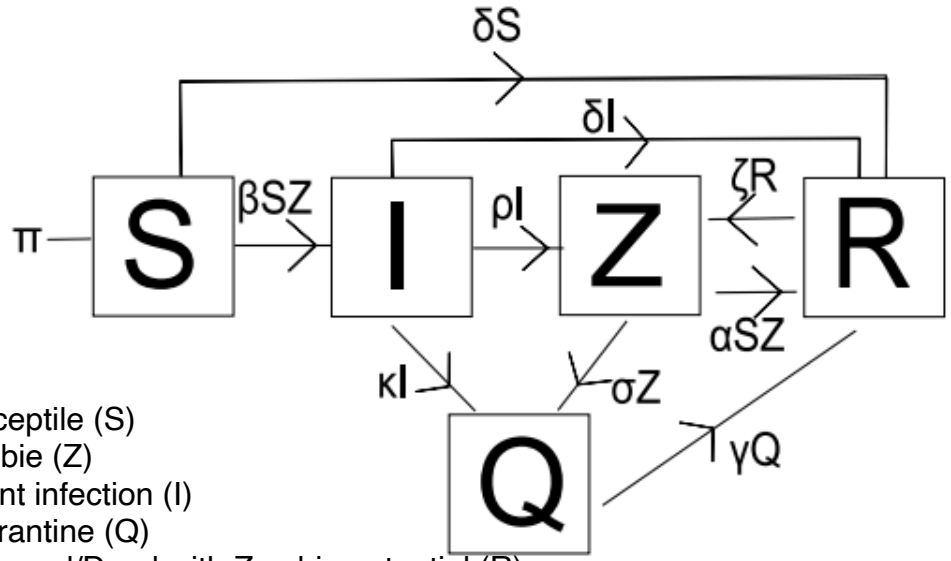
$\alpha\beta$ Immunization in Alzheimer's disease



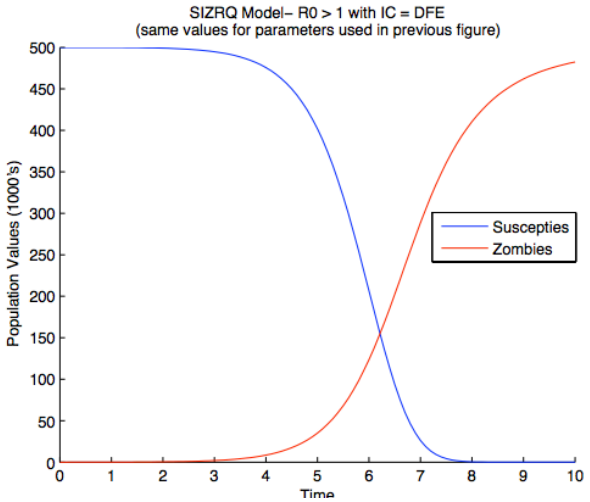


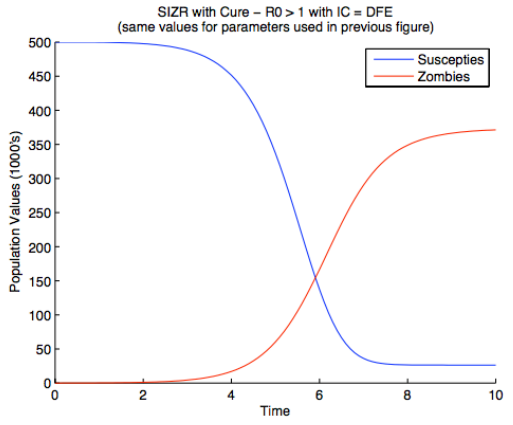
Proctor CJ, Boche D, Gray DA, Nicoll JAR. Investigating Interventions in Alzheimer's Disease with Computer Simulation Models. Padmanabhan J, ed. *PLoS ONE*. 2013;8(9):e73631. doi: 10.1371/journal.pone.0073631.

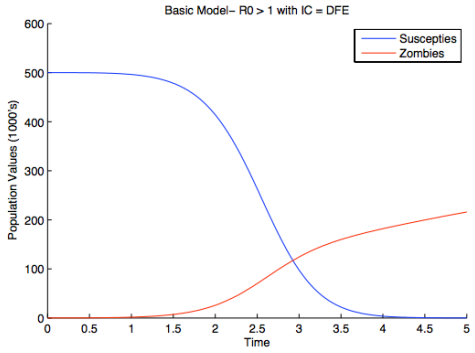
Zombie Apocalypse

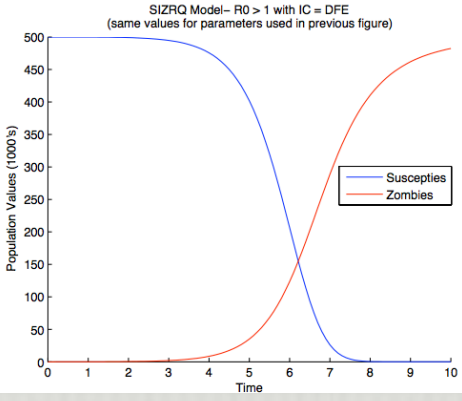


Susceptile (S)
Zombie (Z)
Latent infection (I)
Quarantine (Q)
Removed/Dead with Zombie potential (R)









https://loe.org/images/content/091023/Zombie%20Publication.pdf

Usefulness

- Provides a framework of what can be considered a high-quality, reproducible model.
  - Syntactic correctness, semantic soundness, and correspondence with reference publication
- Annotation of models removes ambiguity.
- Unlike other pathway databases, contains quantitative information representing quantities or kinetics.
- Having over 150,000+ quality models is a significant resource for the scientific community.
- https://www.ebi.ac.uk/biomodels-main/