

Corso di "Biologia dei Sistemi"

A.A. 2016/17

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- ✧ E-mail: carlo.cosentino@unicz.it
- ✧ Ricevimento: appuntamento via e-mail
- ✧ Libro di testo: Systems Biology.

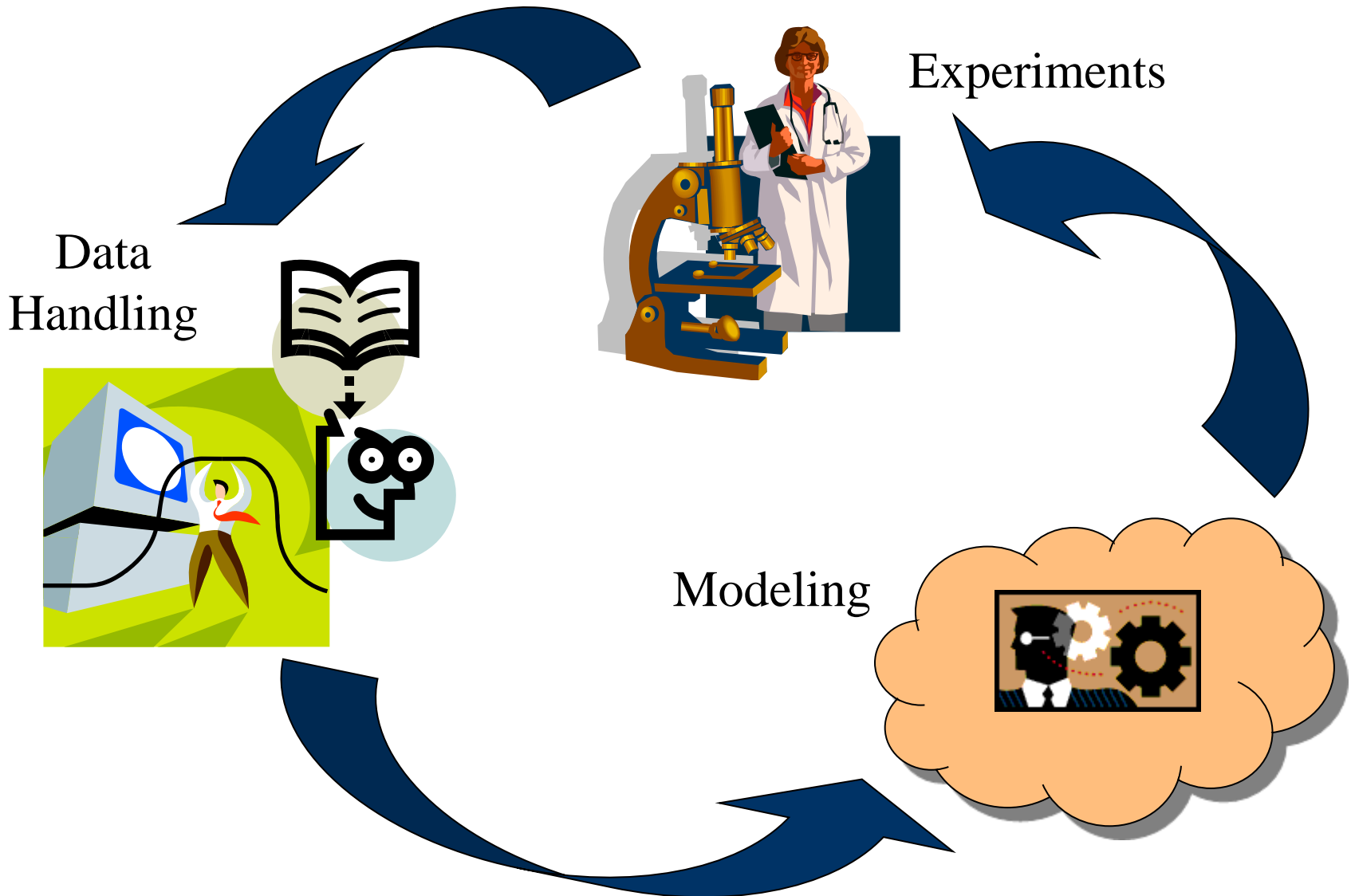
Autori: Edda Klipp, Wolfram Liebermeister, Christoph Wierling, Axel Kowald, Hans Lehrach, Ralf Herwig

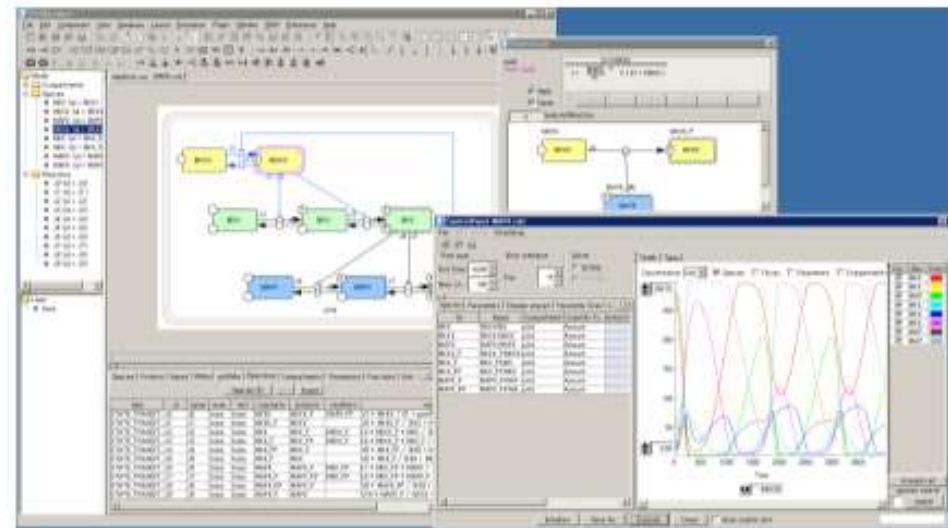
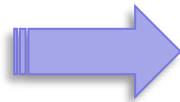
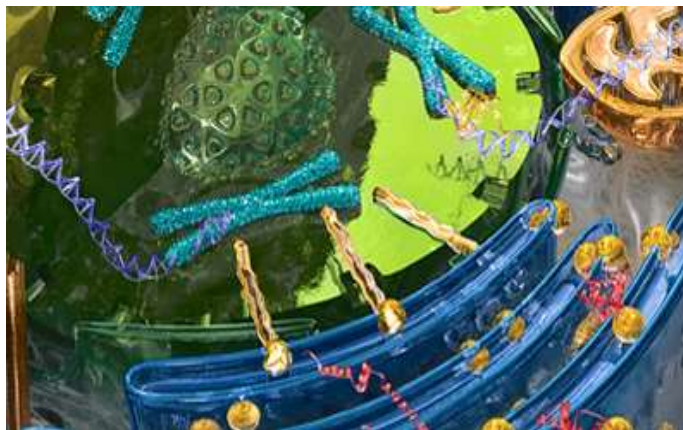
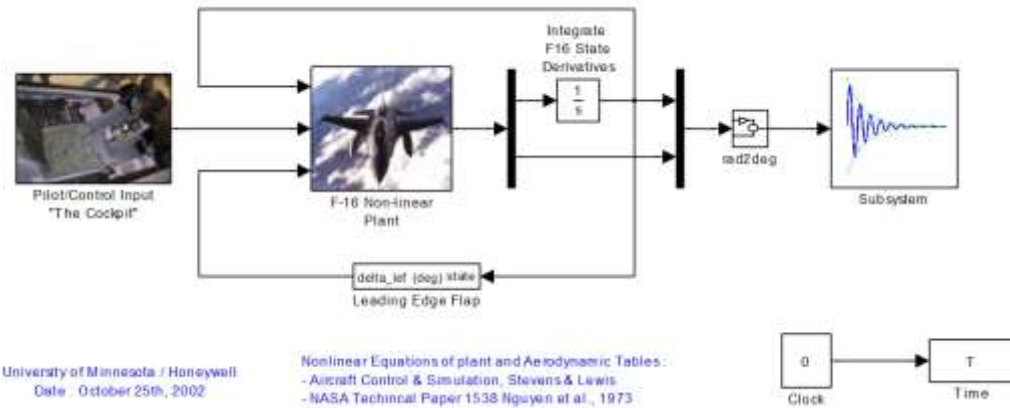
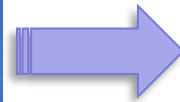
Editore: Wiley-Blackwell

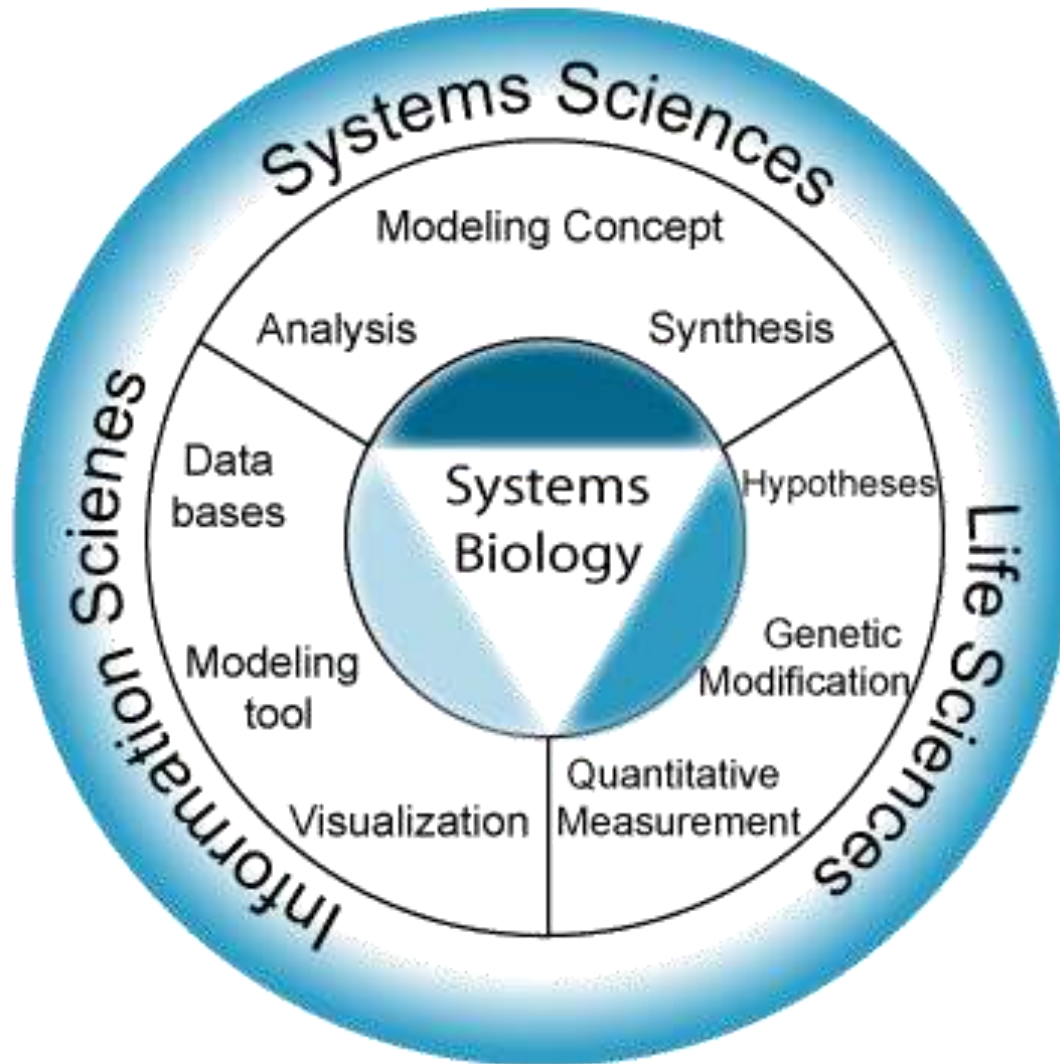
- ✧ Integrazione con i lucidi del corso
 - ✧ <http://bioingegneria.unicz.it/~cosentino>
 - ✧ <http://wpage.unina.it/carcosen>
- ✧ Modalità di esame
 - ✧ Prova orale
 - ✧ Elaborato Matlab/Simbiology o COPASI

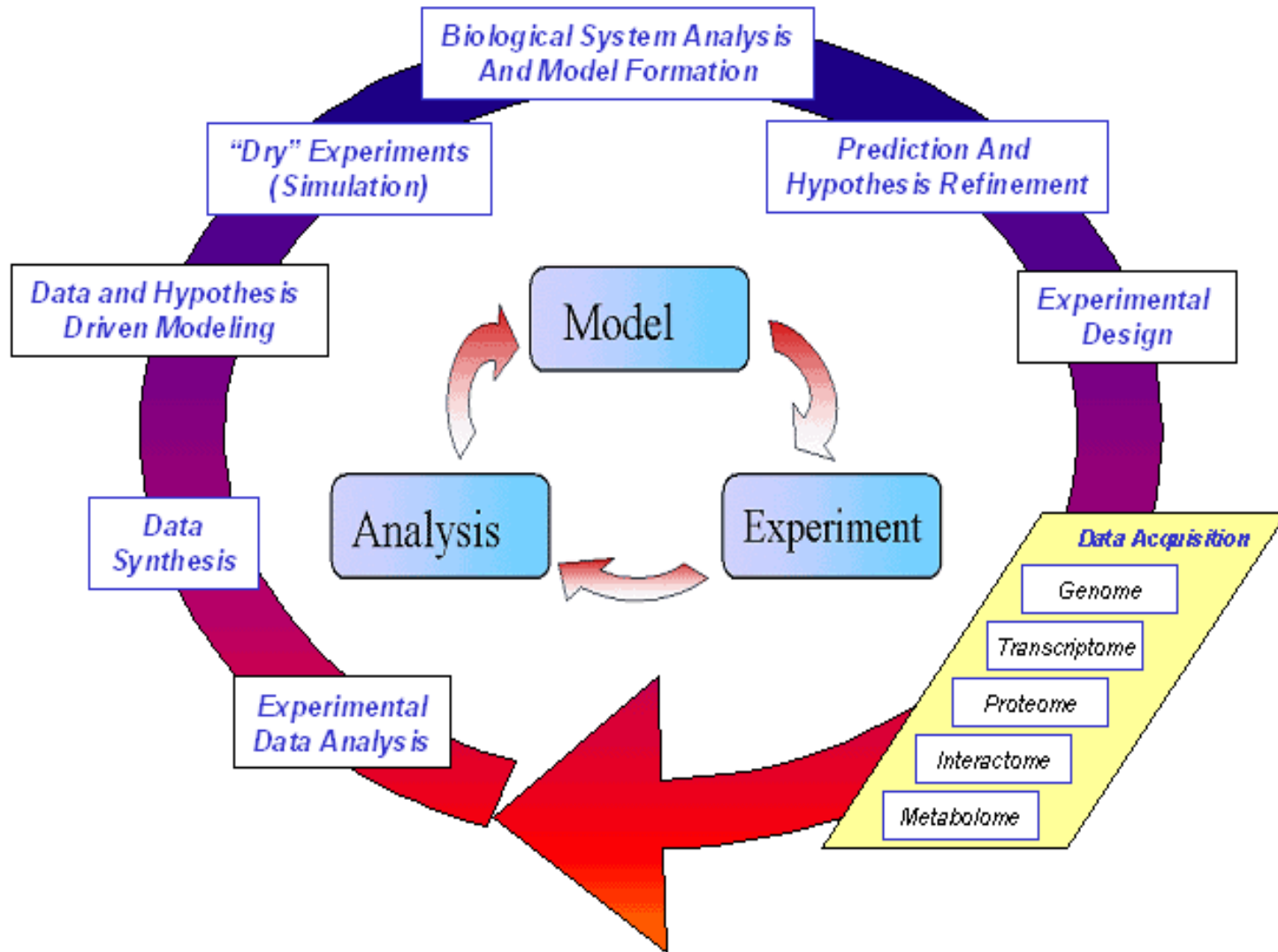
- ✦ La Systems Biology (“Biologia dei Sistemi” o “*Biologia Sistemica*”) è una disciplina che studia le funzioni biologiche ed i meccanismi che regolano le dinamiche delle reti intra- e inter-cellulari, utilizzando metodologie ingegneristiche.
- ✦ *“Life is an emergent, rather than an immanent and inherent, property of matter. Although it arises from the material world, it cannot be reduced to it” (E. Schrödinger)*
- ✦ *“Science is built up of facts, as a house is with stones. But a collection of facts is no more a science than a heap of stones is a house” (H. Poincaré)*





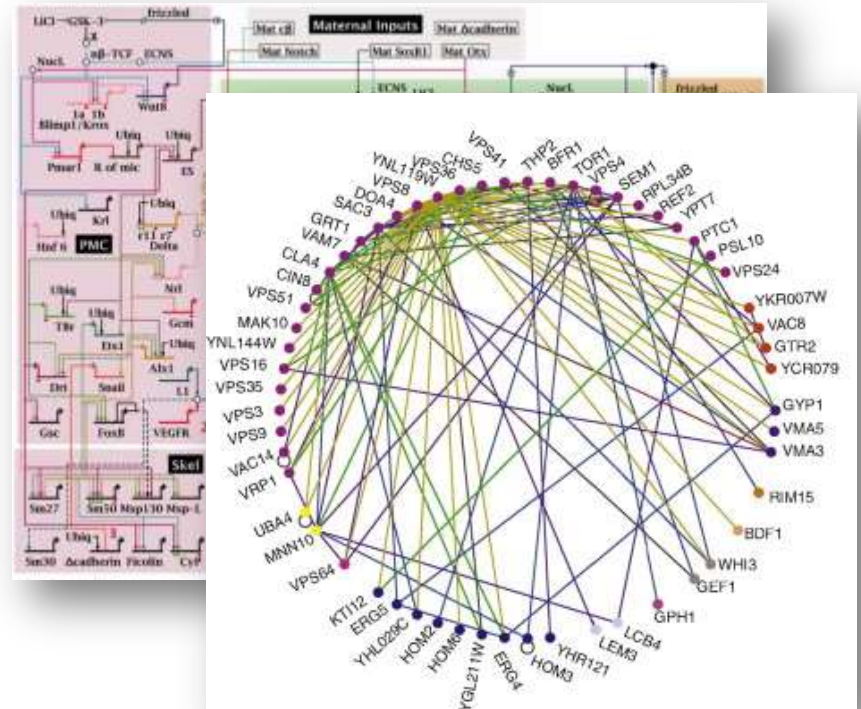
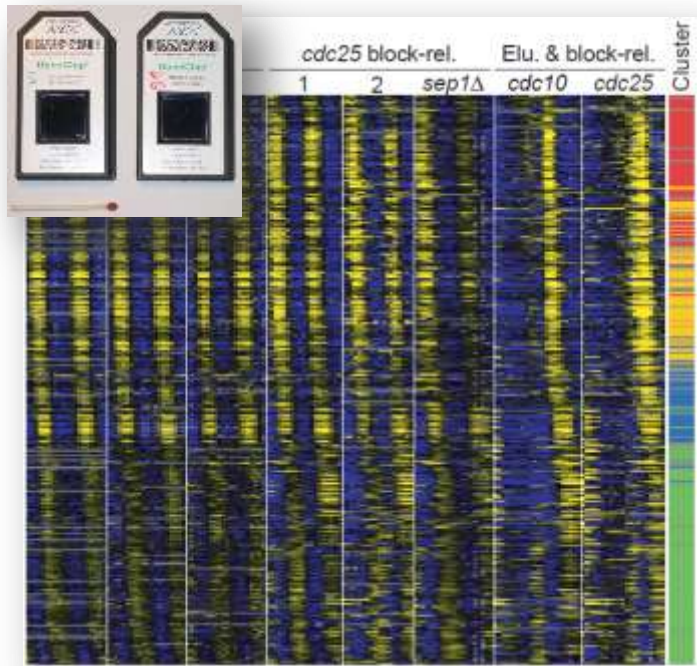




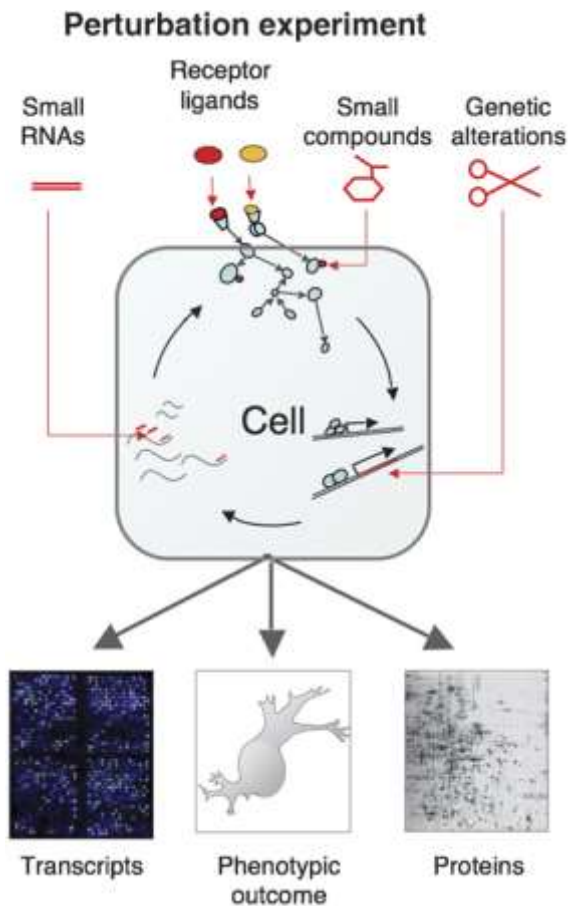


- ✦ Fattori cruciali che ostacolano l'approccio ingegneristico/sistemistico nel settore della biologia molecolare e cellulare:
 - ✦ Misure estremamente difficili e/o costo/tempo elevato, soprattutto in “real-time”
 - ✦ Ambiente microscopico e dinamiche molecolari producono un comportamento altamente stocastico
 - ✦ Significativa variabilità fra individui della stessa specie
 - ✦ Le metodologie per la costruzione di sistemi di controllo biomolecolari (synthetic biology) non sono ancora ben assestate

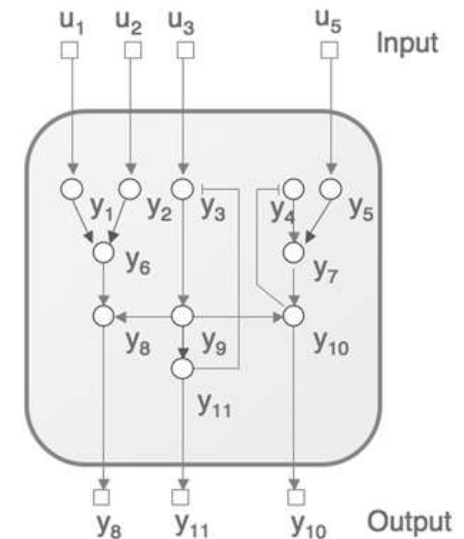
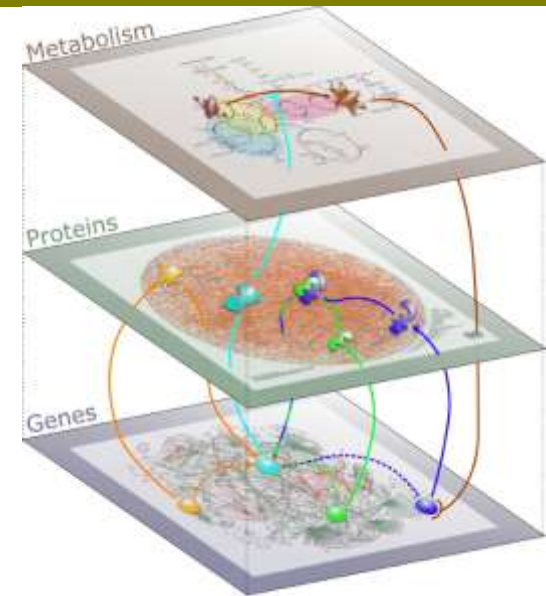
- Le moderne biotecnologie, (DNA e Protein arrays, RNA-seq, etc.), permettono di misurare simultaneamente l'attività di migliaia di specie, risultando in una istantanea dell'attività cellulare a livello sistemico
- Come ricostruire reti biologiche di interazione a partire da questi dataset?



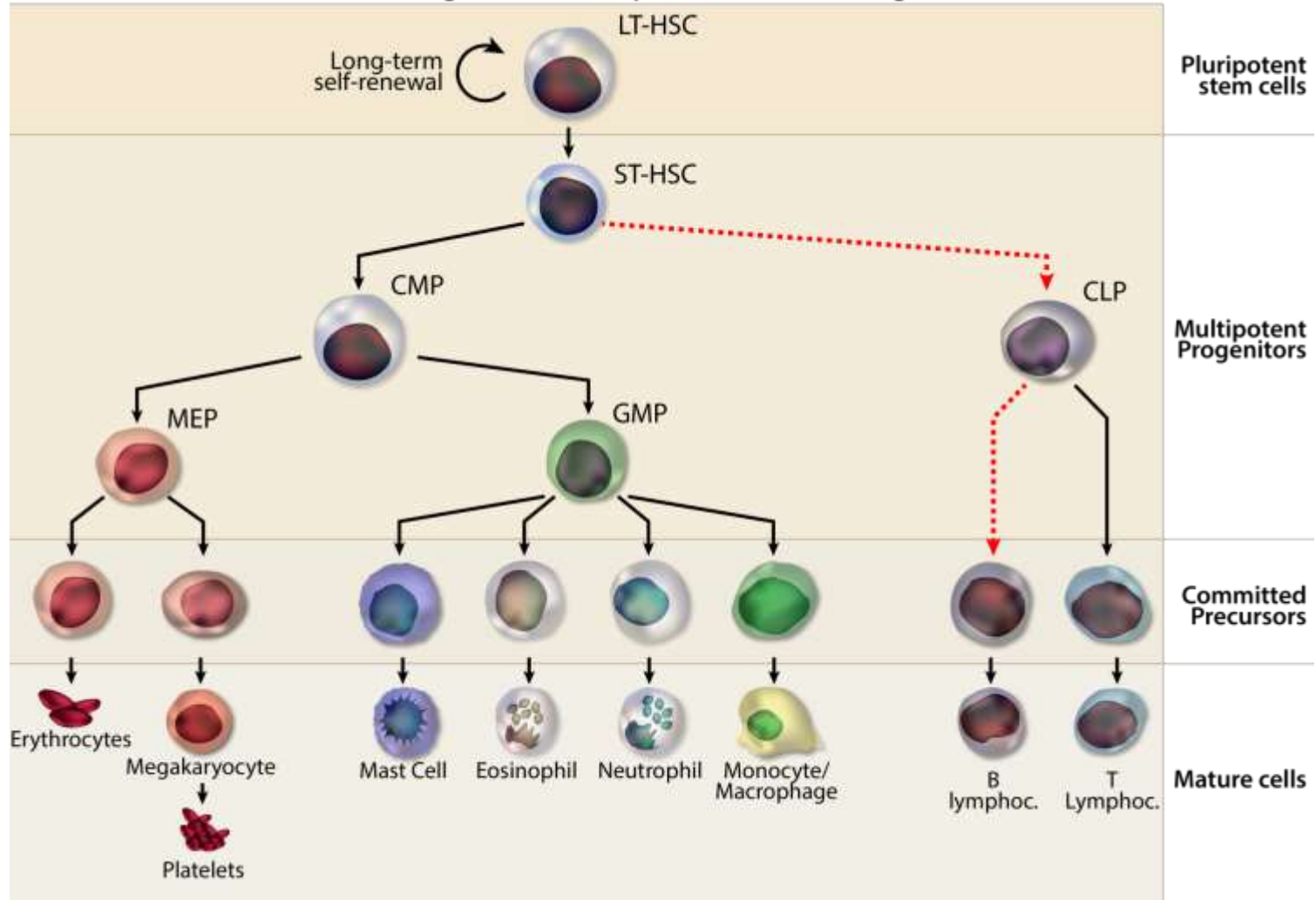
Reti di geni, proteine, metaboliti

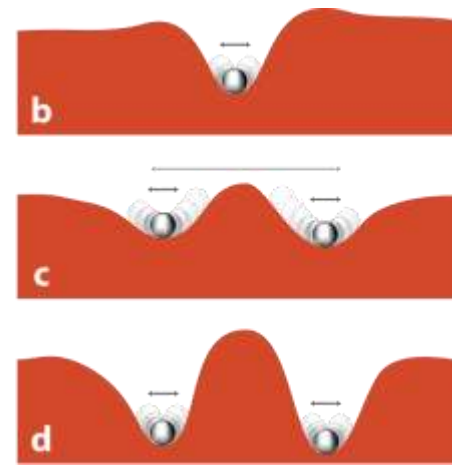
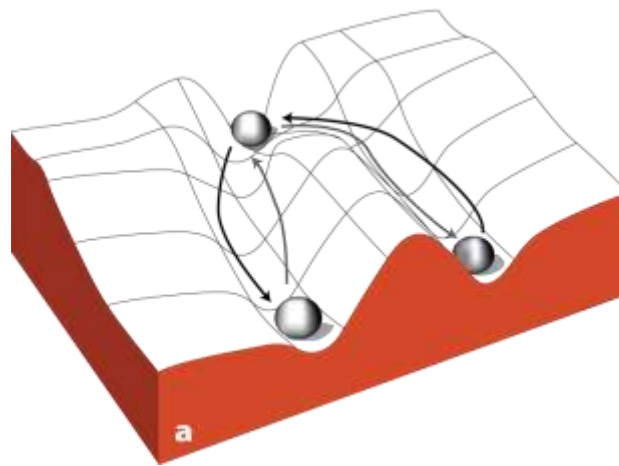
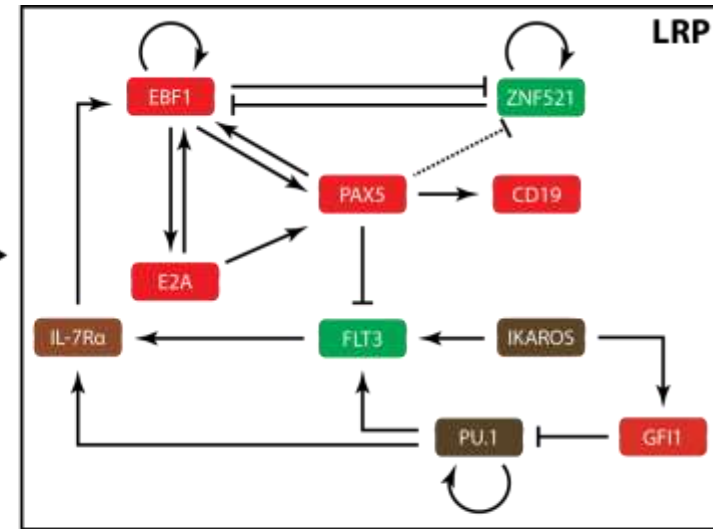
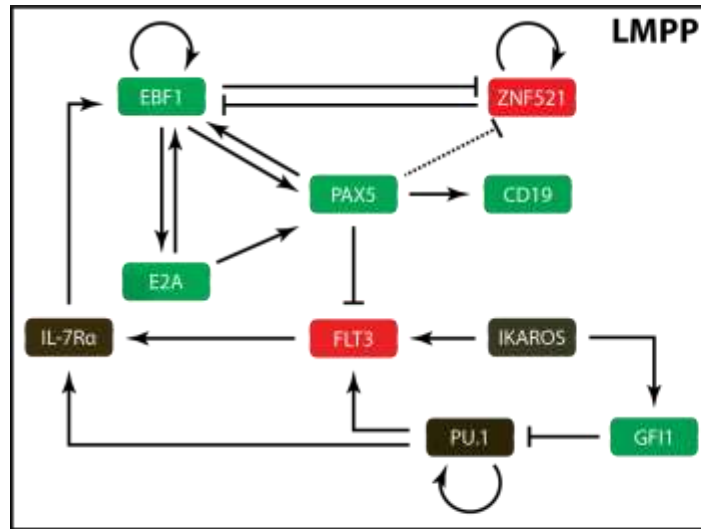


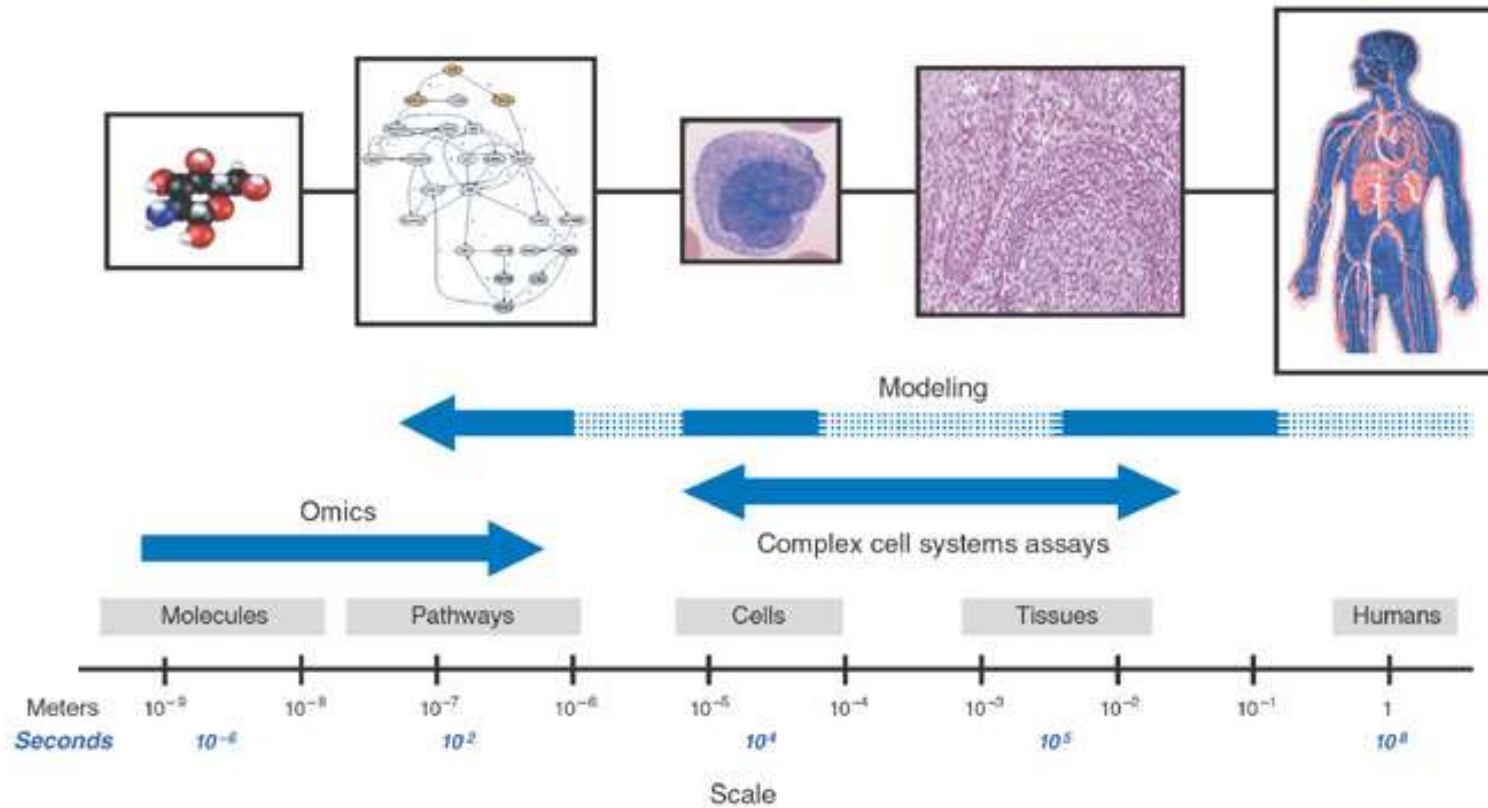
Infer functional interactions between pathway components

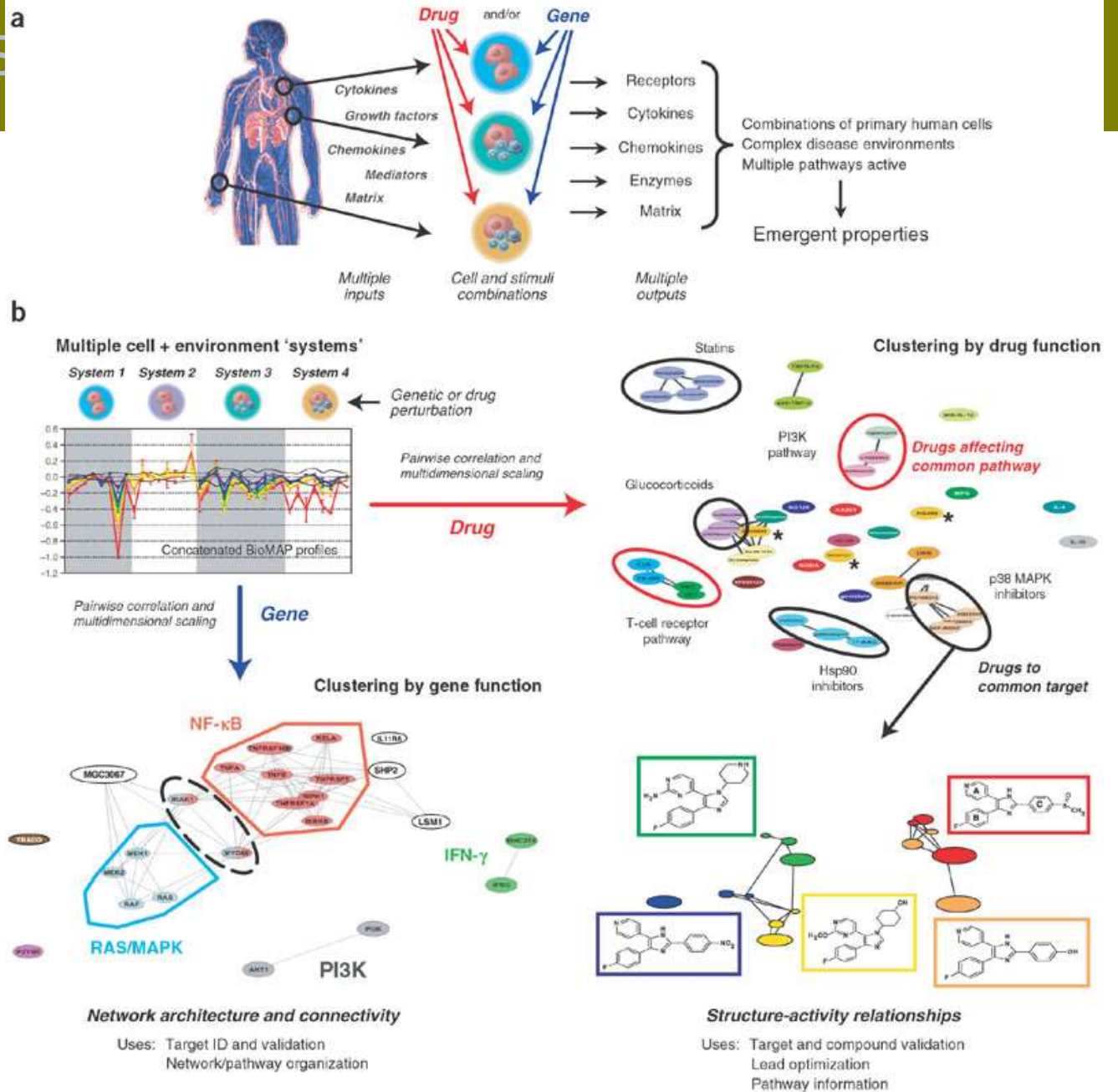


Hierarchical decision making in the hematopoietic stem cell lineage



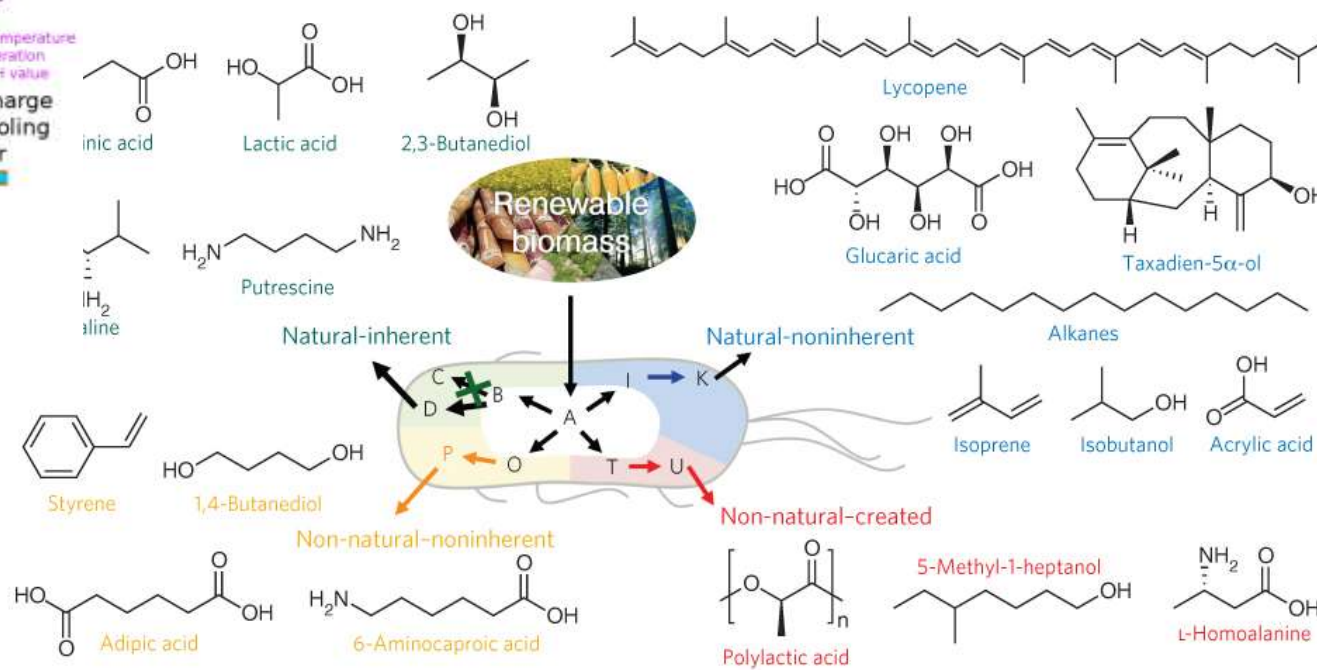
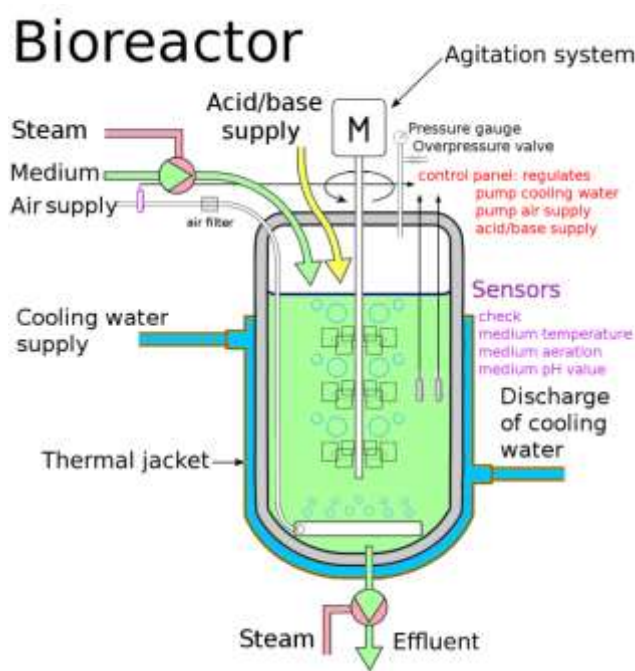




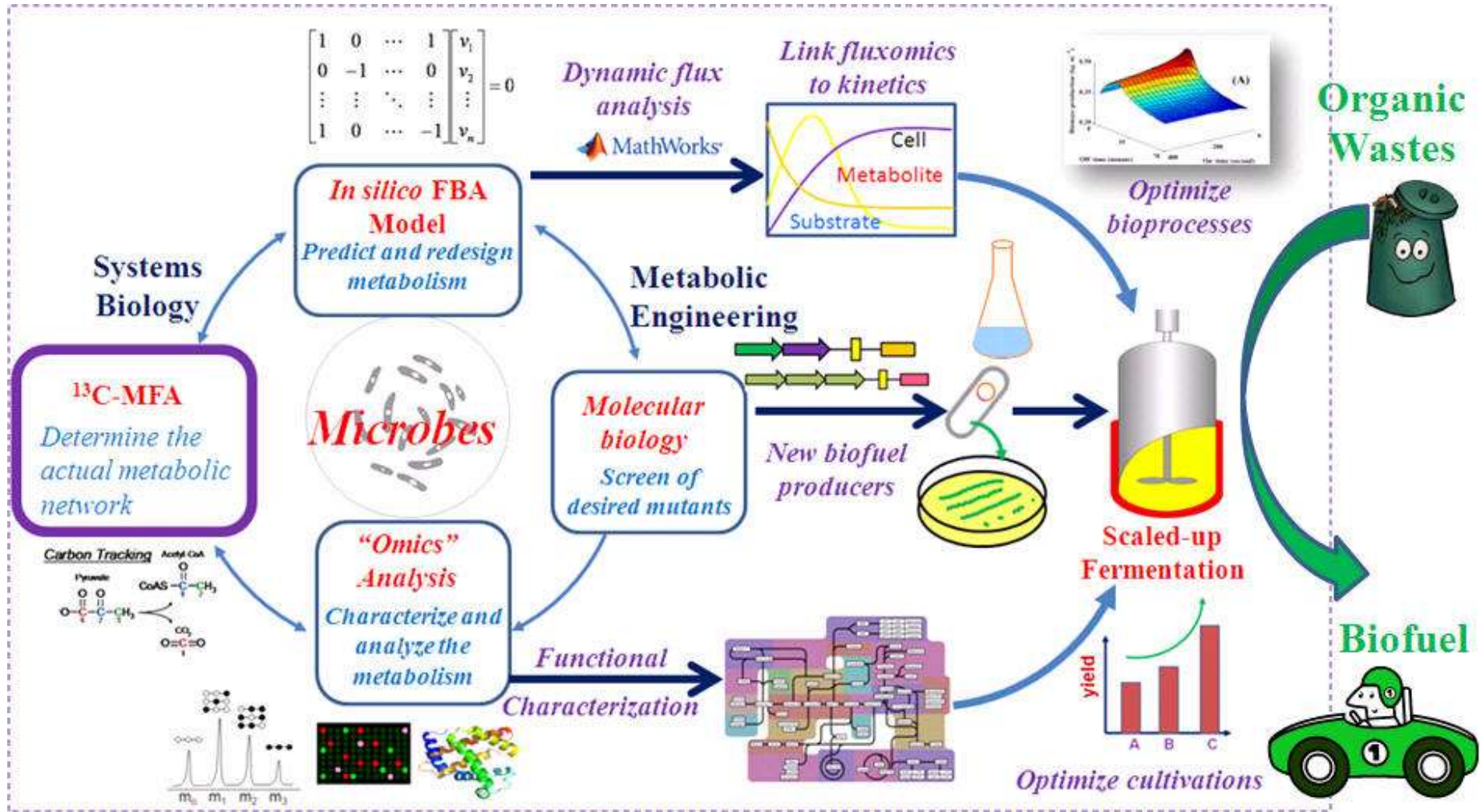


Composti prodotti tramite colture cellulari in bioreattori (cell factories)

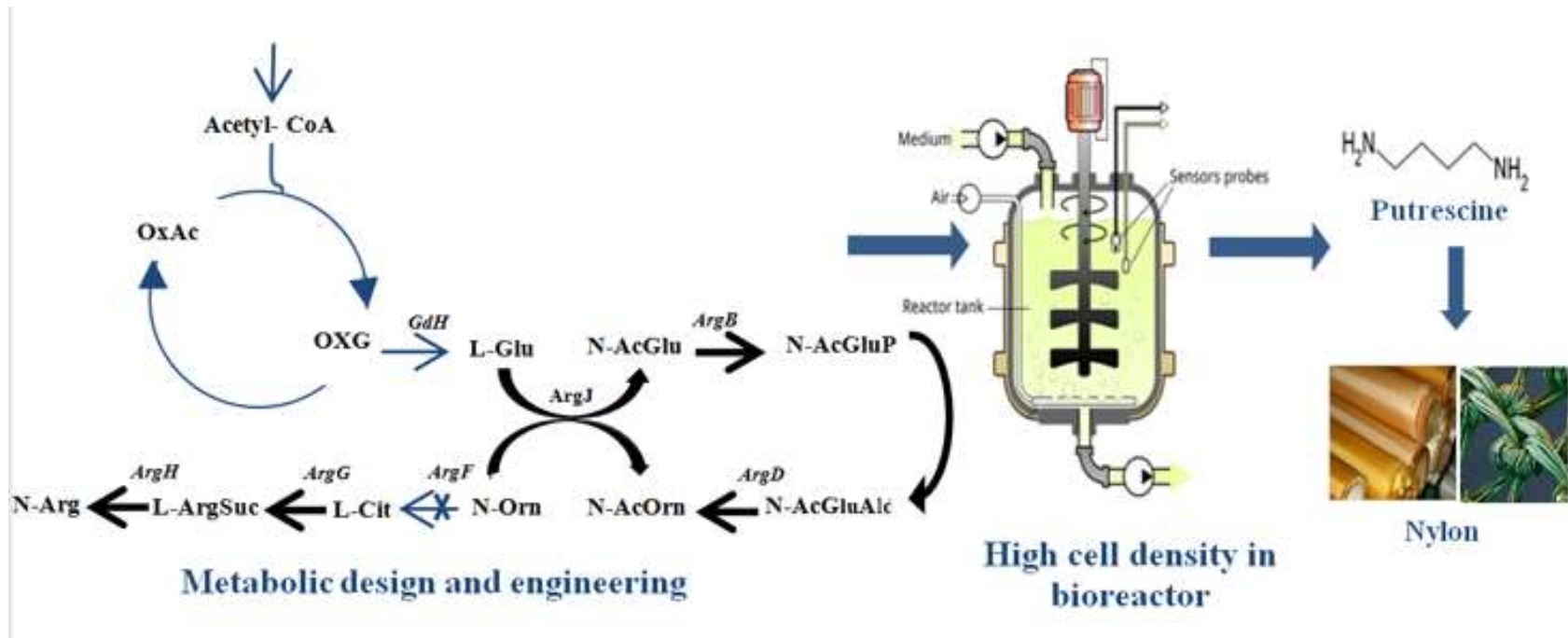
Bioreactor



Lee et al., *Nature Chemical Biology* 8, 536-546 (2012)



- Produzione di putrescina per la produzione di fibre di nylon mediante metabolic engineering



Tracking della concentrazione di una specie molecolare

