Biological Phenotypes

Joseph Nevins
Mike West

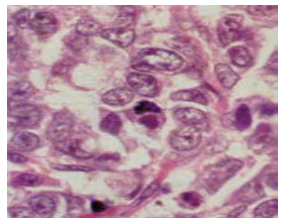
Duke University

Biological Phenotypes

The observable physical or biochemical characteristics of an organism, as determined by genetic constitution and environmental influences

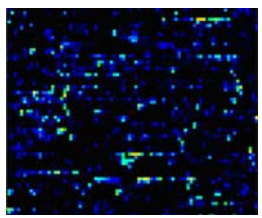
Transitions in Biology

Observational science

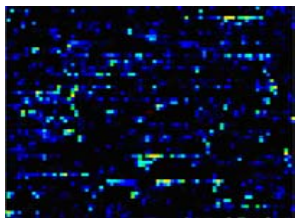


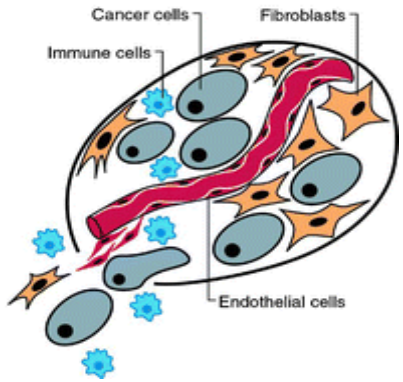
Molecular science

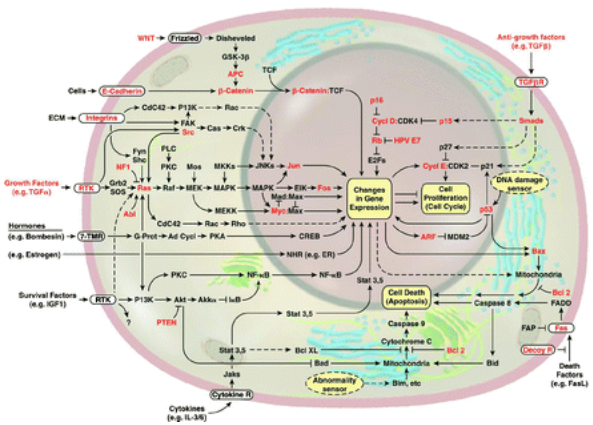
Genomic science



Using the Complexity of Genomic Data

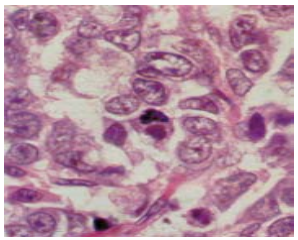






Hanahan and Weinberg, Cell 100: 57 (2000)

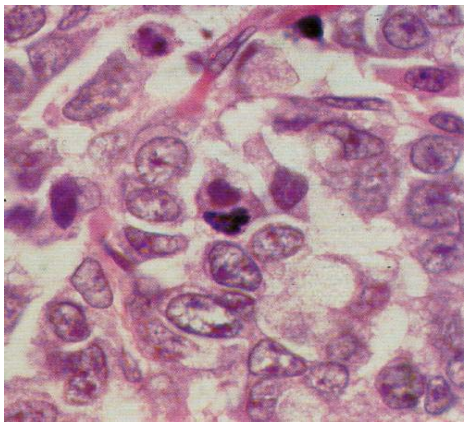
The Challenge of Understanding and Treating Cancer



Cancer is fundamentally a **heterogeneous** disease

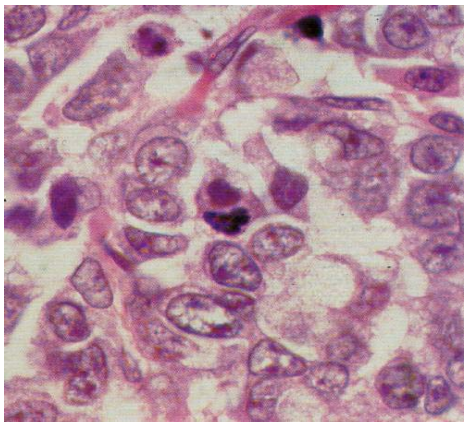
Understanding and dissecting the heterogeneity is key to prognosis and treatment

Low Resolution Phenotypes

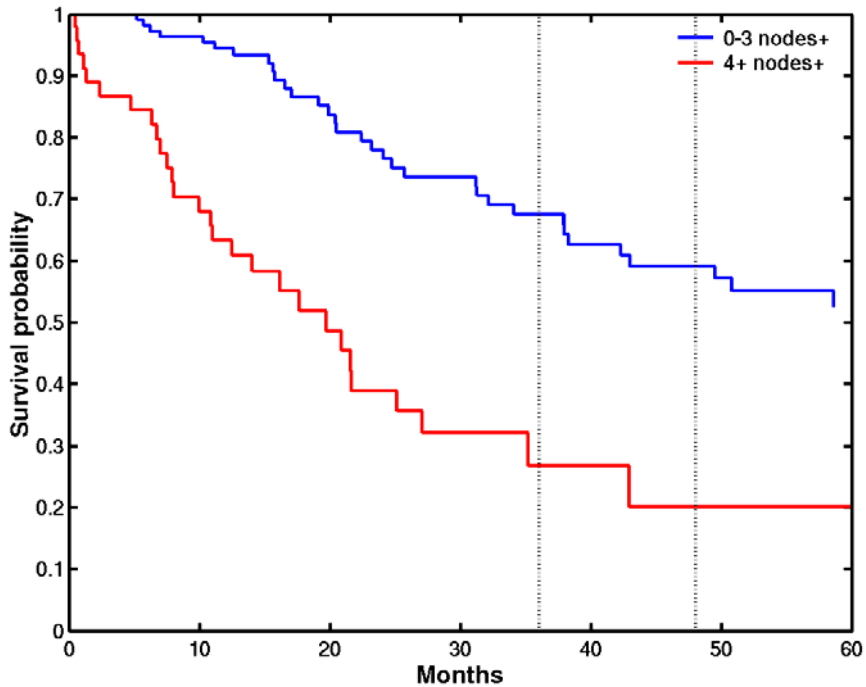


- Lymph node involvement
- Hormone receptor status
- Tumor size
- Visual assessment

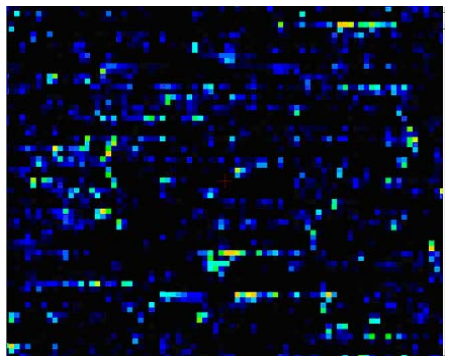
Low Resolution Phenotypes



- Lymph node involvement



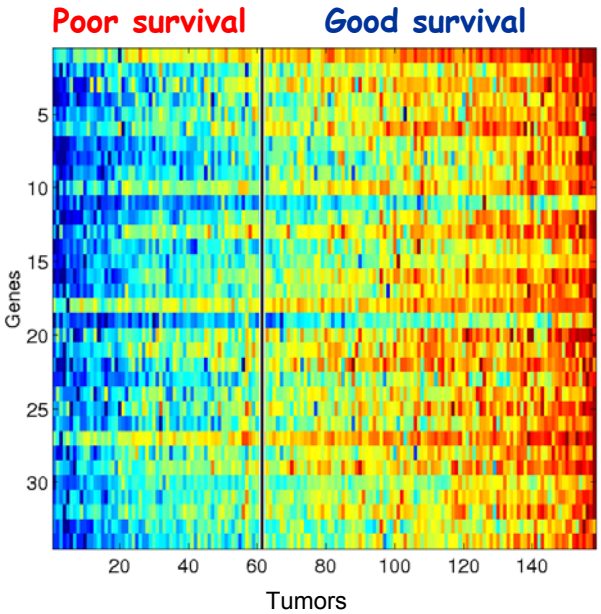
Breast Cancer Phenotypes

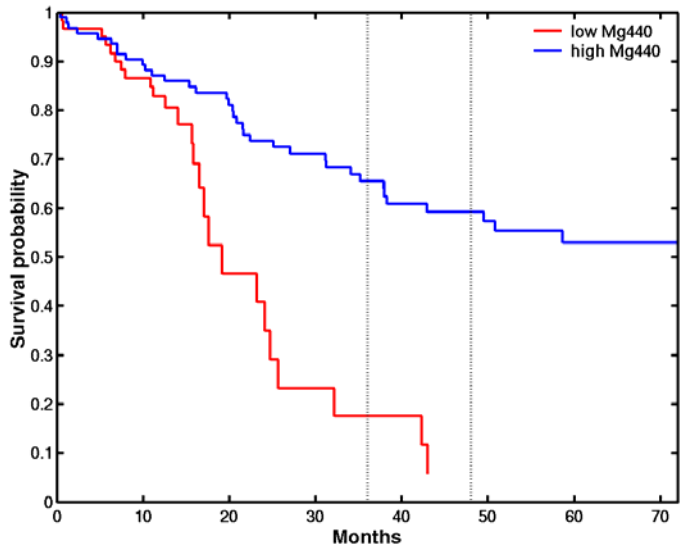


Patterns

Predict Clinical Outcomes

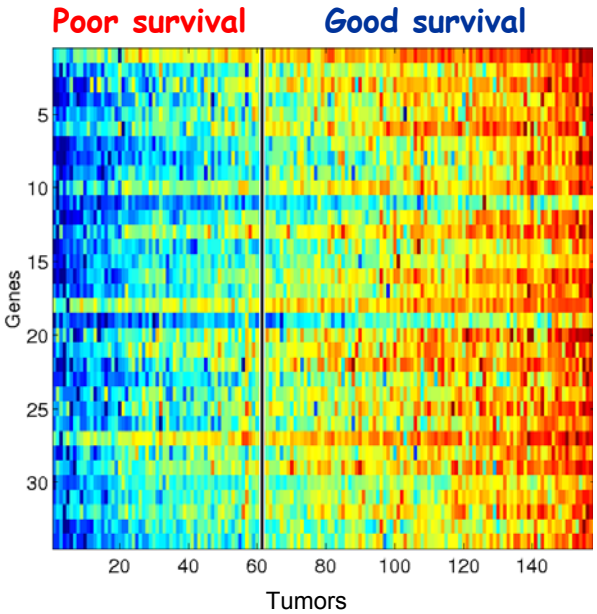
Predicting Survival With a Gene Expression Pattern

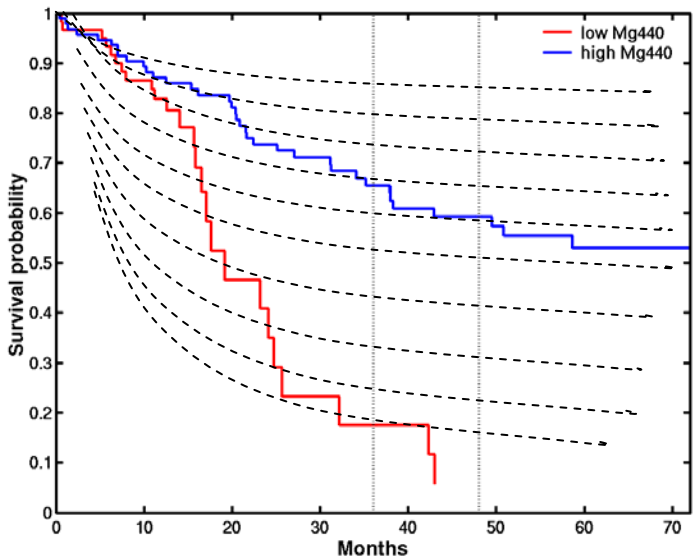




It's genomic, but it's still a 'group' prediction

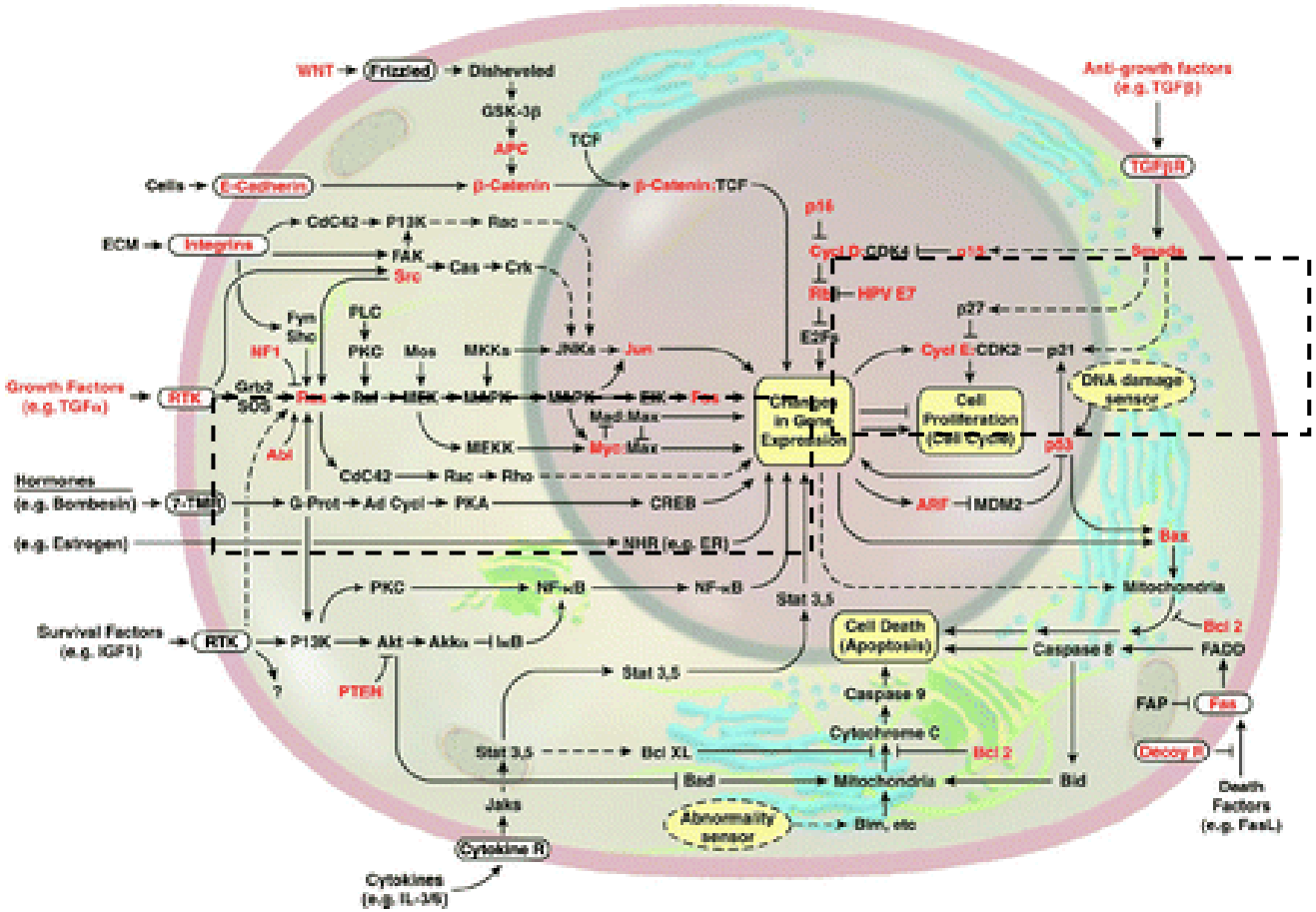
Predicting Survival With a Gene Expression Pattern



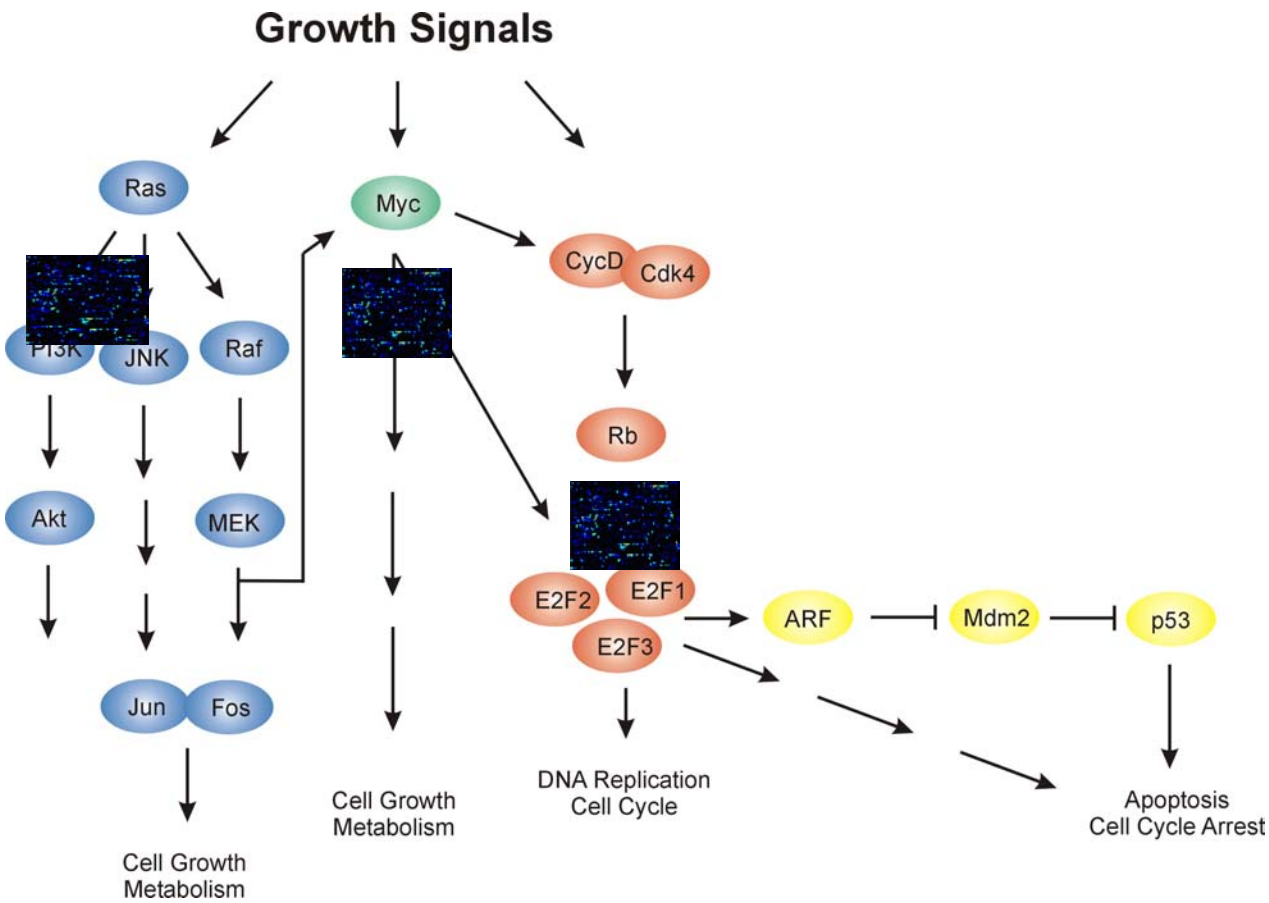


Detailed moleculer data: Personalized prognosis

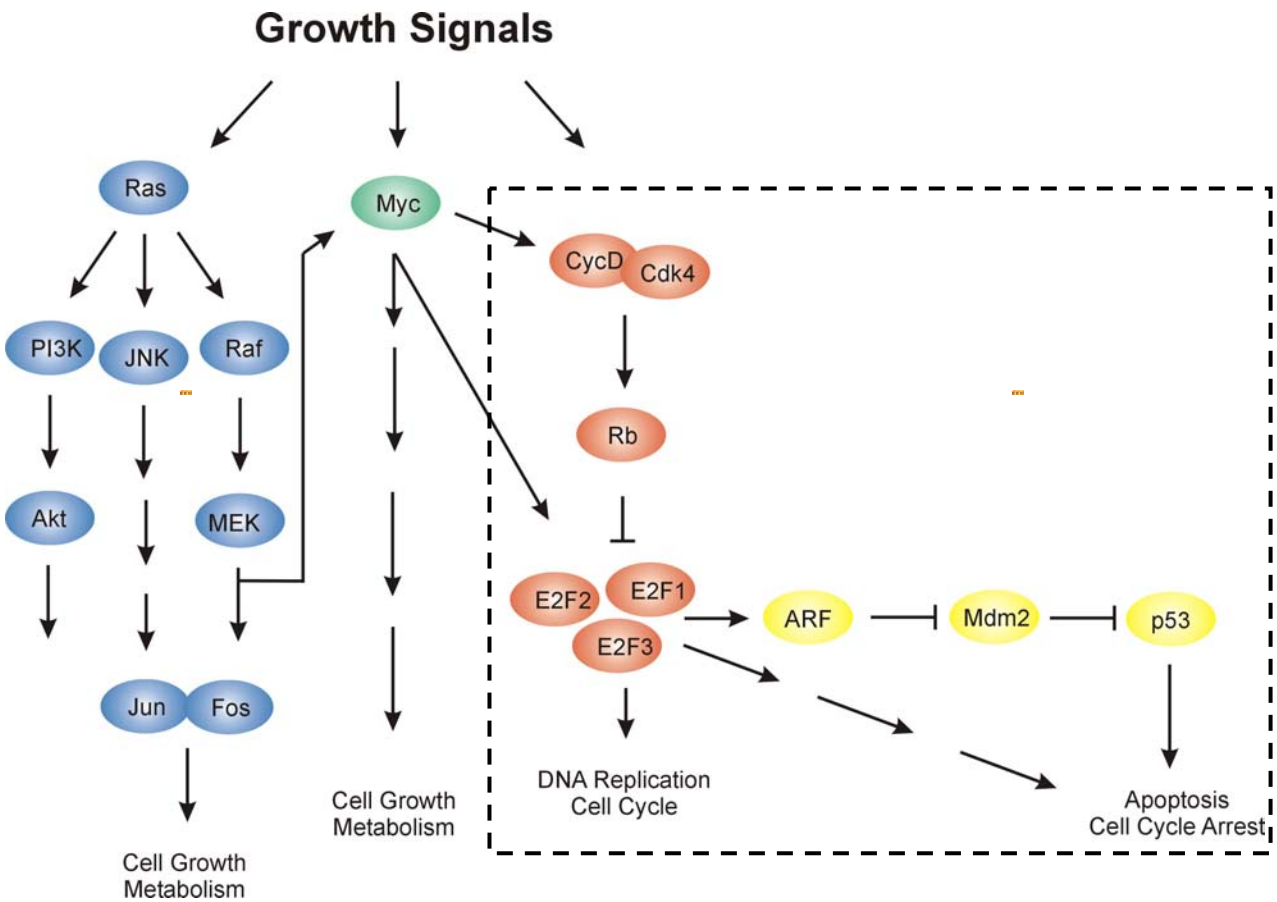
Dissecting Complex Signaling Pathways



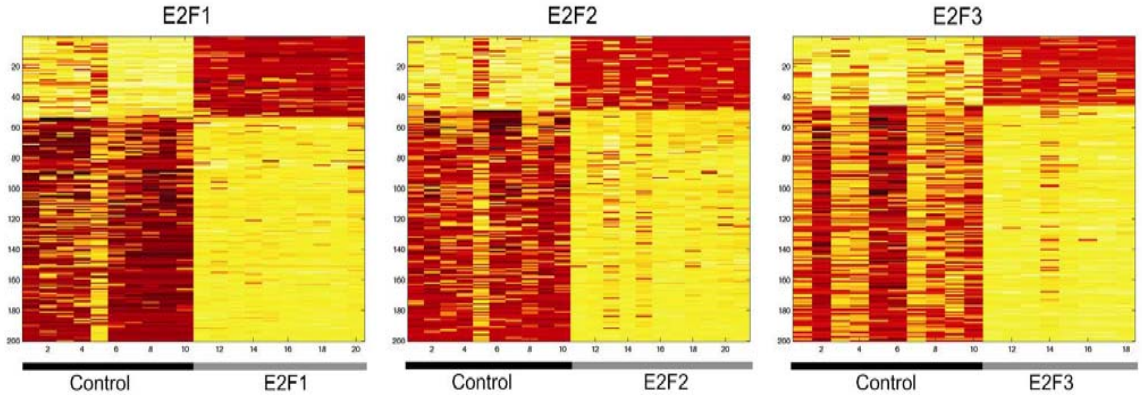
Gene Expression Phenotypes of Oncogenic Signaling Pathways



Gene Expression Phenotypes of Oncogenic Signaling Pathways

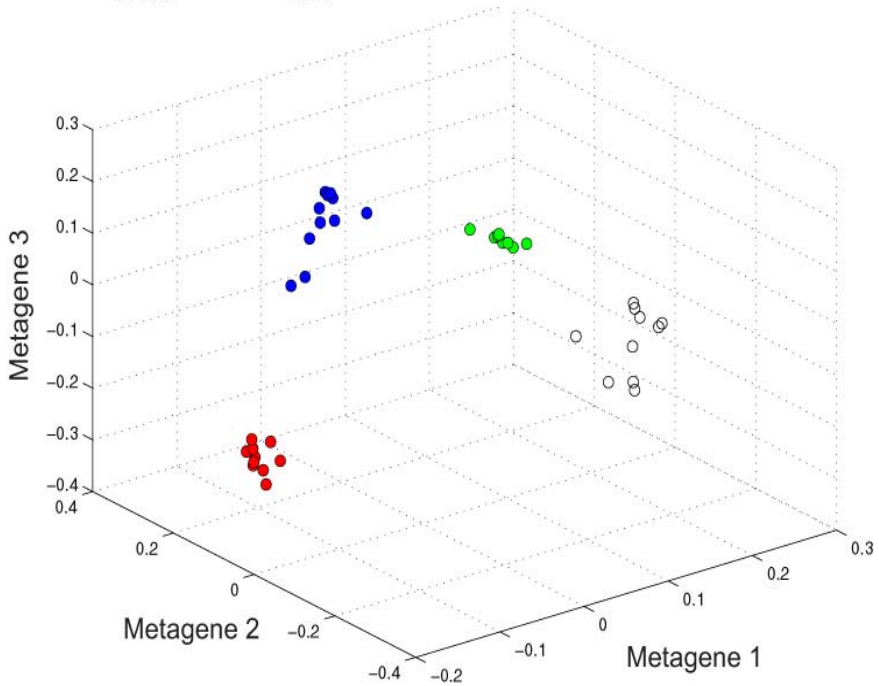


Gene Expression Patterns

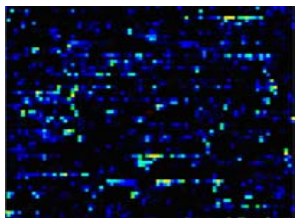


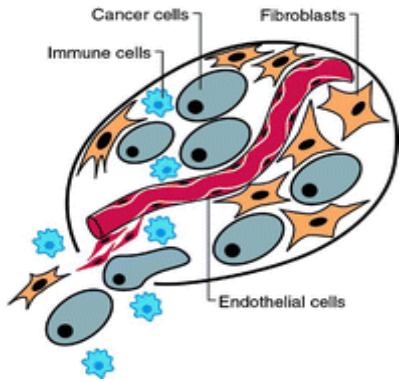
… reflect E2F activity …

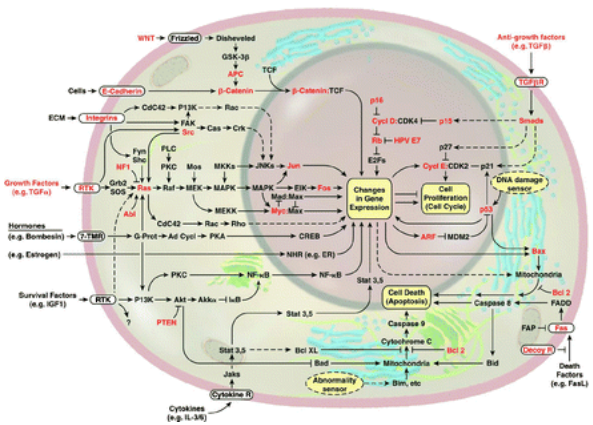
… and distinguish sibling E2Fs



Using the Complexity of Genomic Data







Hanahan and Weinberg, Cell 100: 57 (2000)

Next up:

Oigonucleotide (Affyx) Array Basics