Evolutionary Medicine

Theoretical Framework for Research

Educational Programs

Specific Research Questions

Evolutionary Medicine

=> ASU has a large number of researchers and activities in evolutionary medicine, from Genomics to Global Health

=> CAS Emphasis is on COORDINATION AND INTEGRATION

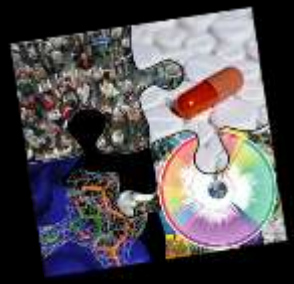
=> Identify Targets of Opportunities and Synergies

=> Develop EDUCATIONAL PROGRAMS

Evolutionary Medicine and Informatics (EMI)

Director: Sudhir Kumar

Unraveling DNA patterns and processes that produced the dazzling diversity of life and people in the world.



Harnessing the power of evolutionary knowledge for better human conditions and medicine.

Personal Genomics

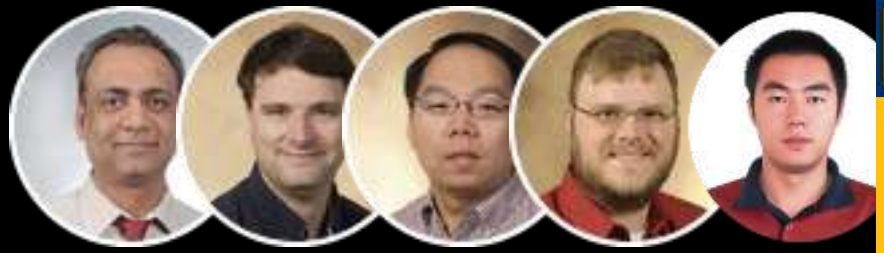
Predicting Adaptive and Disease Propensities of Mutations in Individuals

Disease Origins

Tracing Pathogen Evolution to Unravel Dynamics of Infections and Drug Resistance

Functional Proteomics

Discovering functionally important elements of genomes



Discovery Bioinformatics

Modeling, Analysis, and Simulations to Discover Patterns and Test Predictions

Transforming Evolutionary Theory

- Merger of CAS and Evolutionary Theory
- Emphasis on Regulation and Developmental Processes
- Hierarchical Expansion of Processes anchored by the Genome
- Biosocial Dimension

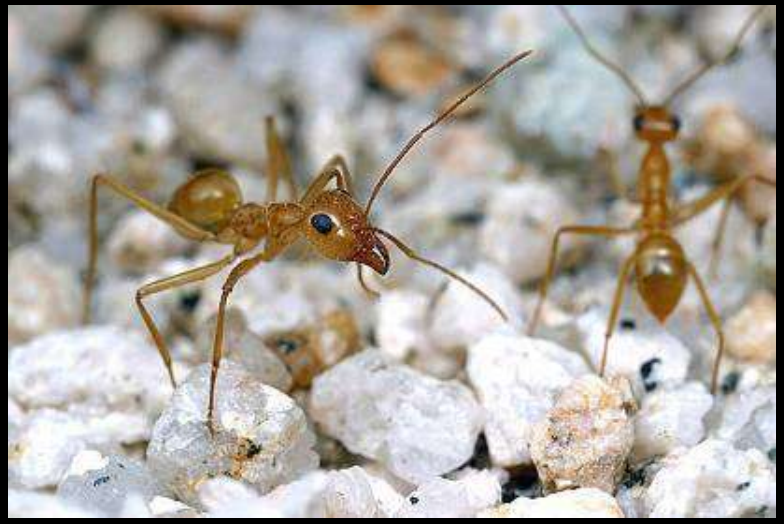
Innovation in Biological, Social, Cultural and Technological Systems

Theoretical Framework for Research

Broad Integration of Disciplines around a Topic

Specific Research Questions

The Developmental Evolution of the Superorganism



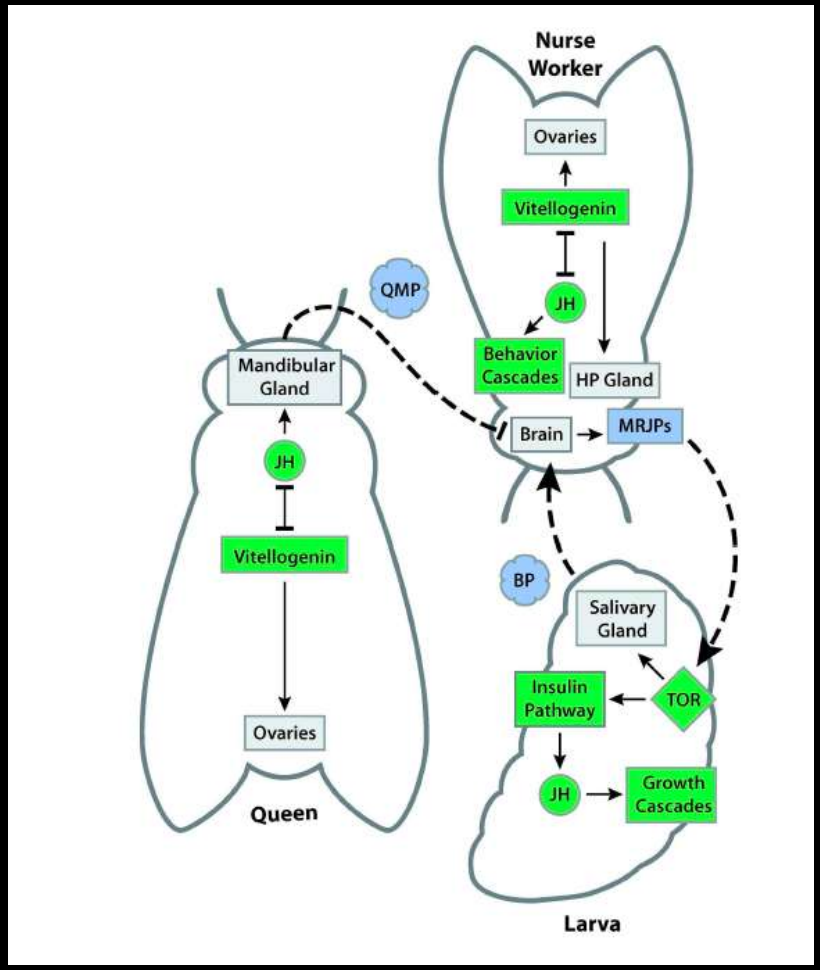
A Hierarchical Expansion of the GRN Framework

PERSPECTIVE AND HYPOTHESIS

Developmental Evolution in Social Insects: Regulatory Networks From Genes to Societies

TIMOTHY A. LINKSVAYER[1]*, JENNIFER H. FEWELL[2], JÜRGEN GADAU[2], AND MANFRED D. LAUBICHLER[2]
[1]Department of Biology, University of Pennsylvania, Philadelphia, Pennsylvania
[2]School of Life Sciences, Center for Social Dynamics and Complexity, Arizona State University, Tempe, Arizona

JOURNAL OF EXPERIMENTAL ZOOLOGY
PART B
MOLECULAR AND DEVELOPMENTAL EVOLUTION



In silico Synthetic Experimental Evolution

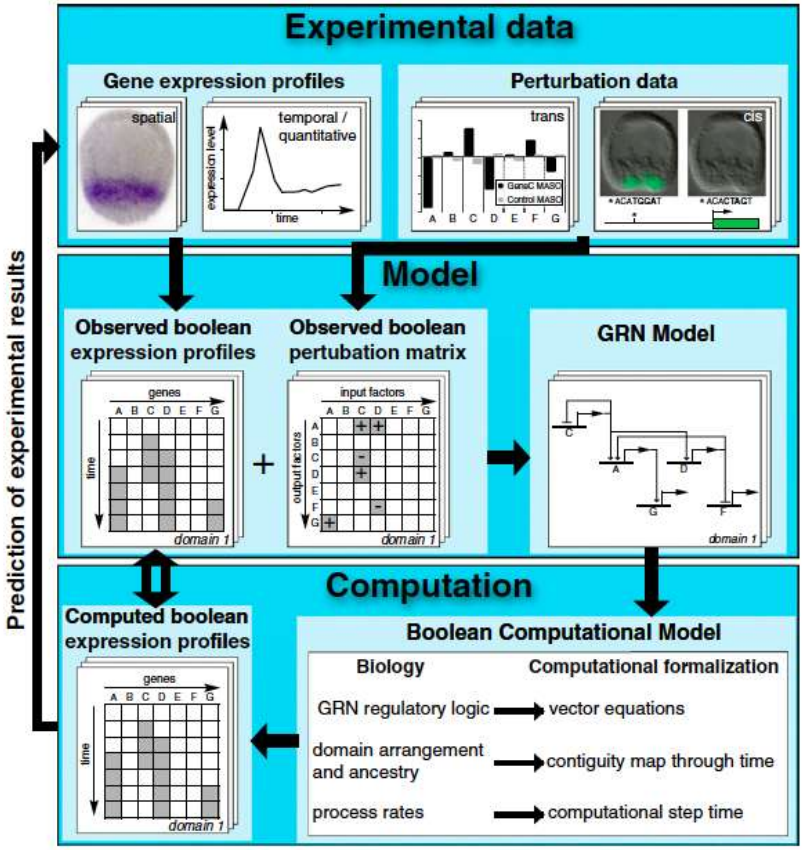
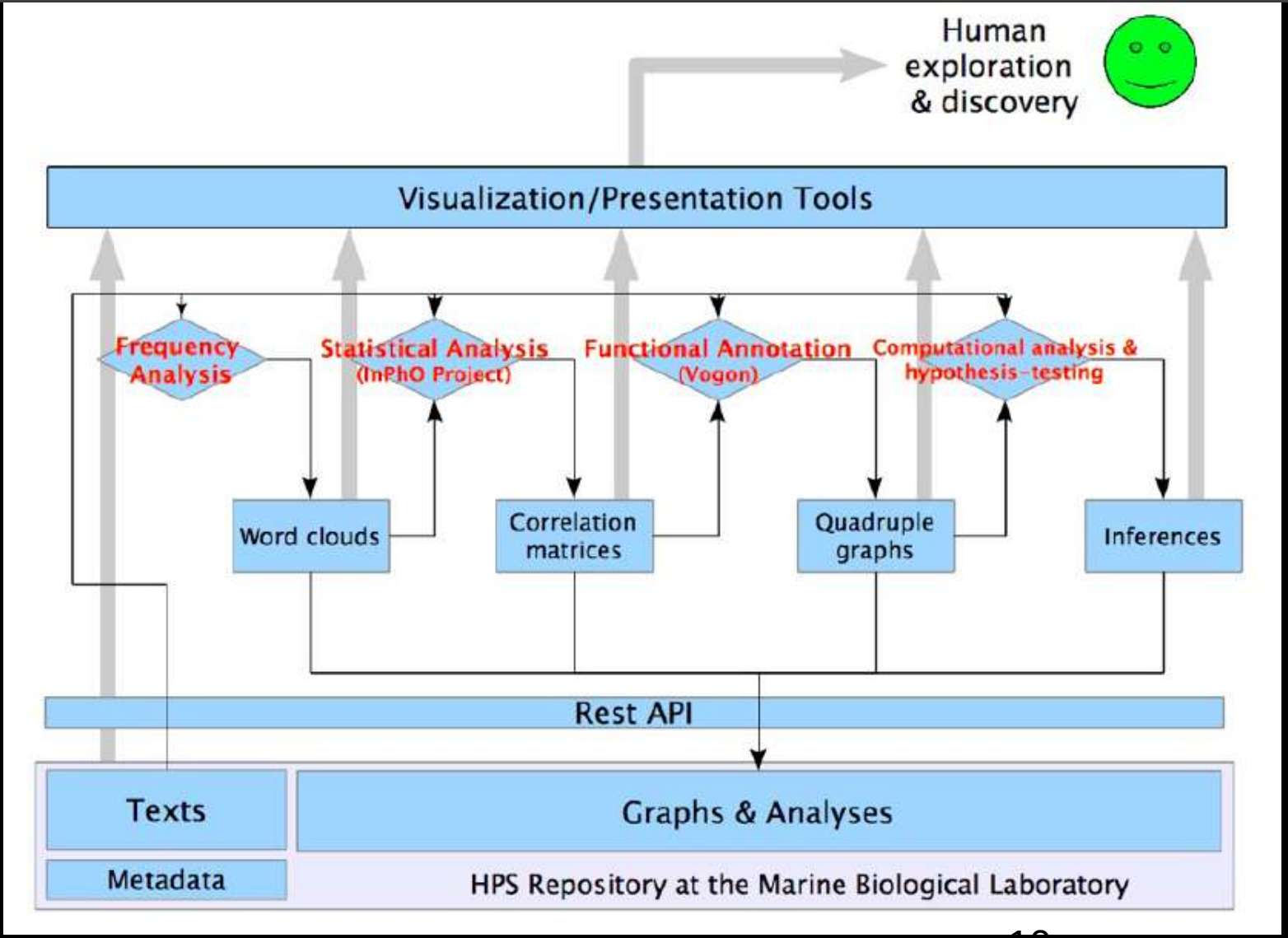


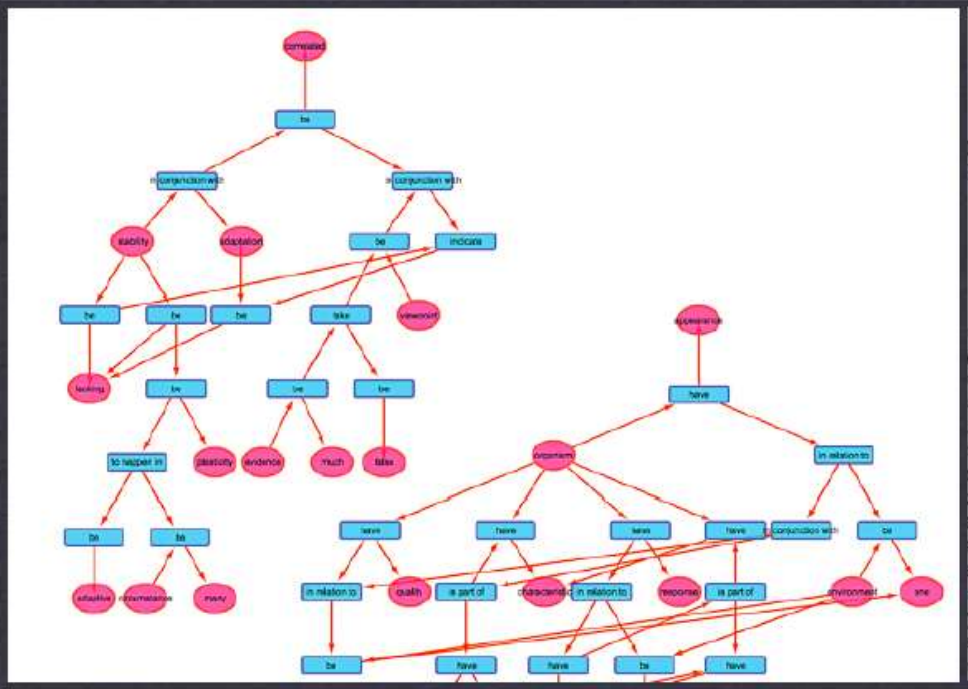
Fig. 1. Diagram summarizing the flow of information and logic relations between experimental data, the GRN model deduced from it, and the Boolean computational model. Gene expression data, systemwide perturbation experiments, and *cis*-regulatory analyses (*Top*), combined with the basic facts of the embryonic process, are used to generate abstract time-space expression pattern and the interaction matrices (*Middle*). These results in turn underlie the design of the deduced genetic circuitry captured in the GRN model. Inputs to the Boolean computational model (*Bottom*) are the vector equations derived directly from each node of the GRN model; the relative geometry of the interacting embryonic spatial domains considered in the model; and the kinetics with which gene cascades operate in this embryo. The model incorporates essential aspects of the temporal and spatial biology of the embryo, and gives rise to a matrix of specific predictions of where, when, and for how long every gene is individually expressed over a 24-h period. This computed matrix of expression results can now be compared directly with the observed matrix of gene expressions, in normal or perturbed conditions.

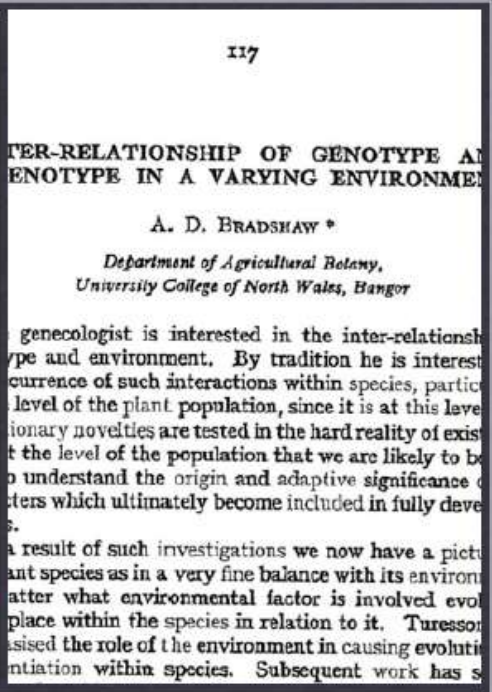
Peter et al., 2012

Innovation in Knowledge Systems



Bioinformatics of Texts





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TER-RELATIONSHIP OF GENOTYPE A
ENOTYPE IN A VARYING ENVIRONME

A. D. BRADSHAW *

Department of Agricultural Botany,
University College of North Wales, Bangor

genecologist is interested in the inter-relationsh
ype and environment. By tradition he is interest
currence of such interactions within species, partic
level of the plant population, since it is at this leve
lionary novelties are tested in the hard reality of exis
t the level of the population that we are likely to b
o understand the origin and adaptive significance
cters which ultimately become included in fully deve
s.

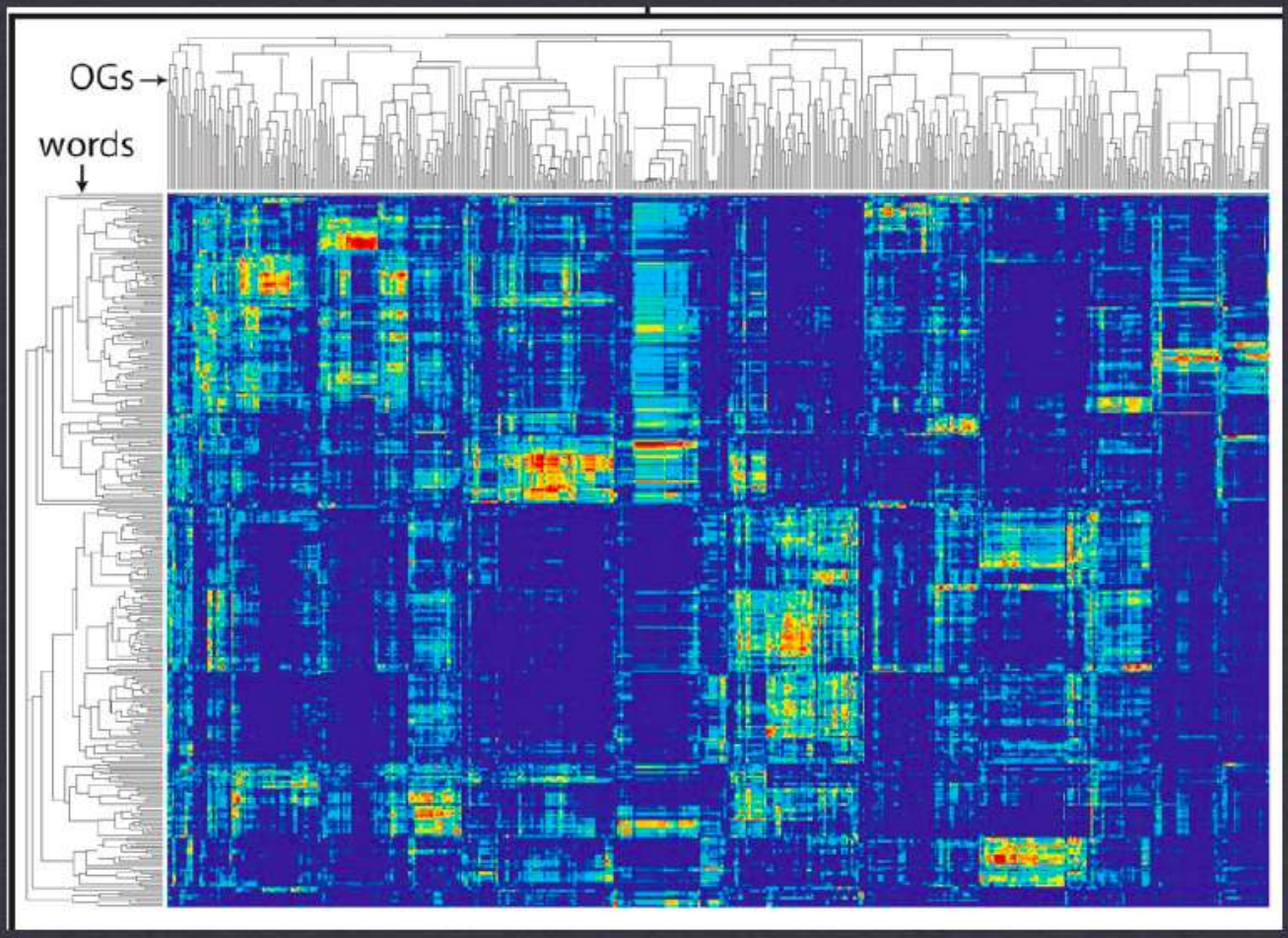
a result of such investigations we now have a pict
ant species as in a very fine balance with its environ
atter what environmental factor is involved evo
place within the species in relation to it. Turesso
sised the role of the environment in causing evoluti
ntiation within species. Subsequent work has s

We are becoming increasingly aware that the individual cannot be considered out of the context of its environment. The way in which it reacts to different environments is as much part of its characteristics as its appearance and qualities in a single environment At the present time there is a great deal of interest in the way in which an individual can maintain stability in the face of varying environmental influences. A considerable amount of evidence has shown that this stability is under genetic control. Much of the evidence has taken the viewpoint that stability and adaptation are correlated and that lack of stability indicates lack of adaptation. But as Nilsson-Ehle implies, it seems that plasticity, or lack of stability, can be of positive adaptive value in many circumstances. This essay seeks to explore this viewpoint further.

VOGON: STATEMENTS AS NESTED QUADRUPLES

PHENOTYPIC PLASTICITY: TONY BRADSHAW

Science/Genomes as Evolving Information Systems



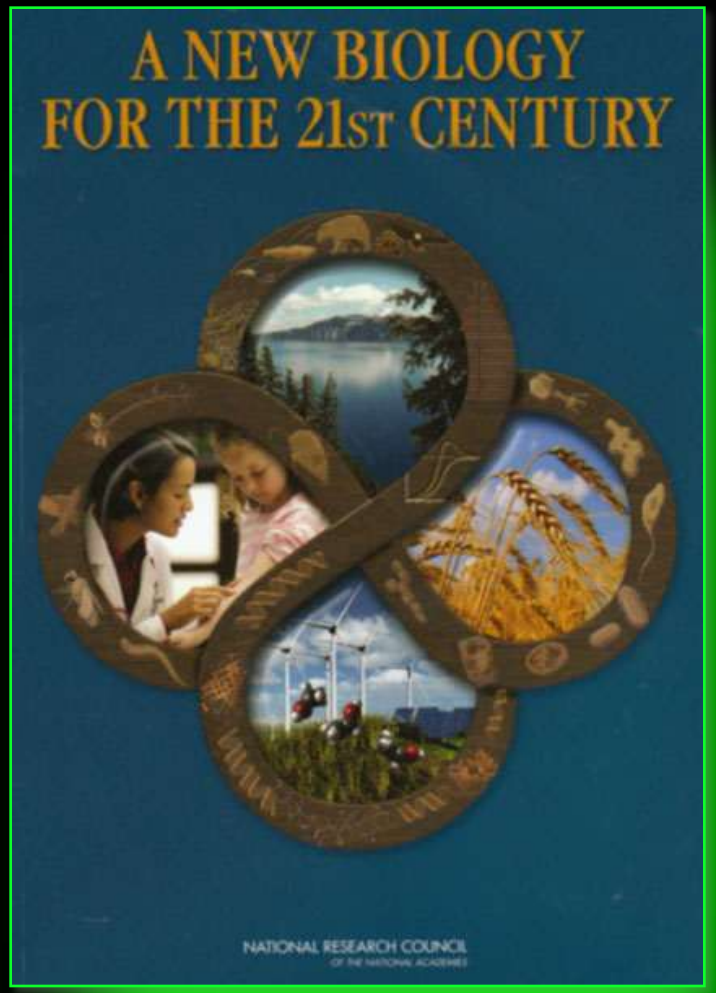
CLUSTERING TEXTS BASED ON CONTENT

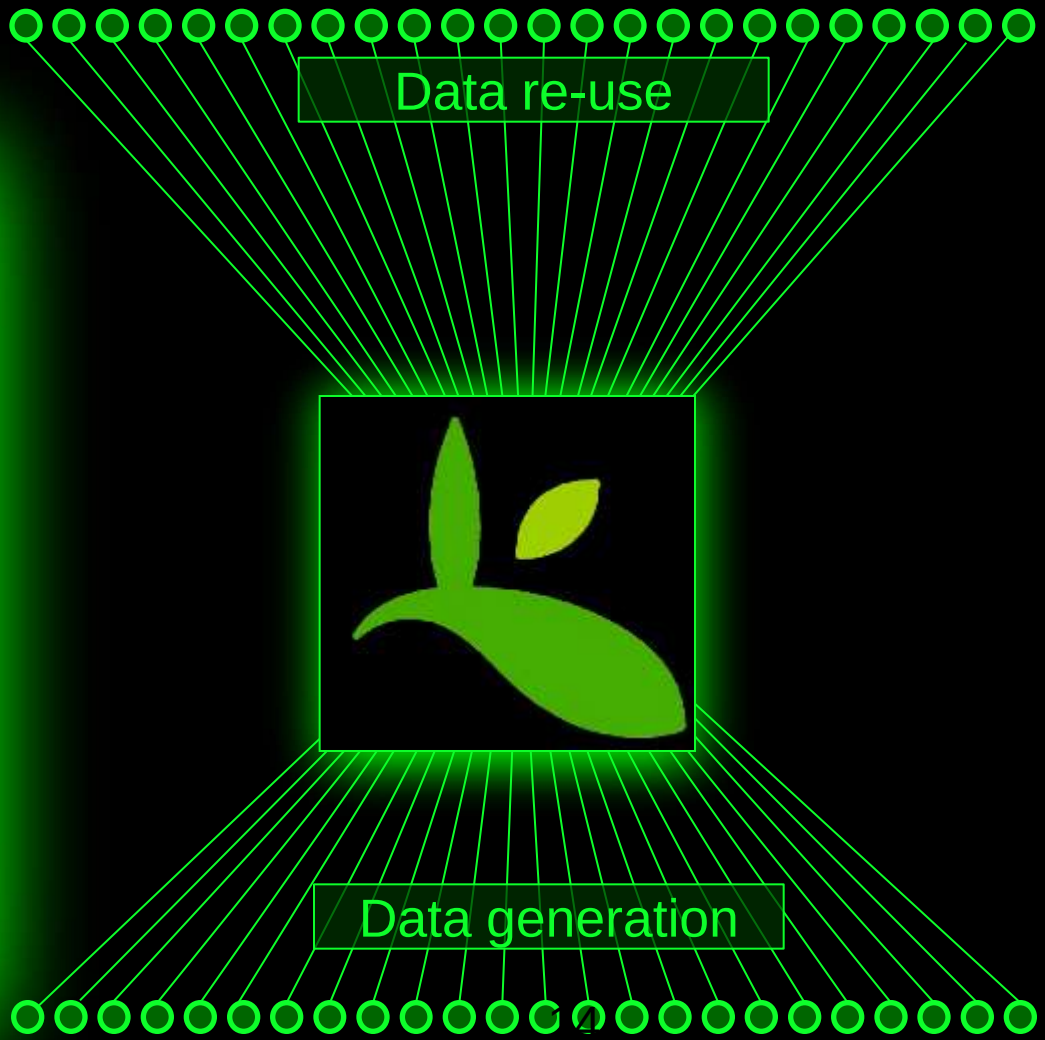
VECTORIZATION, COMPARISON, DECOMPOSITION (LSA, PCA, ETC.)

Big Data Beyond Biomedicine

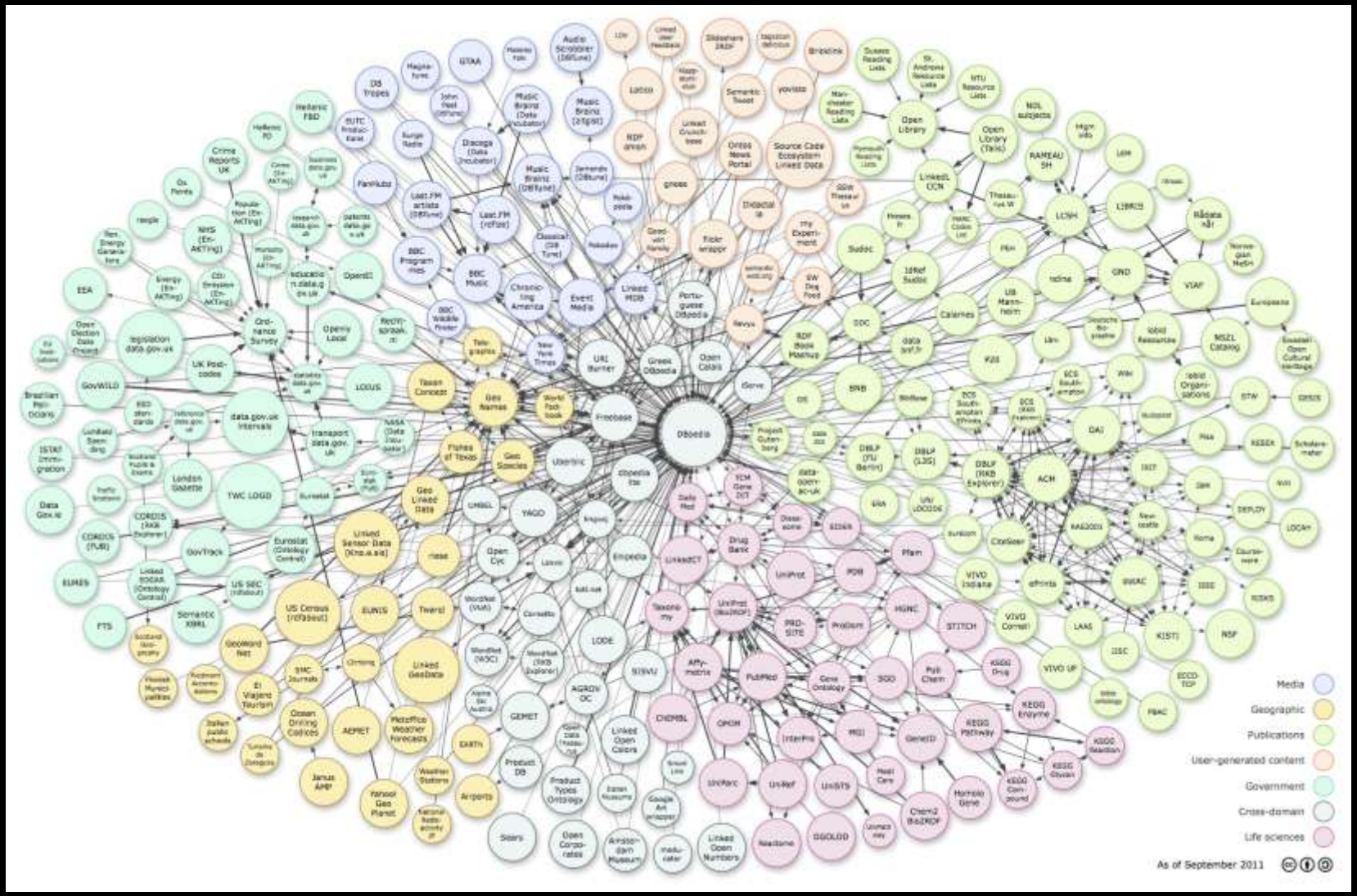
- Theoretical Framework for Research
- Transfer of Methods and Technologies
- Challenges of Data Integration

Big Data everywhere



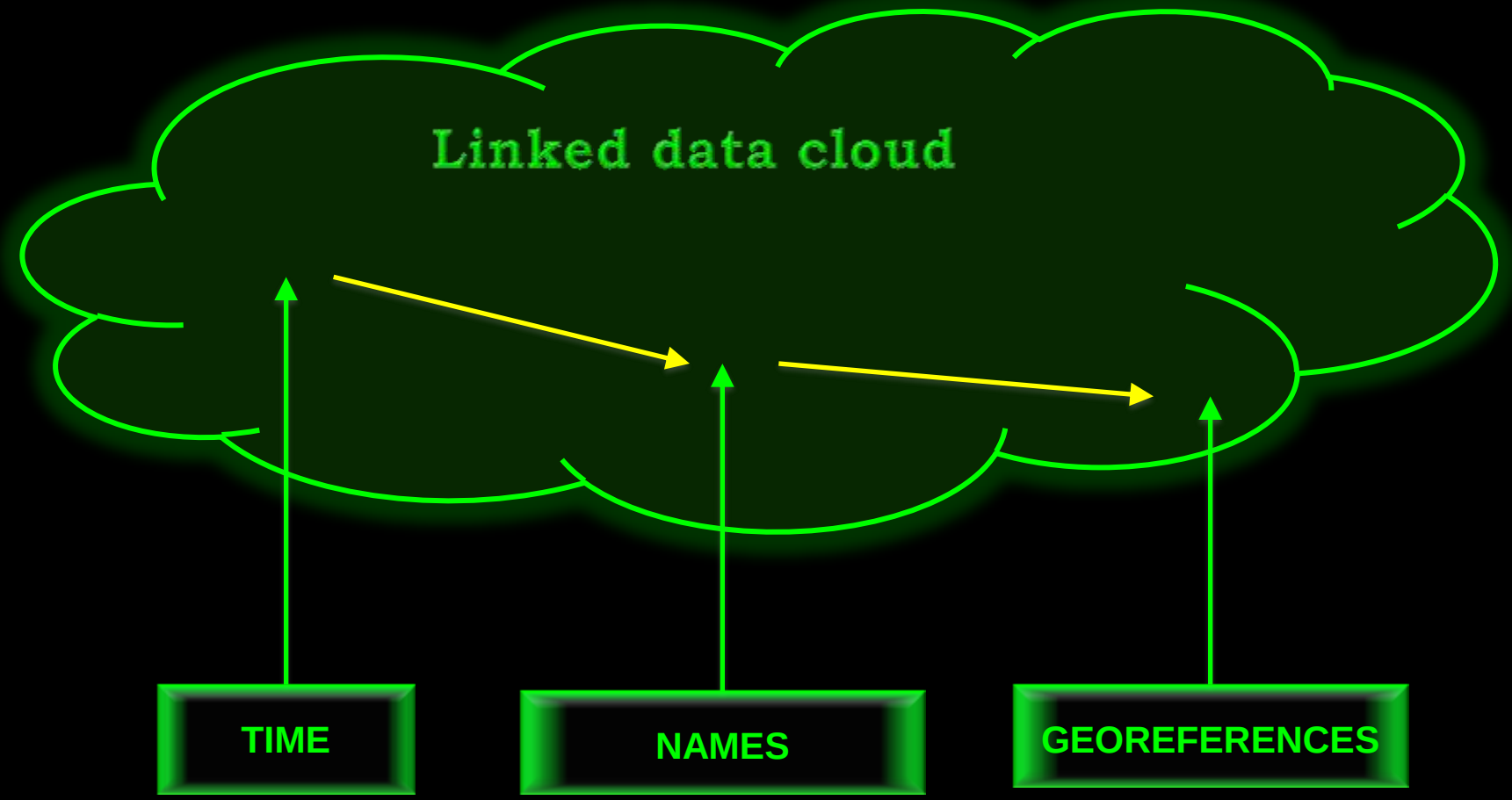


Open Linked Data Cloud



Data-linking

How has the distribution of commercial fish species changed in 100 years



Find me data for ‘then’ and ‘now’

For this species using both old and new names

Where did it occur then
Where does it occur now

CAS Education

Undergraduate (Certificates, Concentrations)

Graduate (Certificates, Concentrations)

Postgraduate (Special Topics Course at the MBL)