Dimensional Informatics

Tim Brailsford

The problem with data

Base and attached tables related by prime key on a typical relational database.

Why is this a problem?
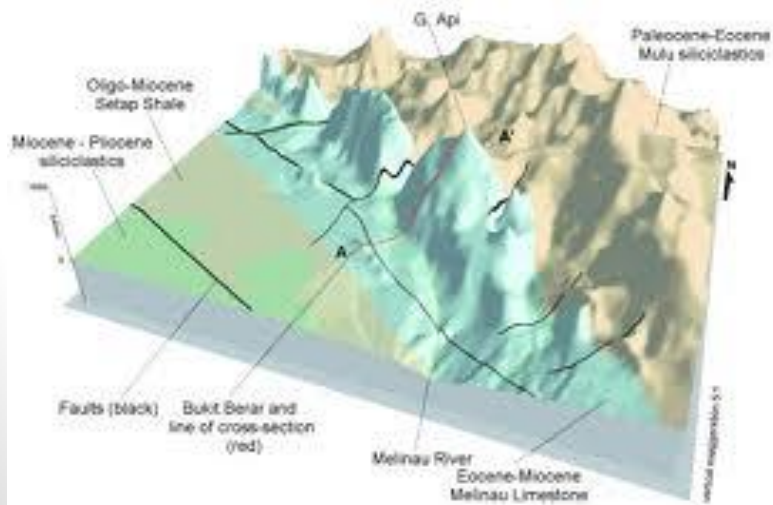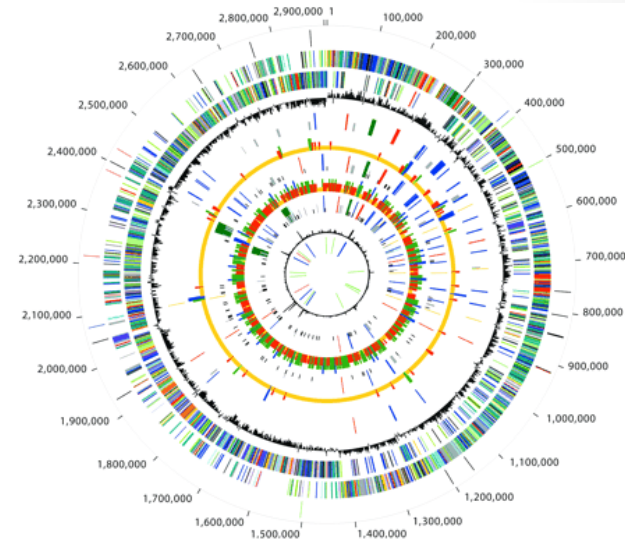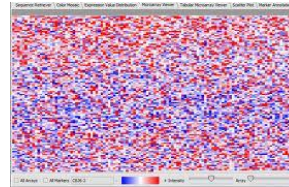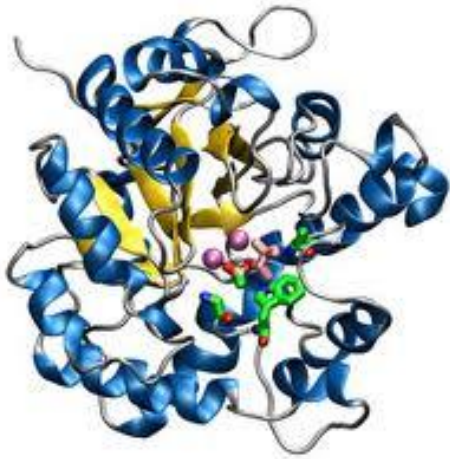
The Null Conundrum

First Name	Middle Name	Last Name
Timothy	John	Brailsford
James	NULL	Goulding

Semi-Structured Data

Dimensional Informatics

- Inspired by Ted Nelson's ZigZag System
- Data is contained in cells
- Cells are arranged in ordered lists – ranks in dimensions
- Dimensions usually have semantic meaning
- All cells exist in all dimensions – but the ordering can be different

Complex Data

Element	Symbol	Atomic mass	Density	Melting point
		g/mol	kg/m3	K
Hydrogen	H	1.01	0.09	14.0
Helium	He	4.00	0.17	1.0
Lithium	Li	6.94	534.00	452.0
Beryllium	Be	9.01	1800.00	1550.0
Boron	B	10.81	2500.00	2600.0
Carbon	C	12.01	2300.00	3800.0
Nitrogen	N	14.01	1.17	63.3
Oxygen	O	16.00	1.33	54.7
Fluorine	F	19.00	1.70	53.5
Neon	Ne	20.18	0.84	24.5
Sodium	Na	22.99	970.00	371.0
Magnesium	Mg	24.31	1741.00	924.0
Aluminium	Al	26.98	2700.00	933.2
Silicon	Si	28.09	2300.00	1680.0

Biotin (Vitamin Z)
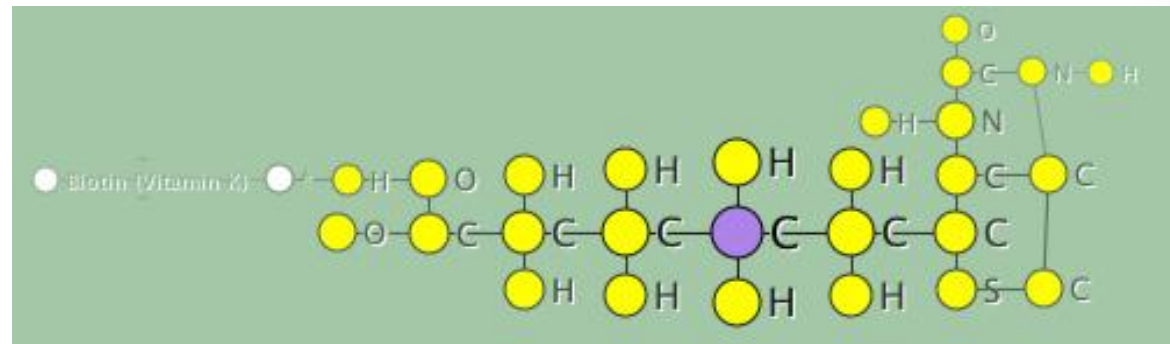
Hyperorders

- James Goulding - PhD

- Any cell may be associated with any other in any dimension

- In set theory:

  $$HM_{hyperorder} = \langle\ C, \{\ D_1, D_2, ..., D_n\ \}\ \rangle$$
  where $D_i \subset C_2$

- You then don't need a separate linking mechanism

Objectives

- CFFRC will have a lot of complex semi-structured data

- Develop a dimensional informatics storage layer - based on hyperorders for CFFRC datasets

- Implement this as a layer that can co-exist with conventional structures (i.e. RDMS)

- This should provide associations and inferences that would previously have been difficult or impossible

Supervision Team

- Tim Brailsford (UNMC)

- James Goulding (Horizon, UoN UK)

- Sean Mayes (CFFRC)

Approaches & Methodologies

- Continue the theoretical work
- Develop a DI server and associated query/retrieval language
- Test this with selected CFFRC data sets
- Implement an overlay to integrate the CFFRC knowledgebase with the DI server

Ideal student

- Really good programmer/software engineer

- Good knowledge of database theory

- Not afraid of maths!