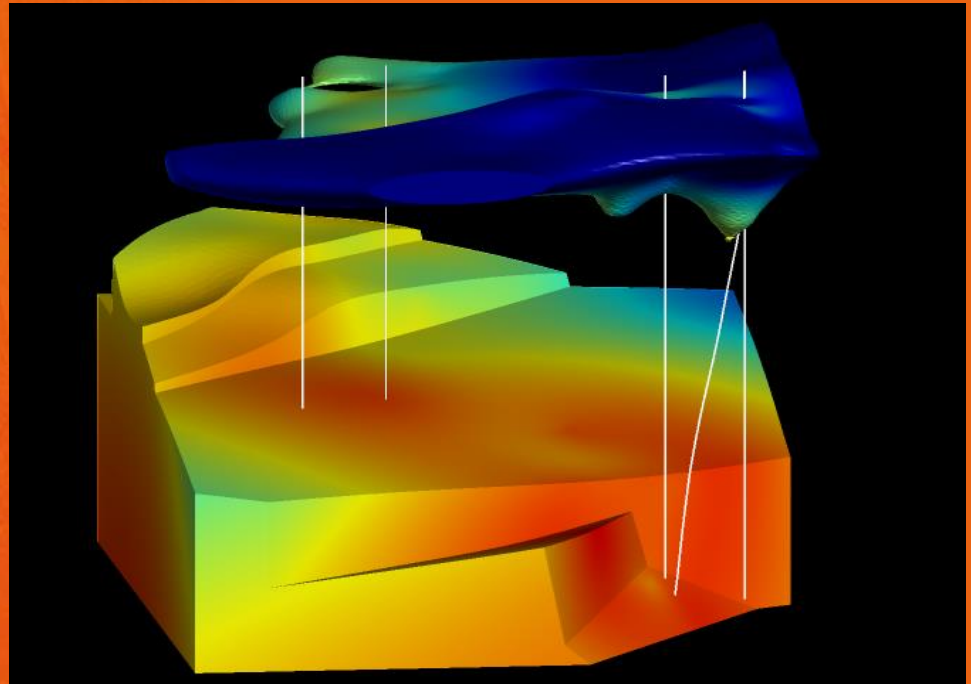


# Integration of Implicit Modelling into a Mining Operation

Presenter:  
Peter Joynt



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# Background

ARANZ Geo is a New Zealand based company that makes geological modelling software (Leapfrog) for the mining, groundwater and geothermal industries

We also provide training and support to our users across the globe



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## Engineering

Mine design

Mine planning

Scheduling

## Scientific

Geostatistics

Geochemistry

Simulations

Wire Framing



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## Data

Drilling databases

Mapping data

Core scanning

# How implicit Modelling started

$$[A][\lambda] = [f]$$

$$[A^{-1}]$$



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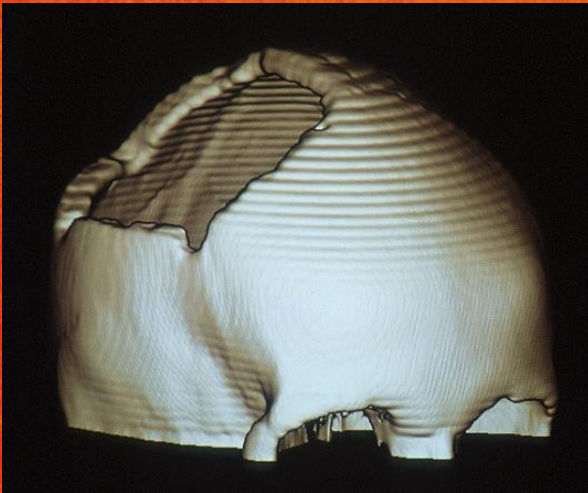
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# The first application of this new technology was in laser scanning

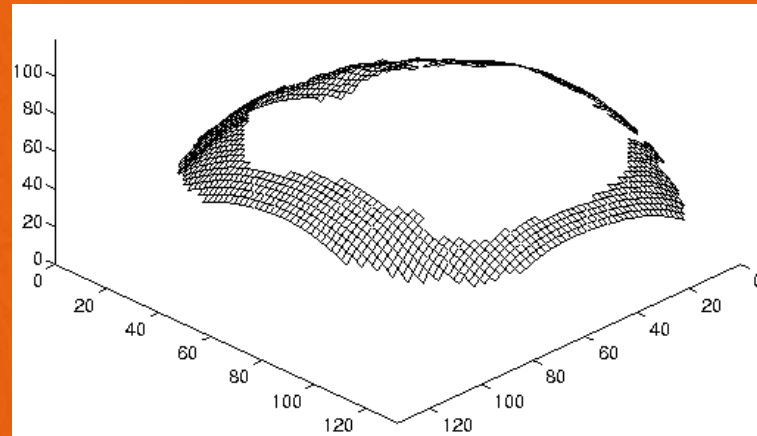


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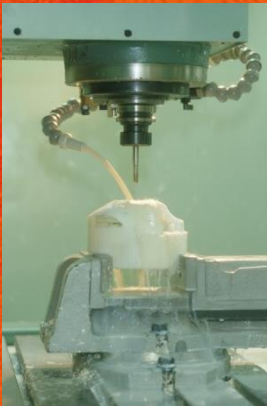
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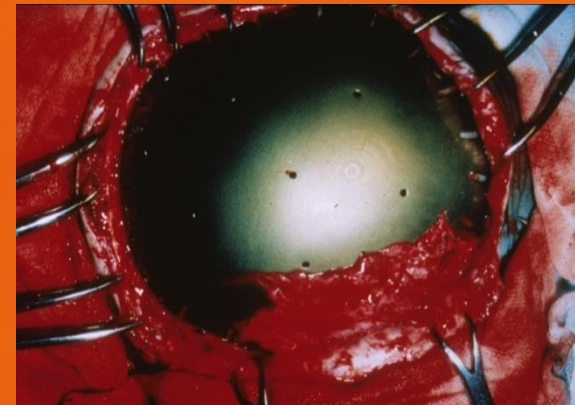
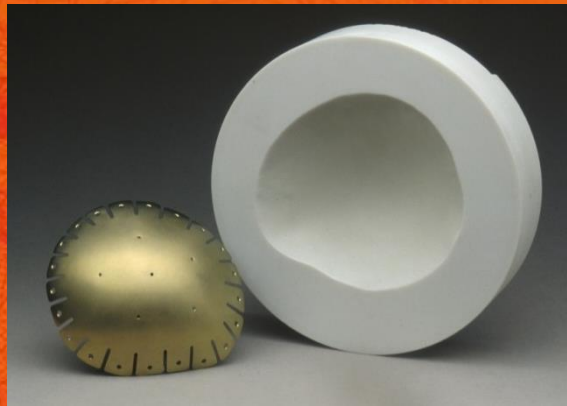
1: Void is scanned with laser



2: Triangulation is created using implicit modelling



3: A titanium Implant is cut



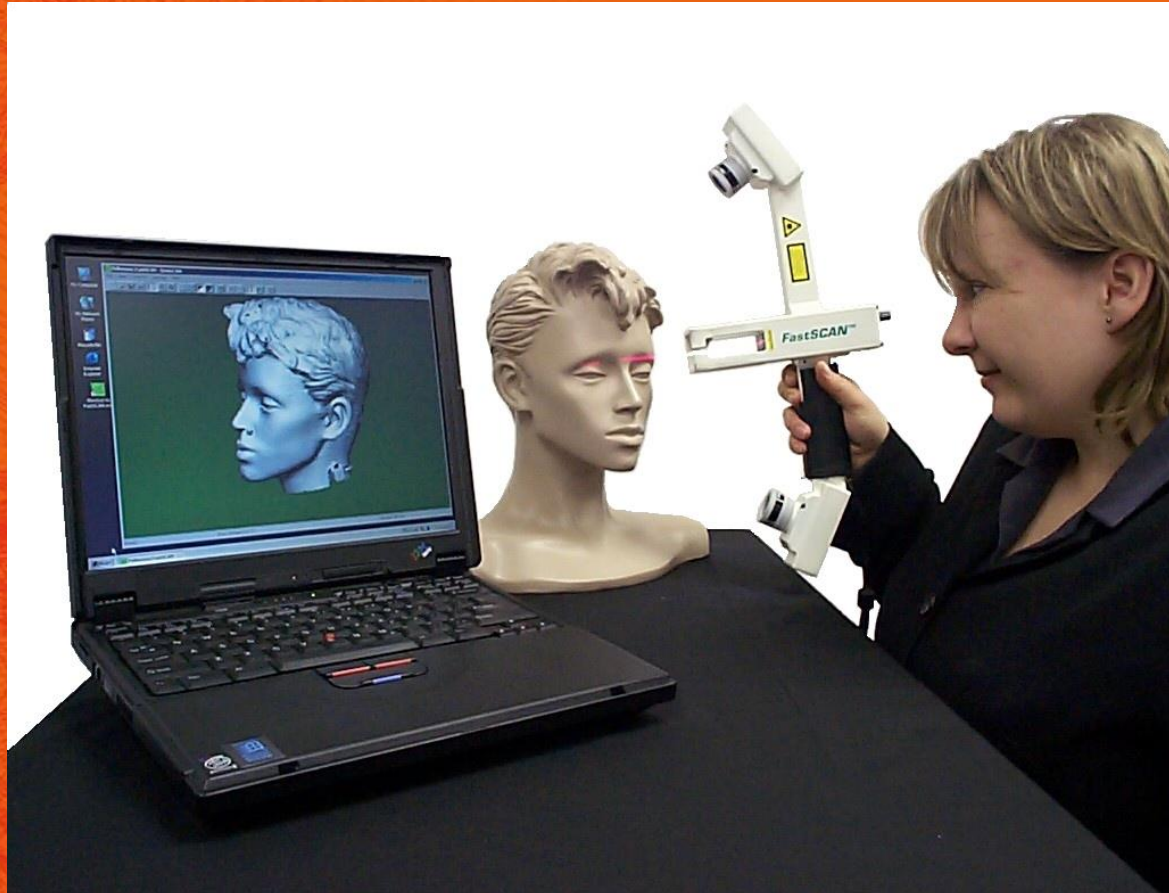
4: Implant is then implanted



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# Real time Laser Scanning



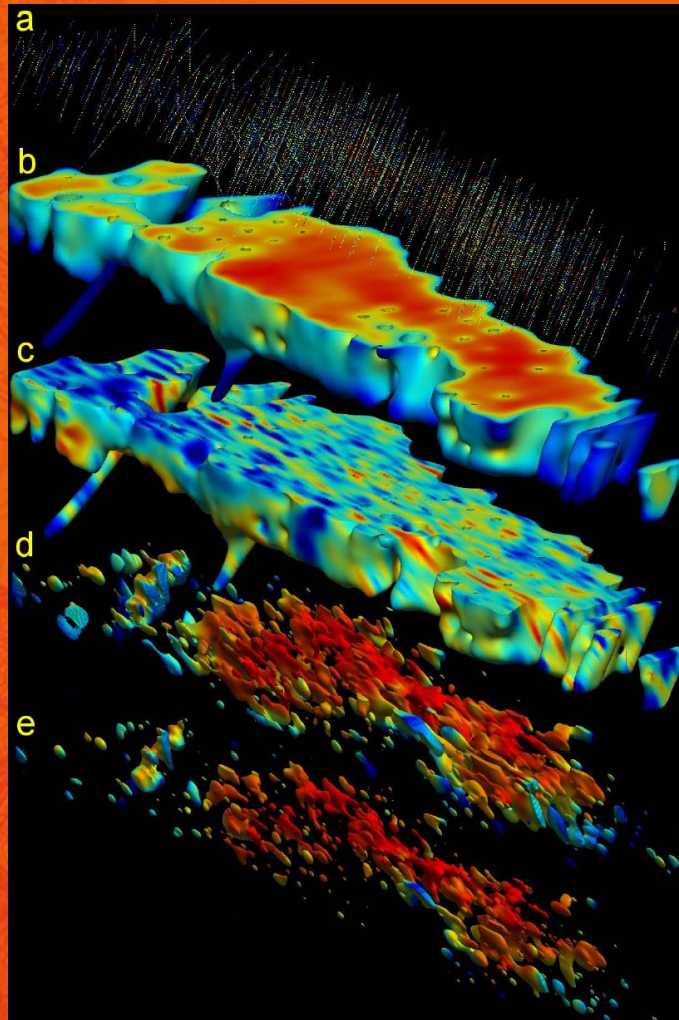
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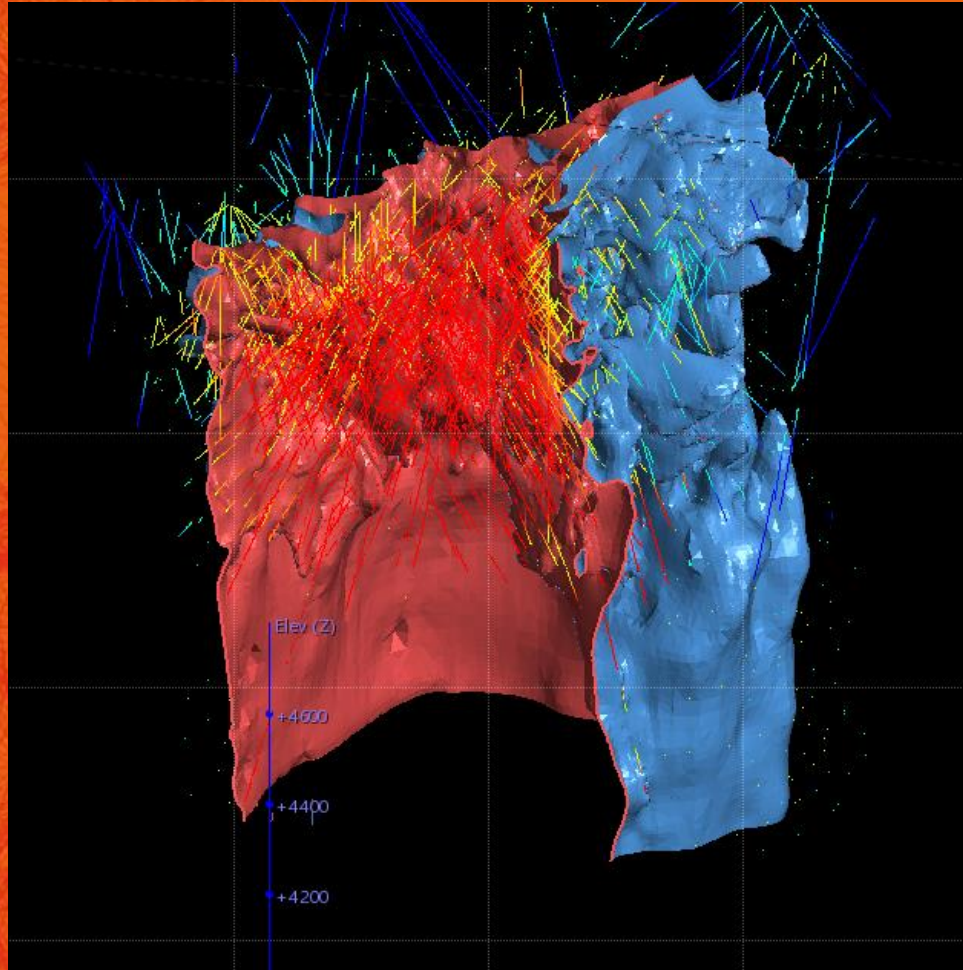
# Implicit Modelling of Assay Data



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# Implicit Modelling of Lithological Domains



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# Explicit vs Implicit Modeling

## Explicit Modeling

- User interprets on 2D sections
- Sections are joined to build a 3D model.
- Effectively an advanced 3D drawing tool
- User joins the dots
  
- More like a drawing package

## Implicit Modeling

- Simple model is generated directly from the data
- Model is refined
- Sections are produced from slicing through the 3D model
- Computer joins the dots
- User manipulates the model
  
- More like a computer animation program



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# Generating volumes – option 1 draw tie lines



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# Generating volumes – option 2 trend



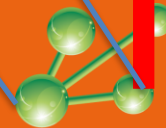
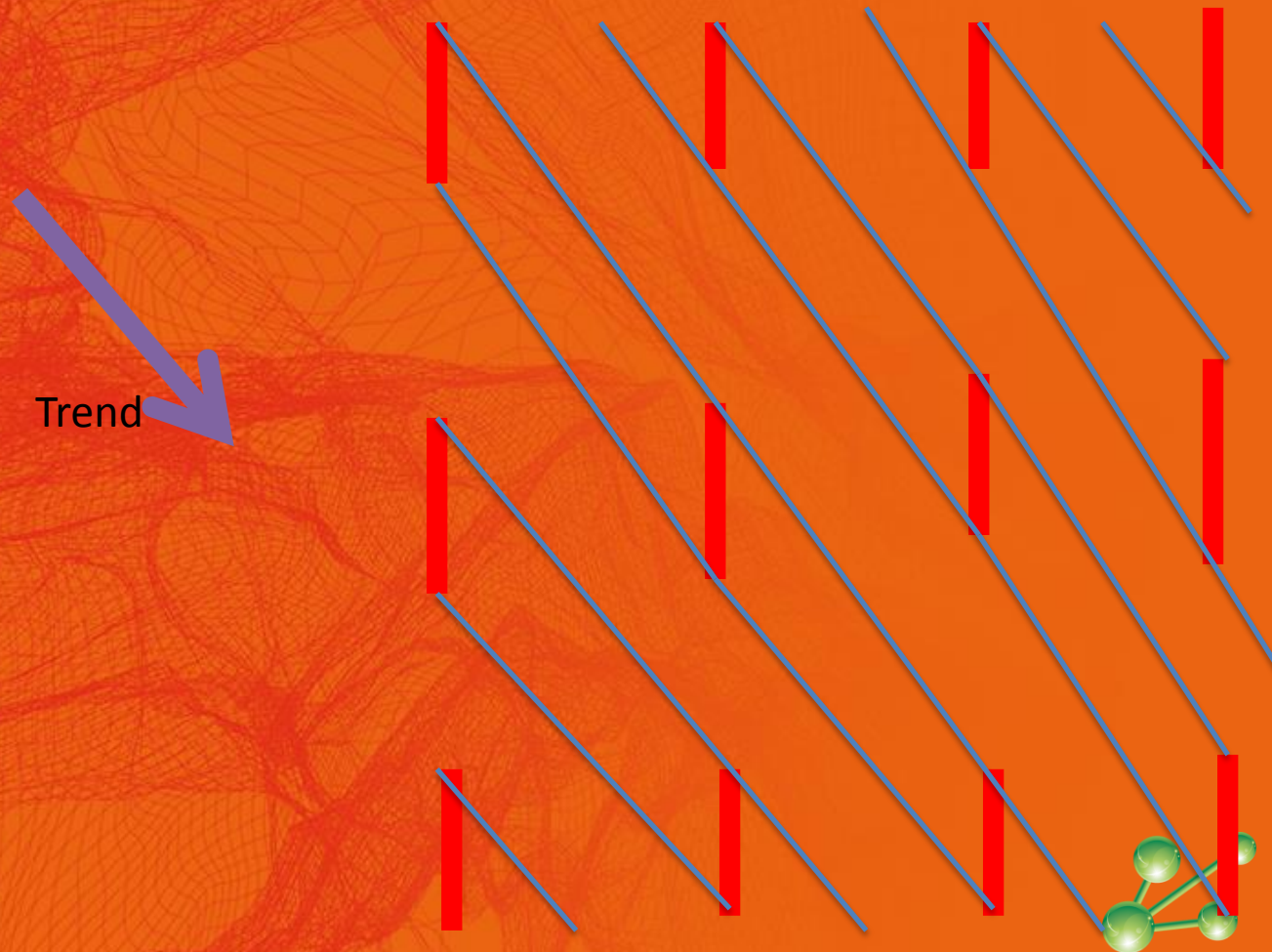
Trend



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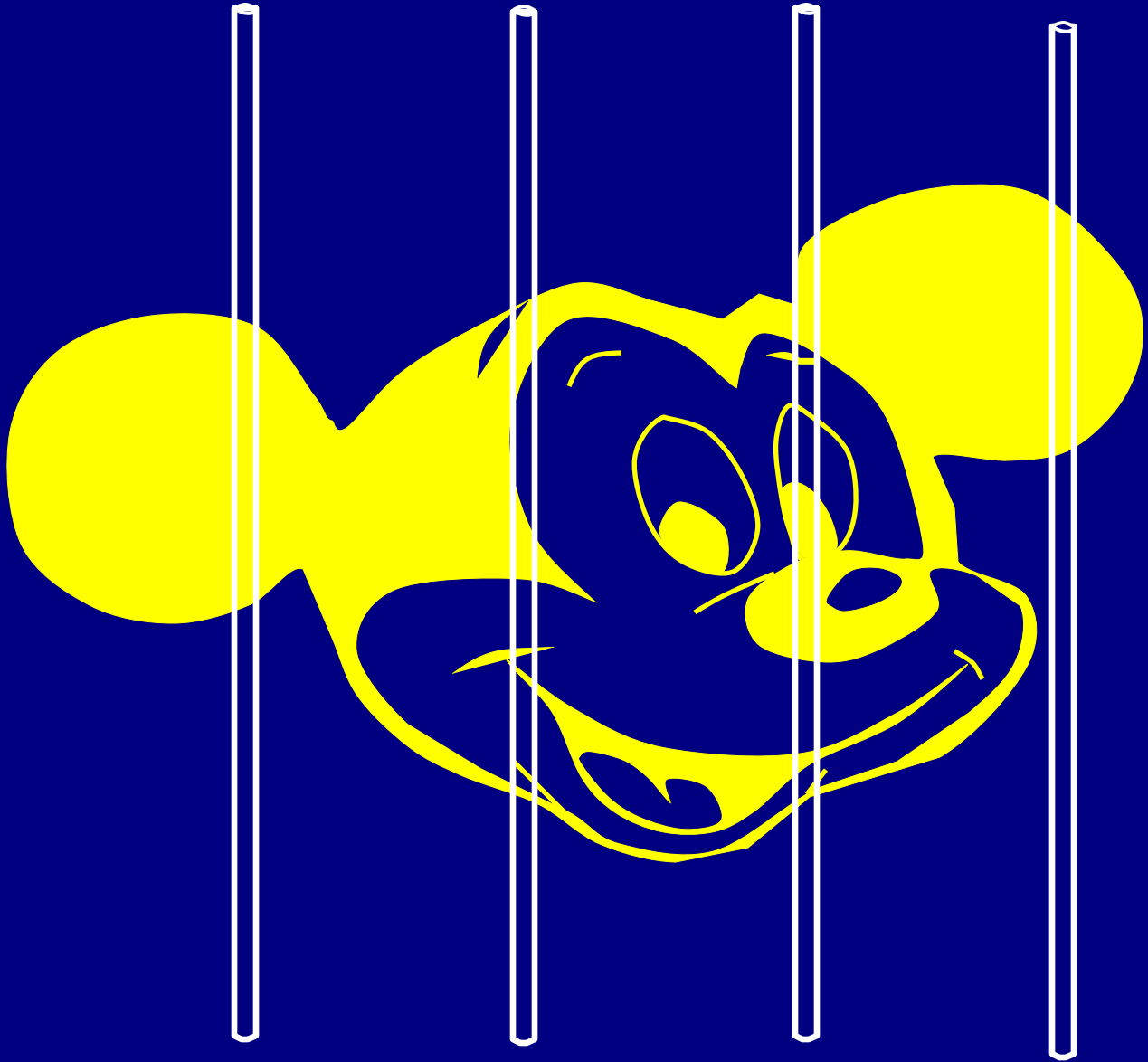
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# Generating volumes – option 2 trend



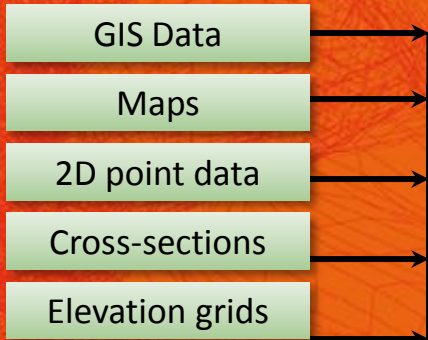
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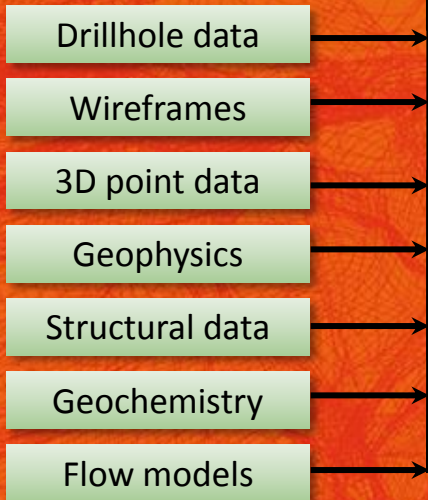


# Data Inputs/Outputs

## 2D data



## 3D data



**Modelling  
Software**

Drawing

Trends

Cross-sections

Planned drillholes

Wireframes

Geological Models

Numerical  
interpolation

Groundwater Models

Geo Metallurgical

Alteration

Structural

Lithological

Oxidation

Stratigraphic

Estimation

Geophysics

Geotechnical

Flow simulation  
grids



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# The Benefits of Implicit Modelling

- **Auditability** – Models can be easily dissected to understand how they are built
- **Speed** – Create multiple models quickly and try different hypotheses
- **Spatial Validation**
- **Incorporation of all data types** – Drilling, Geophysics, GIS data etc
- **Increase modelling efficiency** – More time to work on the interpretation
- **Dynamic models** – Models can be automatically updated as new data becomes available

**A up to date model allows crucial decisions to be made on the latest information**



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# Long term planning

## Traditional modelling



## Leapfrog dynamic modelling



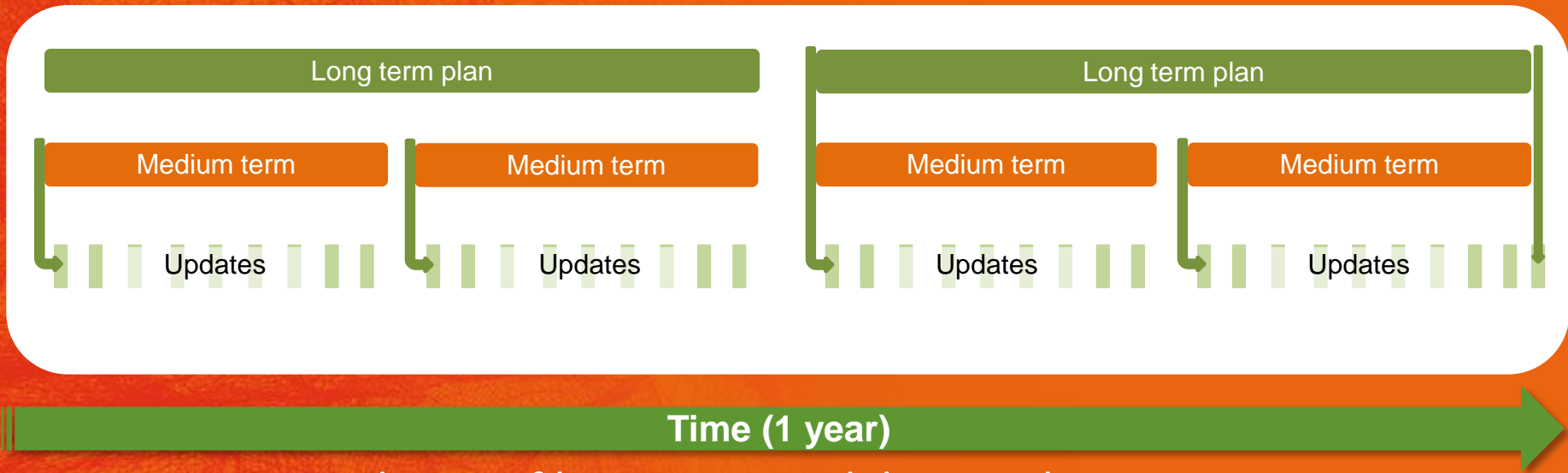
Time (1 year)



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# Short and medium term planning



- Continuous updating of long term model using short term data
- Allows frequent and more rapid reconciliations

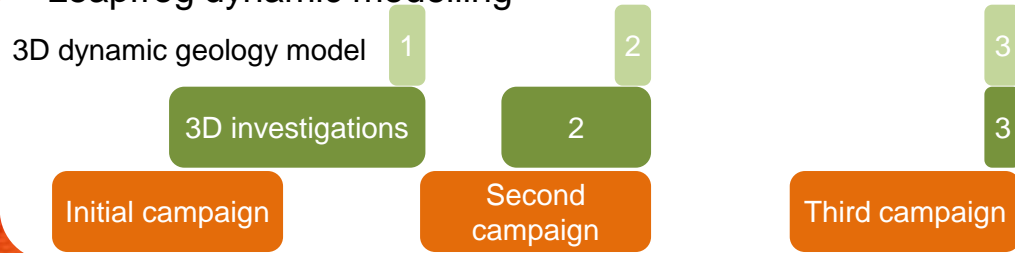


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# Exploration

## Leapfrog dynamic modelling



Time

- Rapid visualisation of drill data
- See feature and trends not possible in 2D
- Up to date decision make. Do you need to drill one more hole before you leave?



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# The Leapfrog Community and Training Options

## **Leapfrog Blog:**

<http://blog.leapfrog3d.com>

## **Community:**

LinkedIn Forum – Leapfrog Users Group

## **Training Options:**

Fundamental and intermediate training

Project assistance

Custom training, suited to your needs



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