

# ***Optimization of Dimension Stone extraction from fractured rock mass: a computer method to assist DS quarry evaluation and production planning***

**Stephen Henley (Matlock, UK)**

**and**

**Dmitry Nikolayev (Dubna, Russia)**

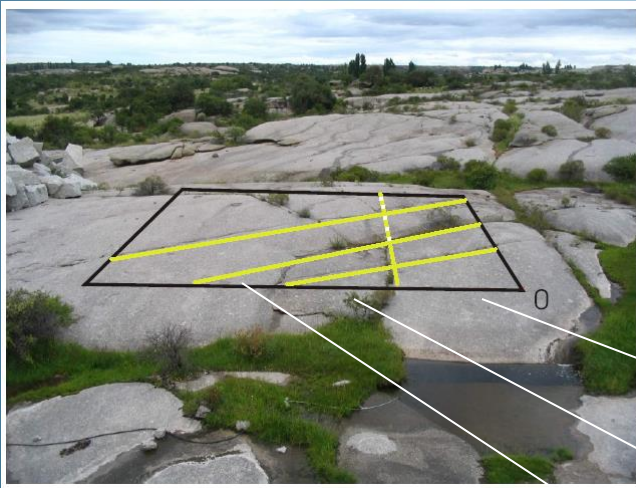
Most rock masses  
are intersected by  
fractures





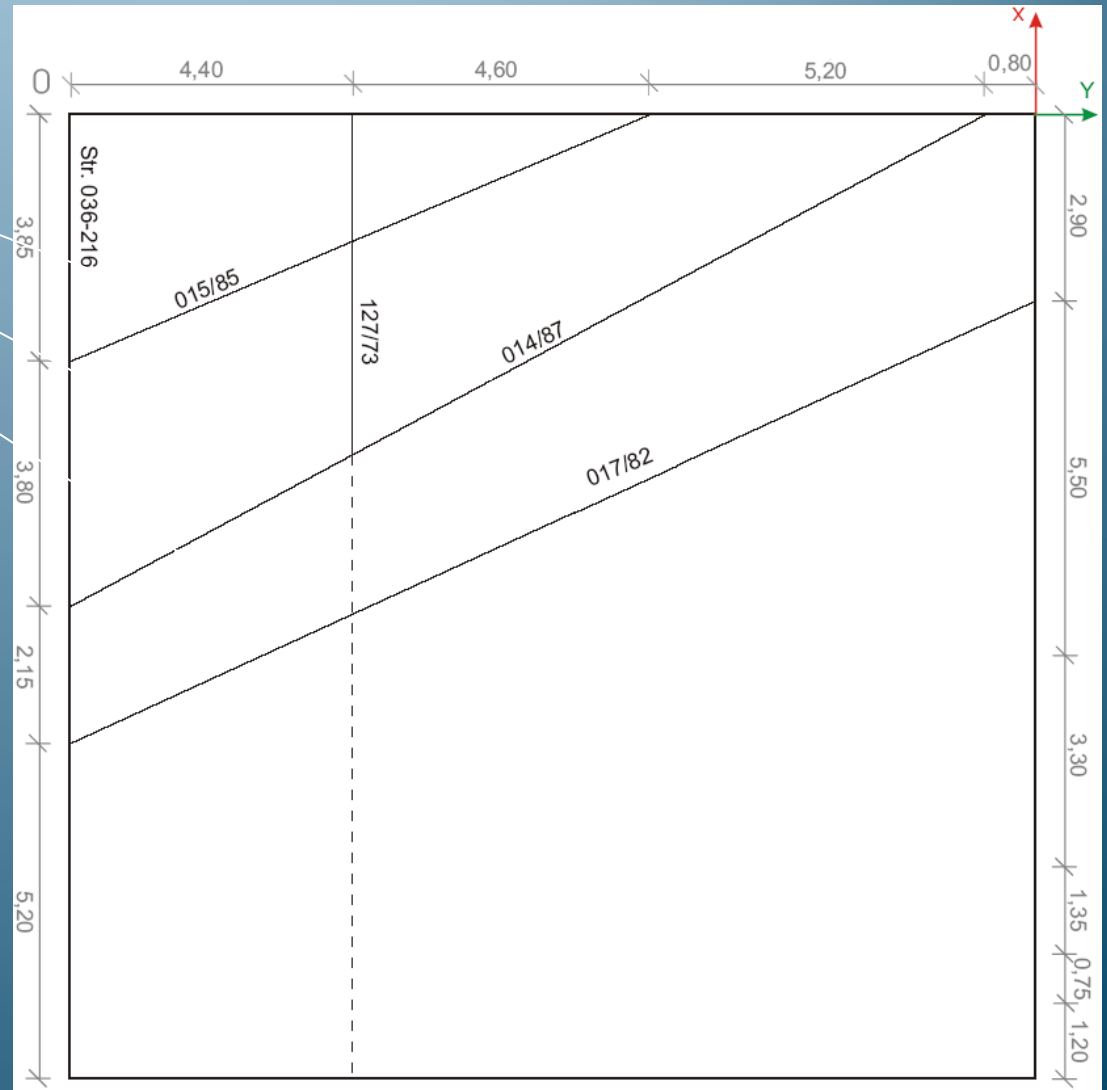
# Example: a block to be extracted

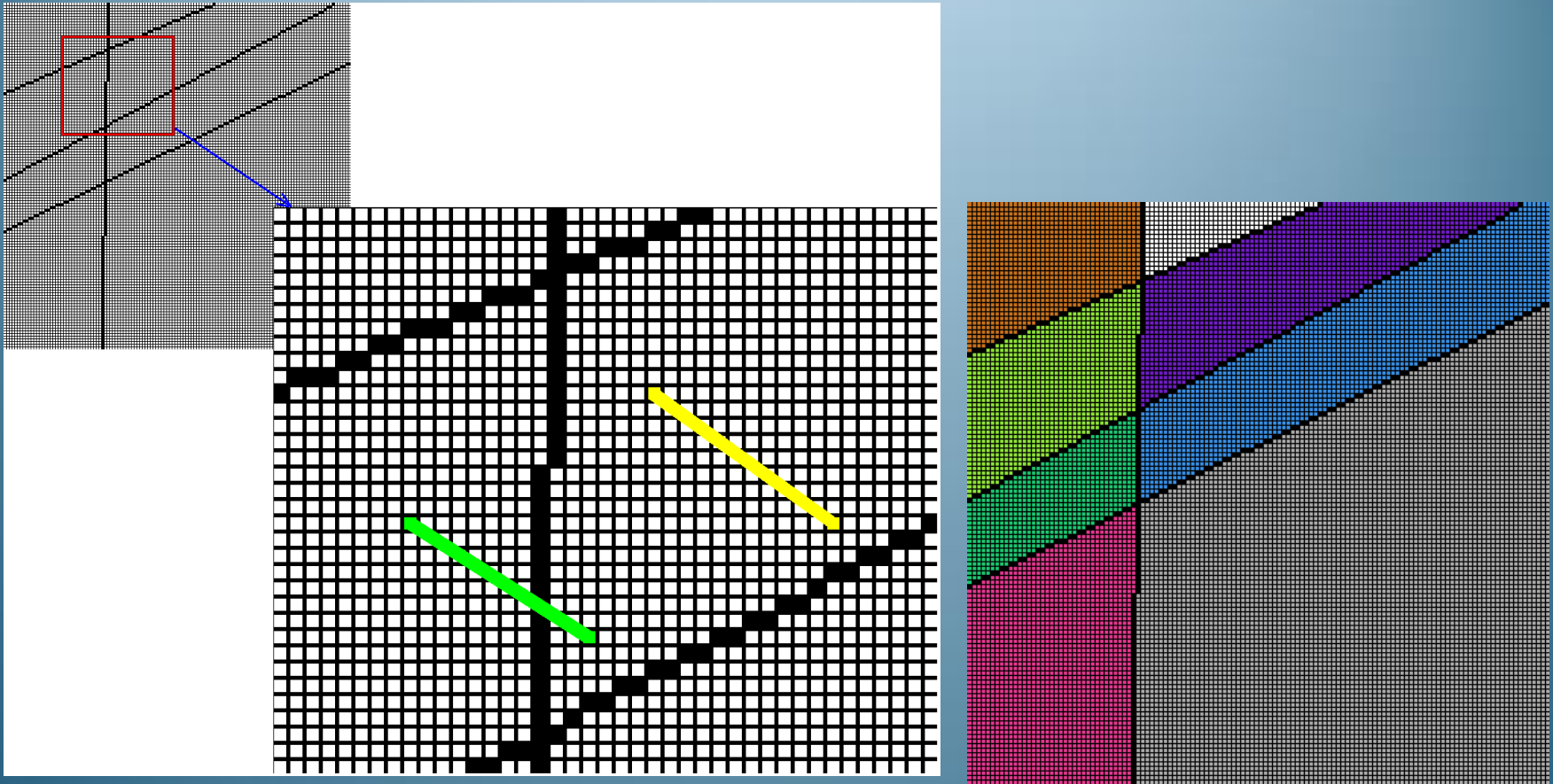




The block is intersected by fracture planes (joints).

**Problem: to optimise the set of rectangular blocks which can be obtained**

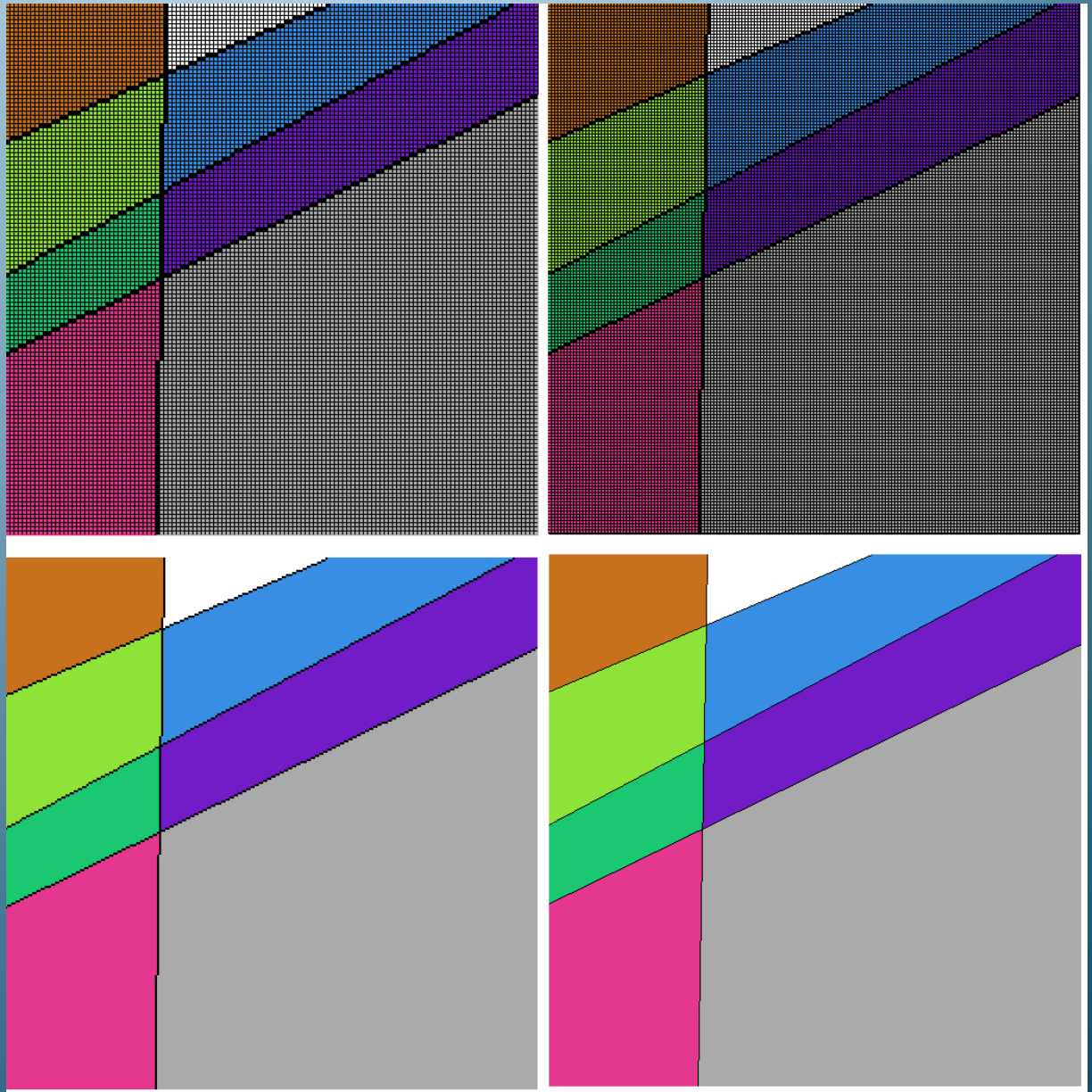




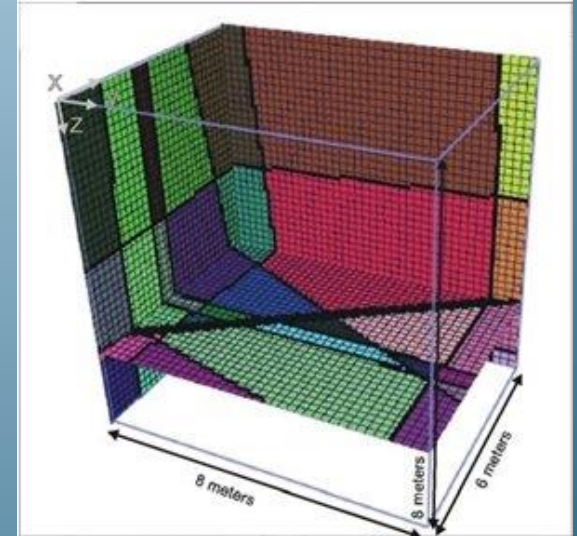
The geology can be modelled as a set of cells or voxels (3d pixels)



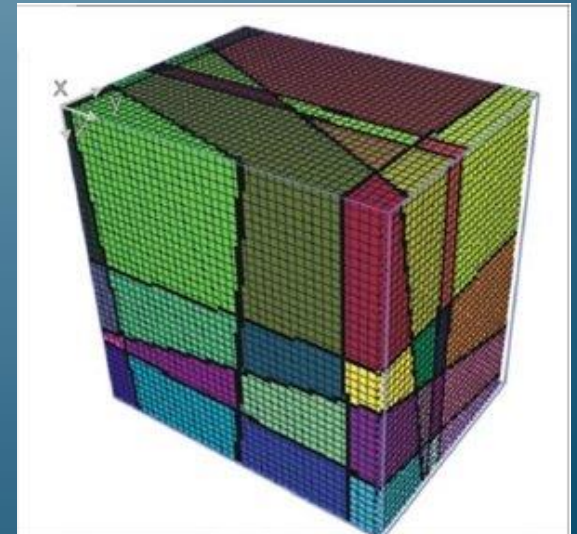
Smaller voxels =  
greater accuracy



# Modelling a real block: 3D model



Based on detailed geological measurements of fractures



# Modelling a real block: 2D slices



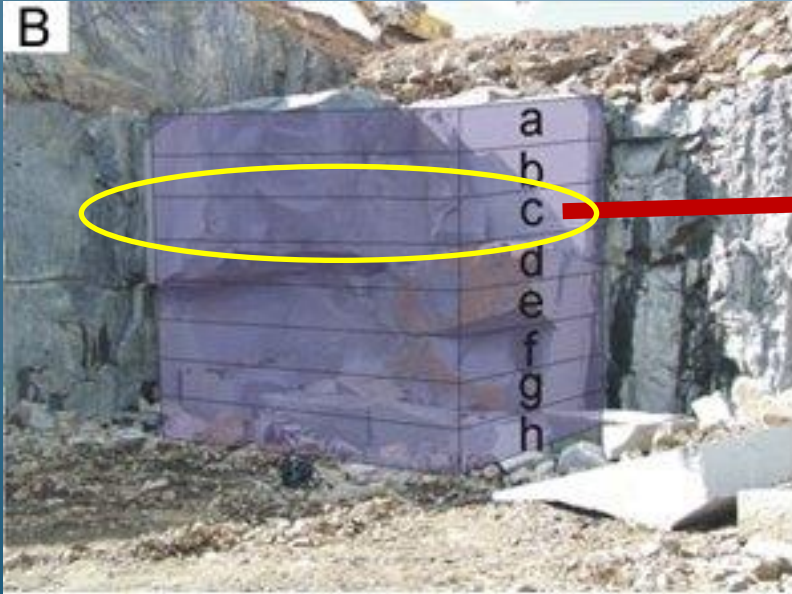
- as it is intended  
to be extracted



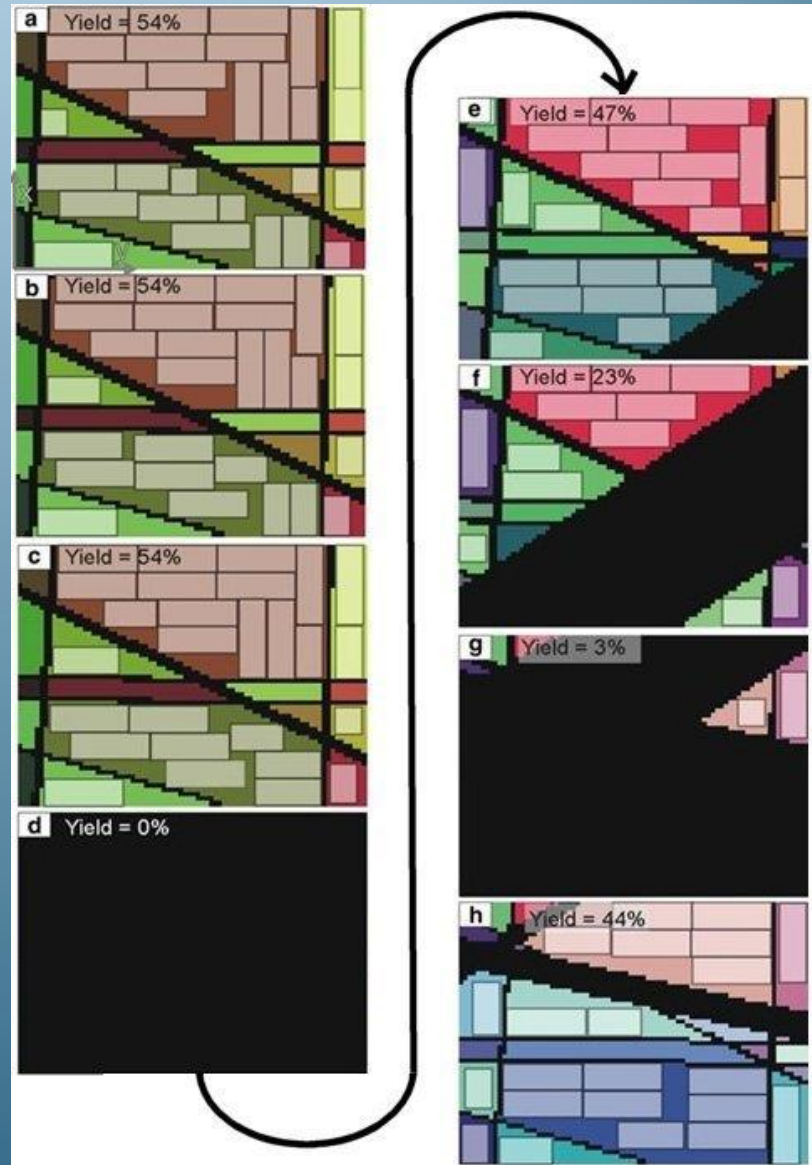
# Modelling a real block: 2D slices



# Modelling a real block: 2D slices

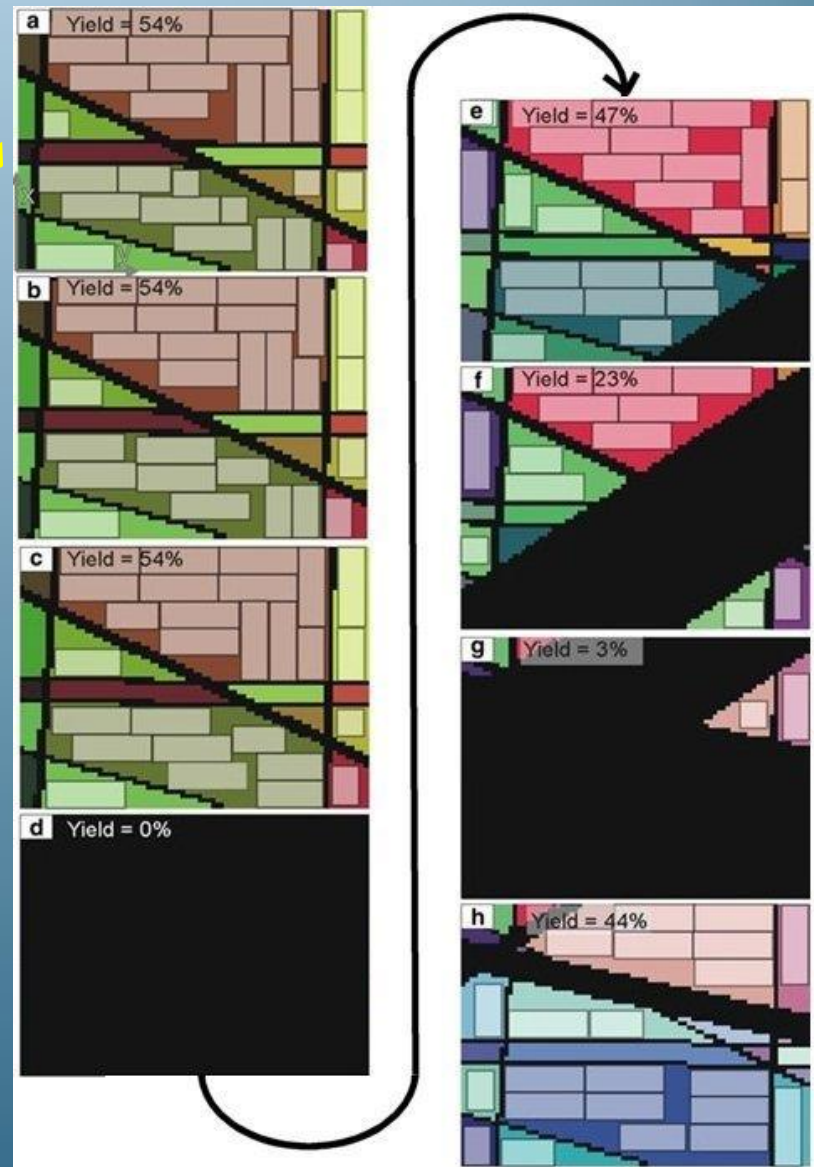


# Modelling a real block: 2D slices showing selected extraction blocks

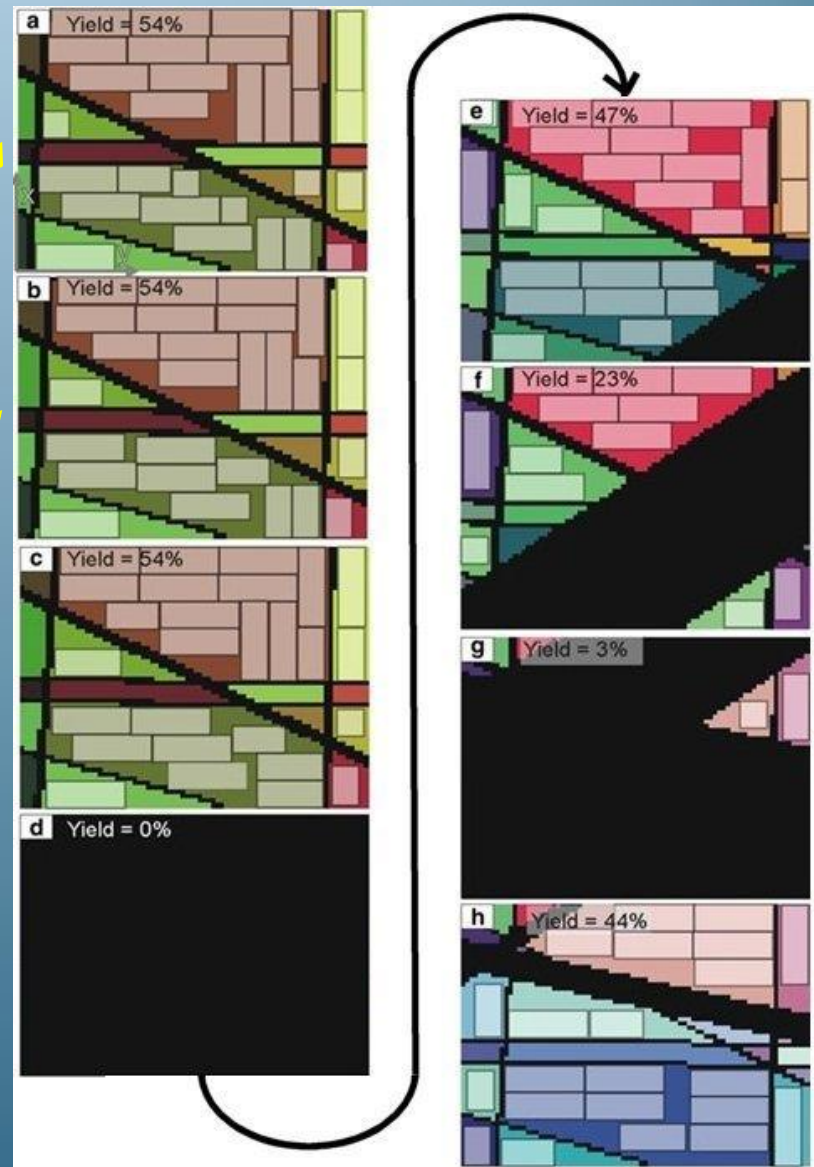




Modelling a real  
block: 2D slices  
showing selected  
extraction blocks

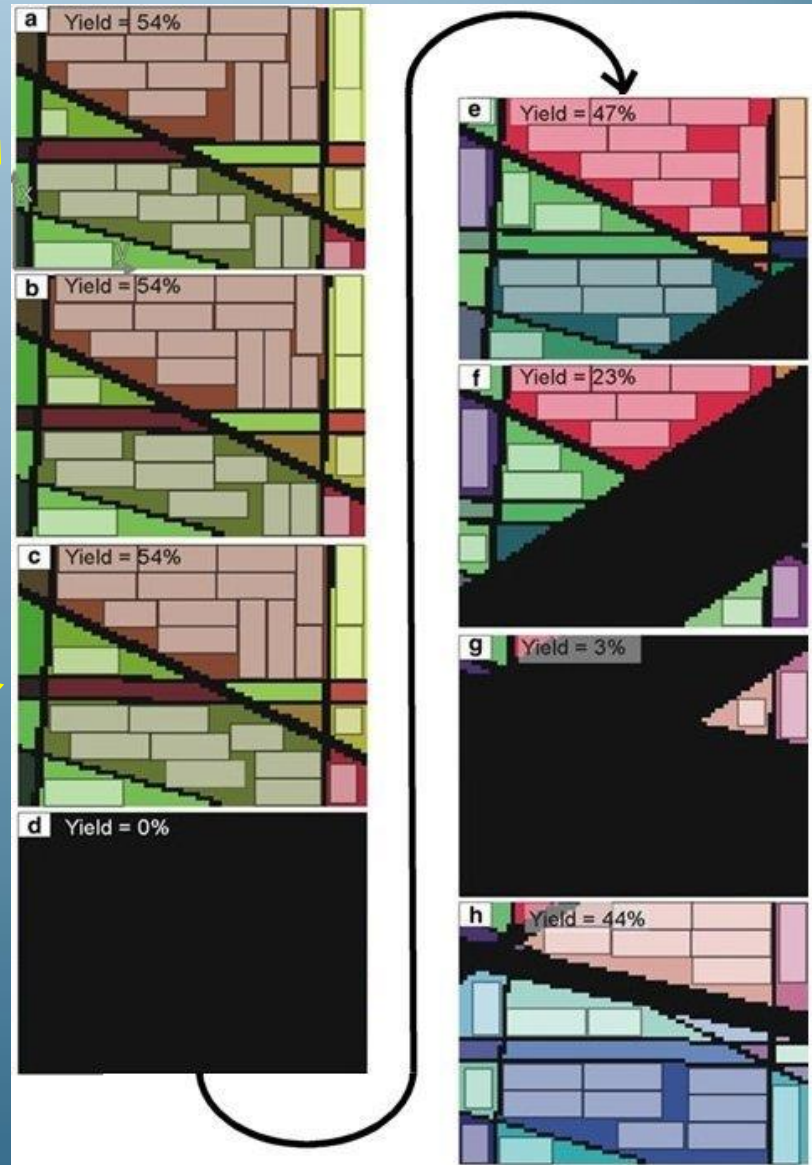


Modelling a real  
block: 2D slices  
showing selected  
extraction blocks



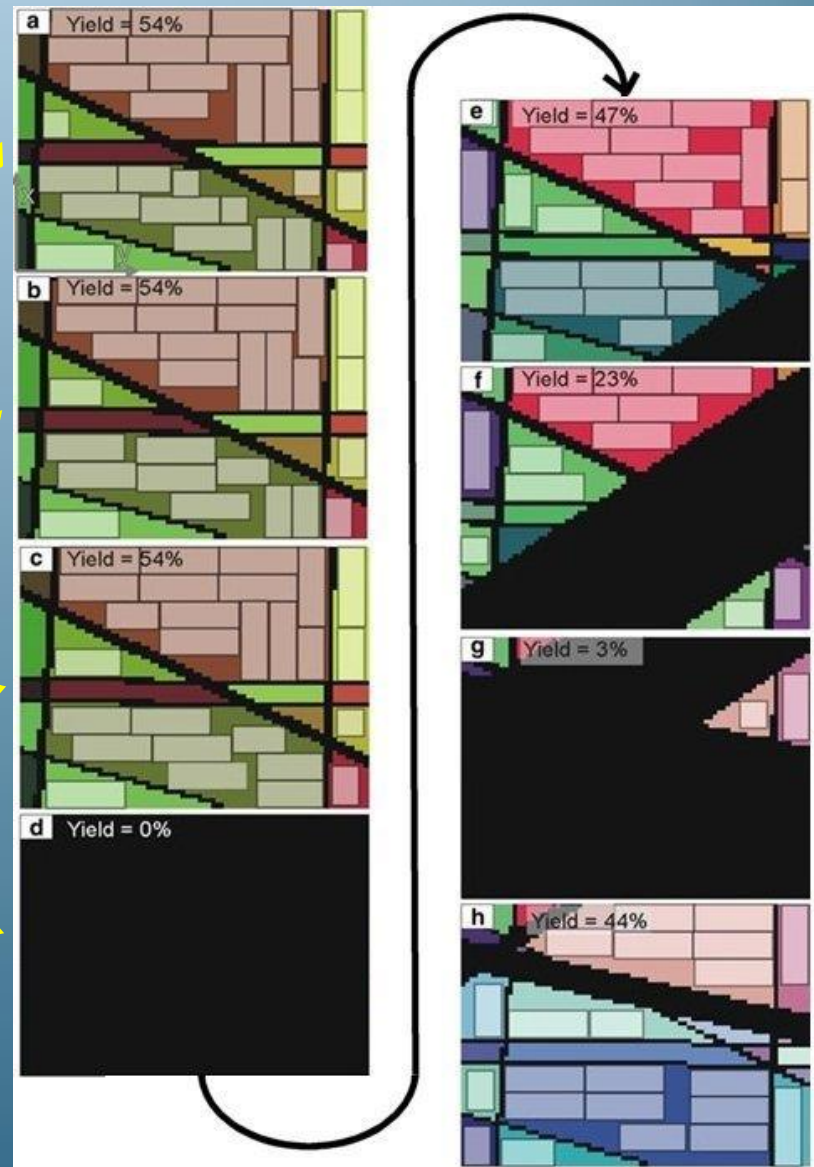


Modelling a real  
block: 2D slices  
showing selected  
extraction blocks

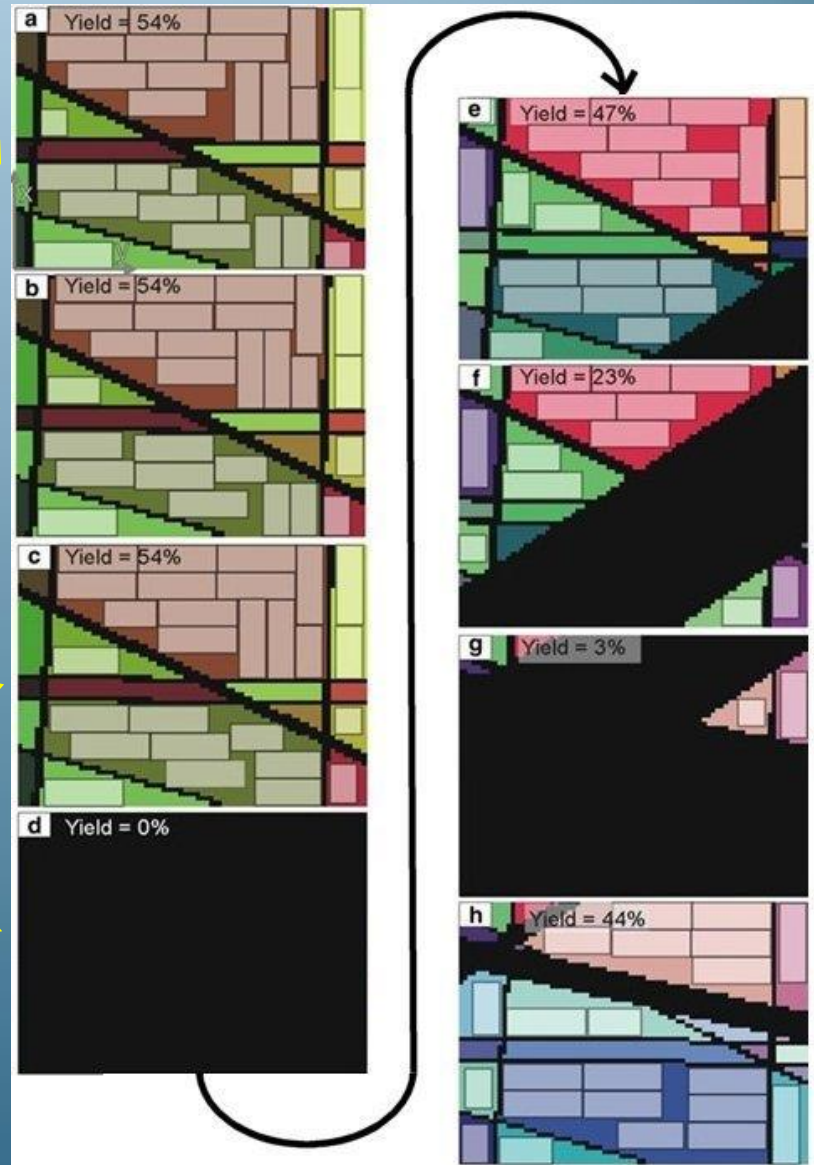




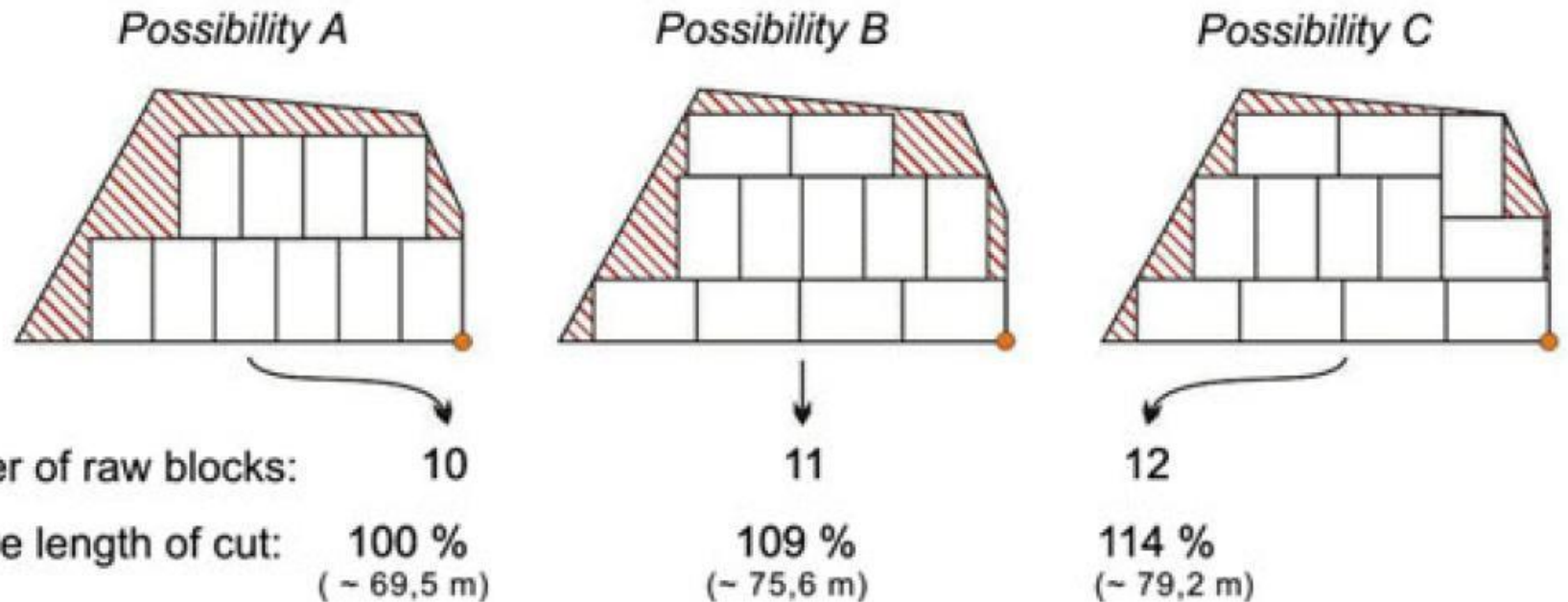
Modelling a real  
block: 2D slices  
showing selected  
extraction blocks



Modelling a real  
block: 2D slices  
showing selected  
extraction blocks



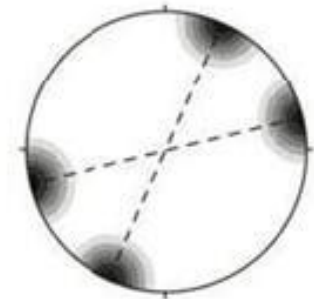
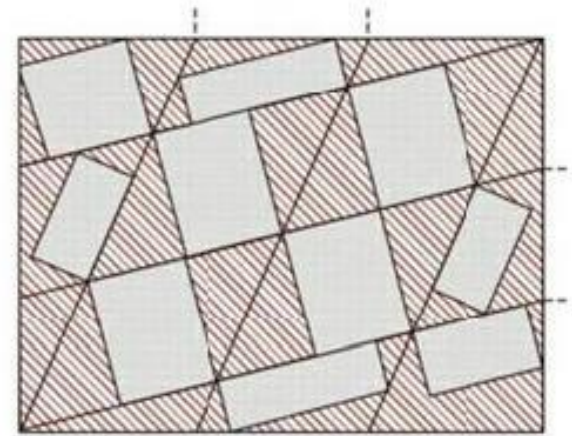
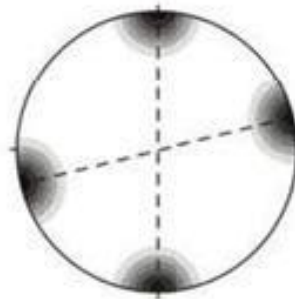
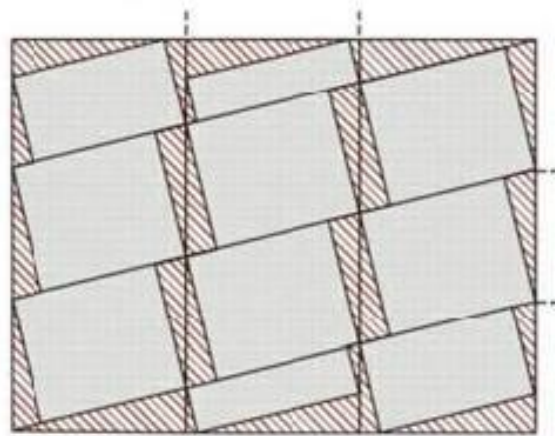
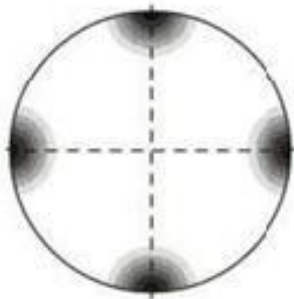
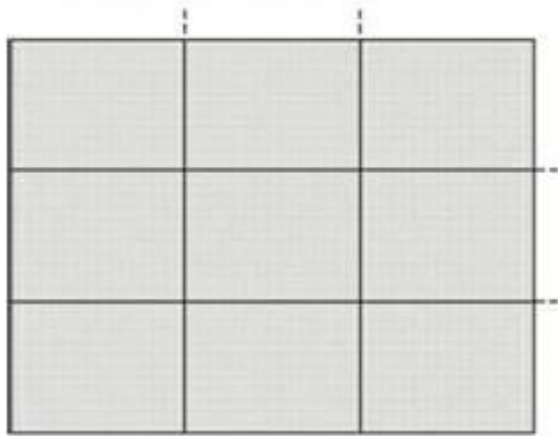
# Optimisation of block selection within one slice



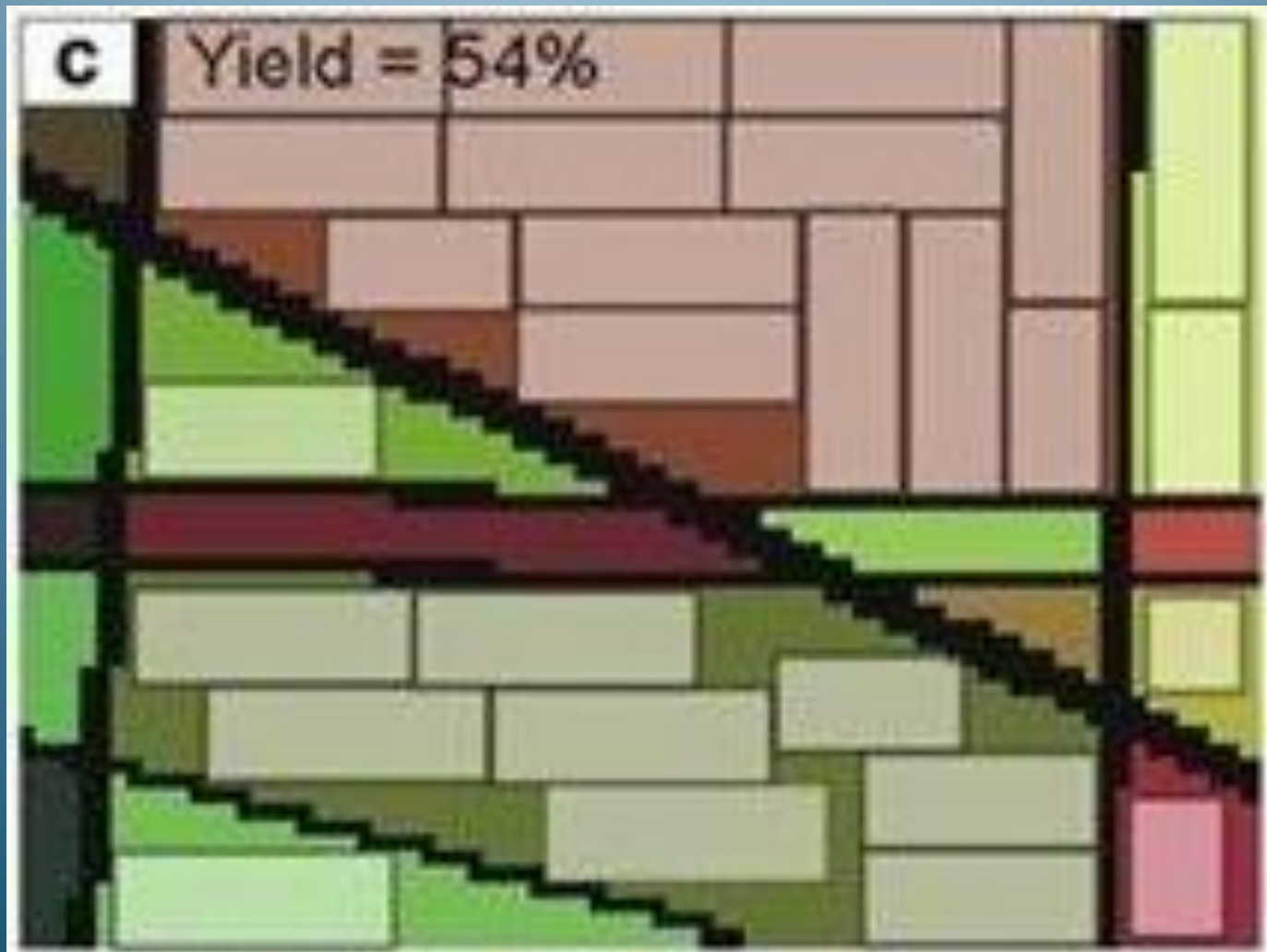
“C” appears best (minimum waste), but must balance against the cutting costs



# Effect of non-orthogonal joint sets



For each slice, an optimum set of rectangular blocks can be identified



# Current status

- The method is currently implemented as a research application (“3D-Block Expert”) developed by Dmitry Nikolayev (with colleagues at the University of Göttingen)



# Future plans

- To be adapted for routine industry use
- Integration with standard geological modelling / quarry planning systems (4dcoders: Geo-Reka + Rockmate + Vmine)
- Target completion date 31 March 2017