

IllustraVis 2009

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Applications of illustrative methods for oil&gas exploration and production

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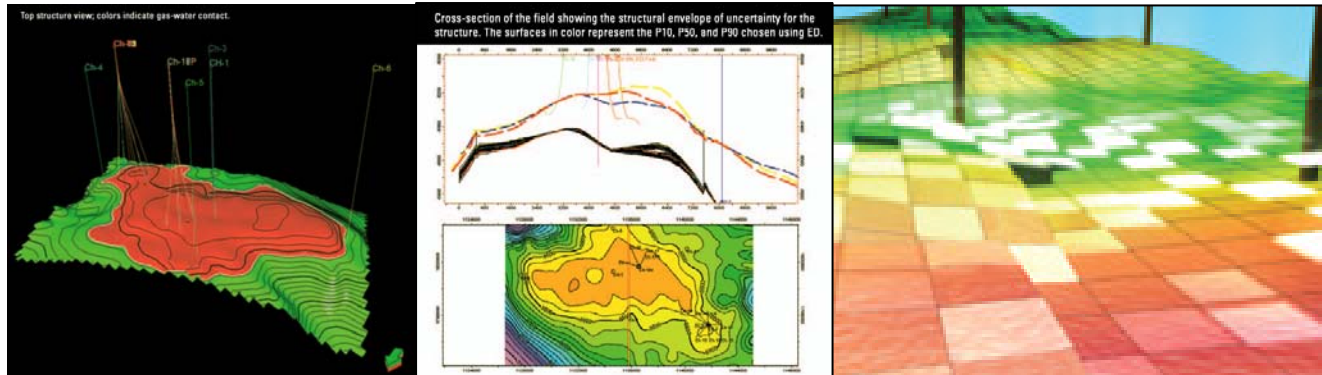
ILLUSTRAVIS09, Bergen, June, 4th



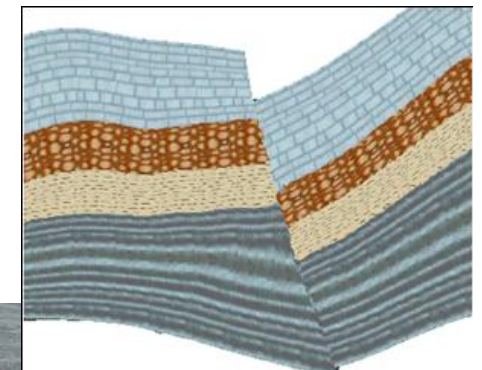
Scientific visualization dominates E&P today

	PURPOSE	MAIN PRINCIPLE
SCIENTIFIC VISUALIZATION	Provide detailed, objective information	Map data to color value
ILLUSTRATIVE VISUALIZATION	Provide aggregated or abstracted information; sometimes subjective (eg. personal ideas/theories)	Map data to colors, textures, symbols, styles, patterns, sketches ++

www.slb.com and www.halliburton.com today



Patel et. al 2007



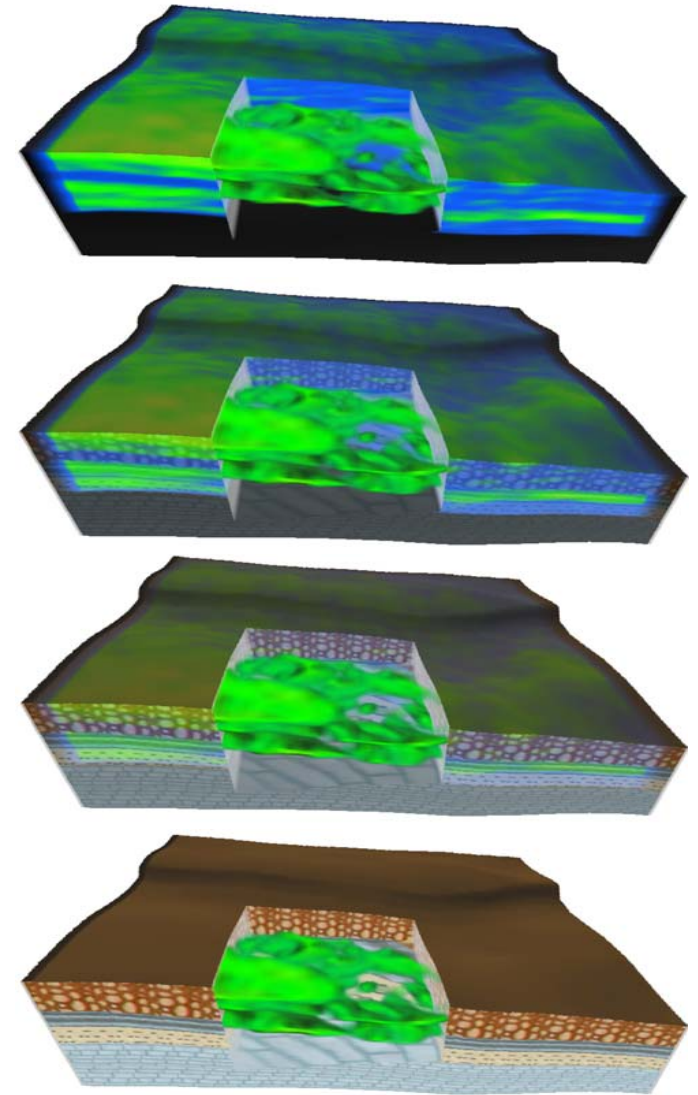
Question 1:

- Is it wise to use the same detailed visualizations in all steps of the field development cycle?
- Or do we need new types of visualizations that better reflect the state of the field development and available information?

EARLY EXPLORATION	EXPLORATION DRILLING APPRAISAL FIELD DEVELOPMENT	PRODUCTION
<ul style="list-style-type: none"> ○ Estimate resources from seismic data ○ Prepare license applications 	<ul style="list-style-type: none"> ○ Confirm resources ○ Plan facilities ○ Plan production 	<ul style="list-style-type: none"> ○ Reservoir simulation ○ Well planning & drilling (production, injection) ○ New seismic surveys ○ History matching and model updates
<p>Limited data available High uncertainty Big picture important</p>	<p>→ → → →</p>	<p>Much data available Reduced uncertainty Details make a difference</p>

Question 2:

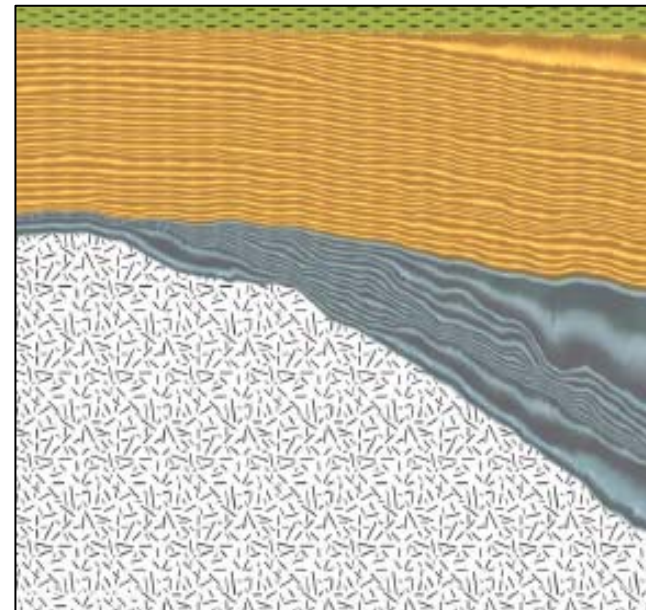
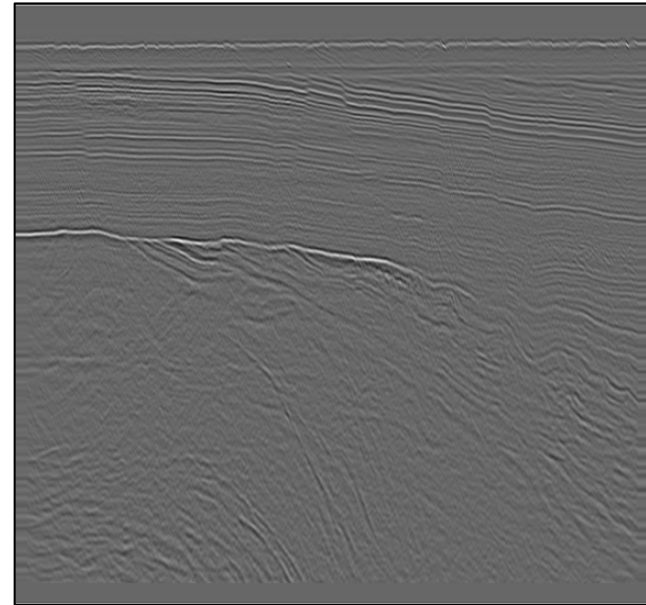
- Is it wise to show the same detailed pictures to all types of personnel involved in a field development and in the important decisions?
- Or do we need new type of visualizations that communicates better?
- Geologists, geophysicists, resevoir engineers, petrophysicists, drilling engineers, subcontractors, business developers, operations managers, executive managers, government officials, environmental activists, politicians, media, and many, many more!



Patel et. al, 2007

Question 3:

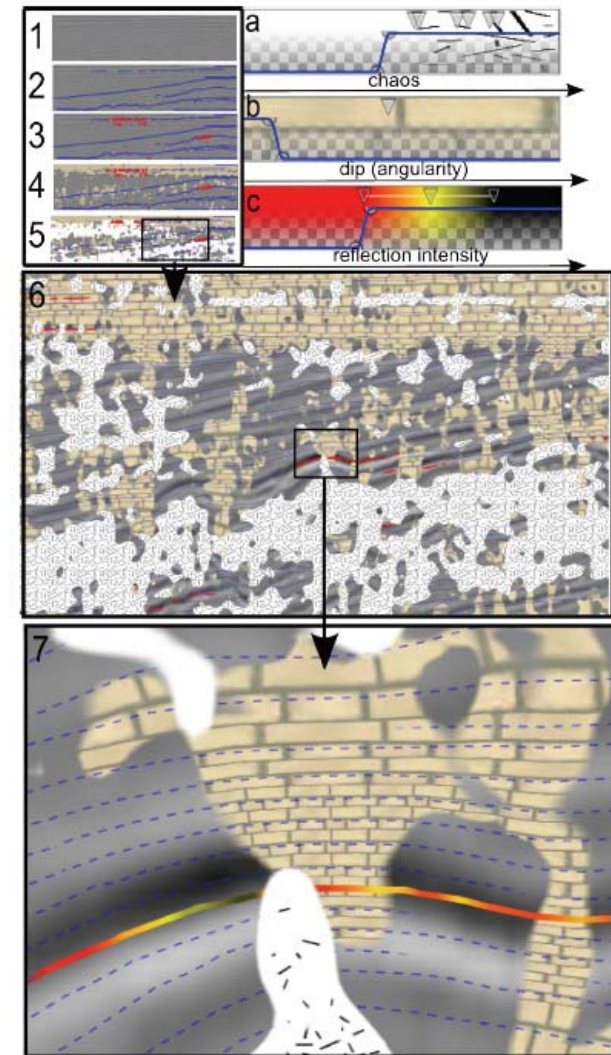
- Is it wise to show *detailed pictures* of something we are very uncertain about?
- Or do we need new types of visualizations where we can aggregate information to express the level of uncertainty?



Patel et. al, 2008

Question 4:

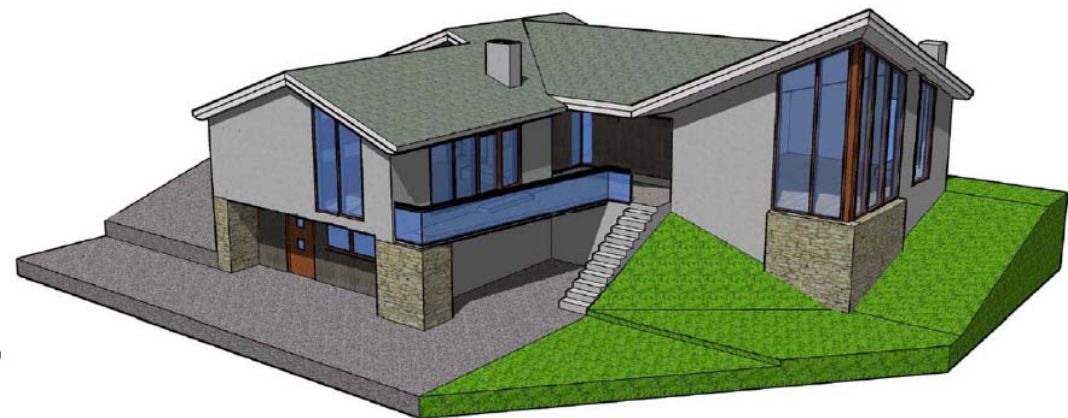
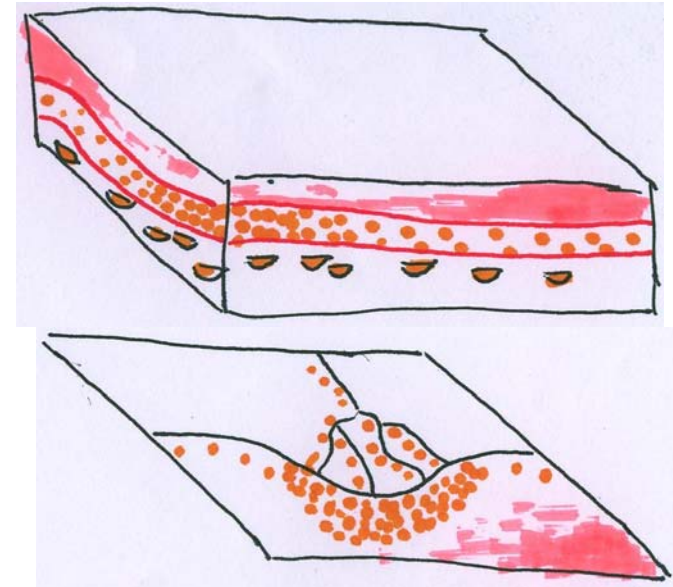
- Is it wise to perform *detailed processing and interpretation* of data with high uncertainty?
- Or can we think about new “*illustrative processing*” / “*illustrative interpretation*” methods combined with illustrative visualization that can be used to *guide subsequent work in an optimal direction*?



Patel et. al, 2008

Question 5:

- Is it wise to use hand-drawings to describe and discuss geological scenarios?
- Or can we think about new “*illustrative modelling*” methods combined with illustrative visualization to *guide subsequent work in an optimal direction*?



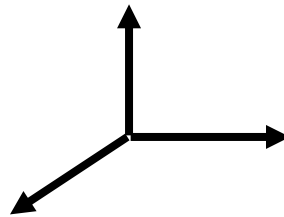
Even architects use
Google Sketchup:
"Is this how you want it?"

Some conclusions

- It is unwise to continue by only using scientific visualizations in the future; such visualizations only covers some needs, even for the domain specialists
- The "illustrative application space" (maybe more than 3D) has the potential to cover many important needs:

Express uncertainty (need quantification too)

- Data resolution/process maturity
- Acquisition and processing errors



Improve communication

- Across domain disciplines
- Towards the laymen

Guidance of complex work processes

- Visual anomalies -> detailed interpretations
- Digital sketches -> common 3D/4D understanding -> detailed modelling

- Hard to know in which areas illustrative methods will get biggest impact
- My personal favourites: guidance and uncertainty, but new methods/intermediate steps must then be possible to integrate into existing work processes