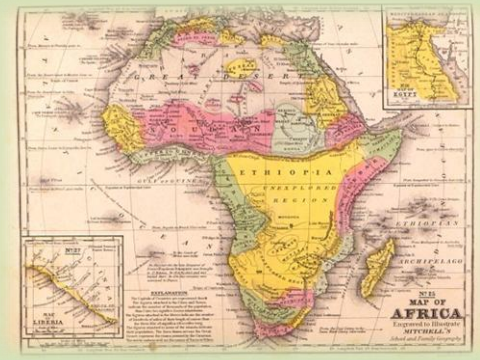
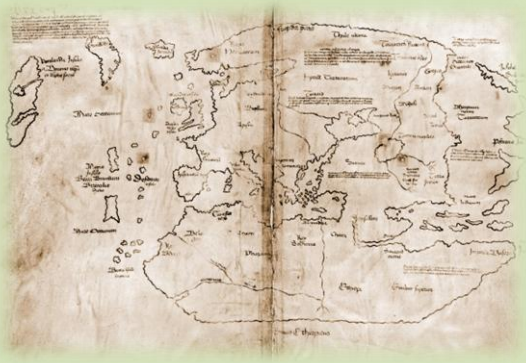
Uncertainty

e-Bulletin #7

In this issue we explore the topic of uncertainty, and what it means for those hoping to better understand natural systems through modelling.





Left: A **known unknown**, the 'unexplored region' of Africa depicted on a map from Victorian times
Right: An **unknown unknown**, the Vinland (late Viking) map, before discovery of the New World

In this bulletin:

- *Uncertainty:* what is it and why we should be talking about it?
- *Second modelling workshop:* Tuesday 23rd July

Second modelling workshop

The second modelling workshop in Hebden Bridge will take place next Tuesday 23 July at Hebden Bridge Town Hall. In this workshop we will:

- **Organise the variables into a network:**
  Using the variables from the first workshop, we'll arrange these into a cause and effect structure, which will later form the basis of our model.

- **Check if the network makes logical sense:**
  Conducting logic tests on the network will make sure we have identified the variables that are of interest to us, and that they are arranged in a way that makes sense.

I look forward to seeing many of you there. Please RSVP if you have not yet done so.

Uncertainty

What is it?

We talk about uncertainty to show how confident we are in something, to indicate what we don't yet know, and to show that some things are simply not black and white. There is rarely anything that is known with 100% certainty, as science cannot make 'perfect' observations. New science, because it works on the edge of what is generally understood, is naturally riddled with uncertainties.

Rumsfeld's 'unknown unknowns'

In a now famous speech, US politician Donald Rumsfeld talked about uncertainty in terms of known and unknown unknowns. A known unknown is like a Victorian map of Africa, in which in the interior of the continent is uncharted. They knew it was there, it was just unknown. An unknown unknown is like the mediaeval maps of the world before the discovery of the Americas, which show sea where land ought to be.

Talking about uncertainty

When we are open about the uncertainty that exists, we show that we understand a problem better in terms of its strengths and weaknesses. Reducing uncertainty is sometimes possible and sometimes not, the questions is not 'do we know everything?' but rather 'do we know enough?' and 'how can we make the best decision using what we do know?' Sometimes it is better to talk about 'risk', which is a combination of the chance of something happening and the consequences of it doing so.

Uncertainty in modelling

Models are a simplification of the real world. They can be used to understand how complex systems work, and to make predictions. They can support decision making by generating a list of things that we would like to know more about. The model we are building is about improving our understanding of the system, and collectively summarising what we already know (along with what we might like to know). It is not being used to make predictions.

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Elements of this bulletin are from: Sense about Science (2013), *Making Sense of Uncertainty*