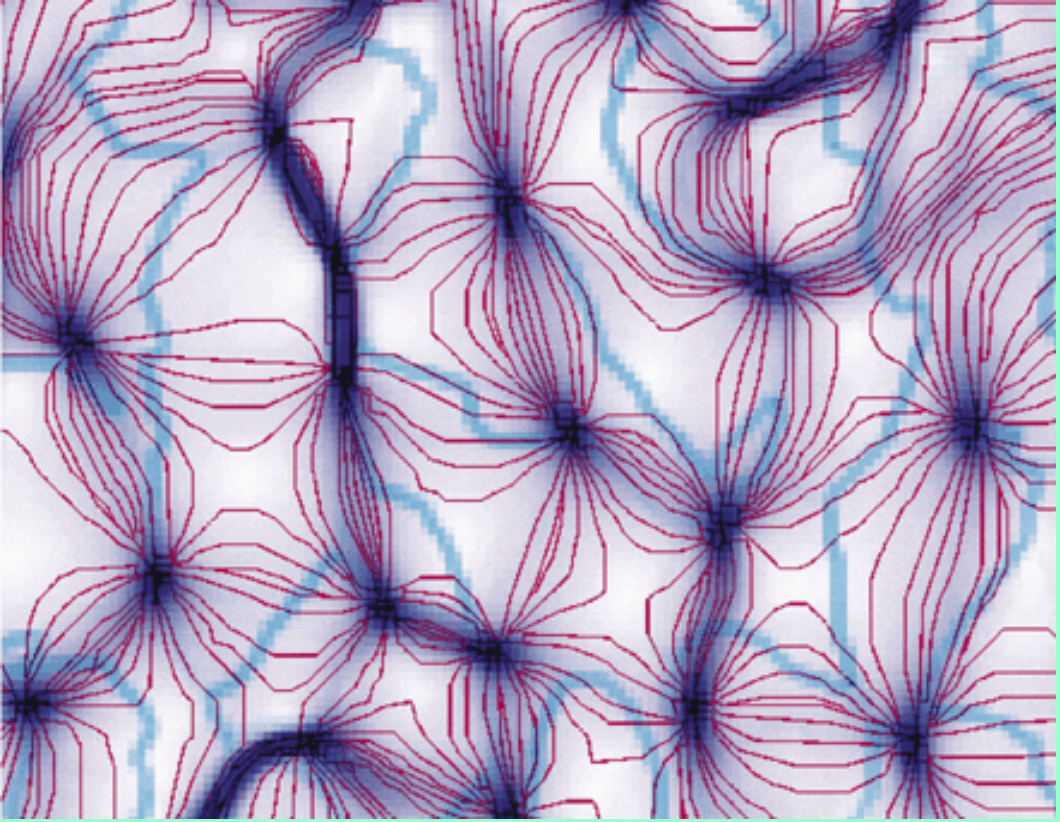
THE LANGUAGE AND GRAMMAR OF MAPS

地图的语言和语法

Brian G Lees
with help from Huang Zhi
UNSW@ADFA, Canberra, Australia.
E-mail Brian.Lees@adfa.edu.au



We think spatially.
（我们具有空间思维）

Spatial concepts map directly on to the cortex as topologically correct mappings.
空间概念直接映射到脑皮层上形成拓扑结构正确的地图。

Relationship between the rate of change of orientation and direction preferences in the primary visual cortex of the cat. Red lines indicate iso-orientation lines along which orientation preference does not change. Dark blue marks regions where orientation preference changes rapidly. Image size: 2.7 × 2.1 mm^2 of cortex. See Kisvrday *et al.*, Visual Cortex 636-647.

Rosie Fleming - *Ngapa Jukurrpa*

Hunter-gatherer societies use topologically correct mappings to communicate spatial information.
在捕猎-采集的原始社会，人类使用拓扑结构正确的地图来传达空间信息。

- This painting depicts a water Dreaming. The straight lines represents the flood waters running through the landscape. The small bar shapes signify clouds. The small circles are water soakages.


.....AND SO DO WE SOMETIMES.（我们现在有时还这么做）
TOPOLOGICALLY CORRECT DIAGRAMS ARE EASILY UNDERSTOOD BY HUMANS
拓扑结构正确的图表容易被人理解
Key to Lines
Key to symbols
UNDERGROUND
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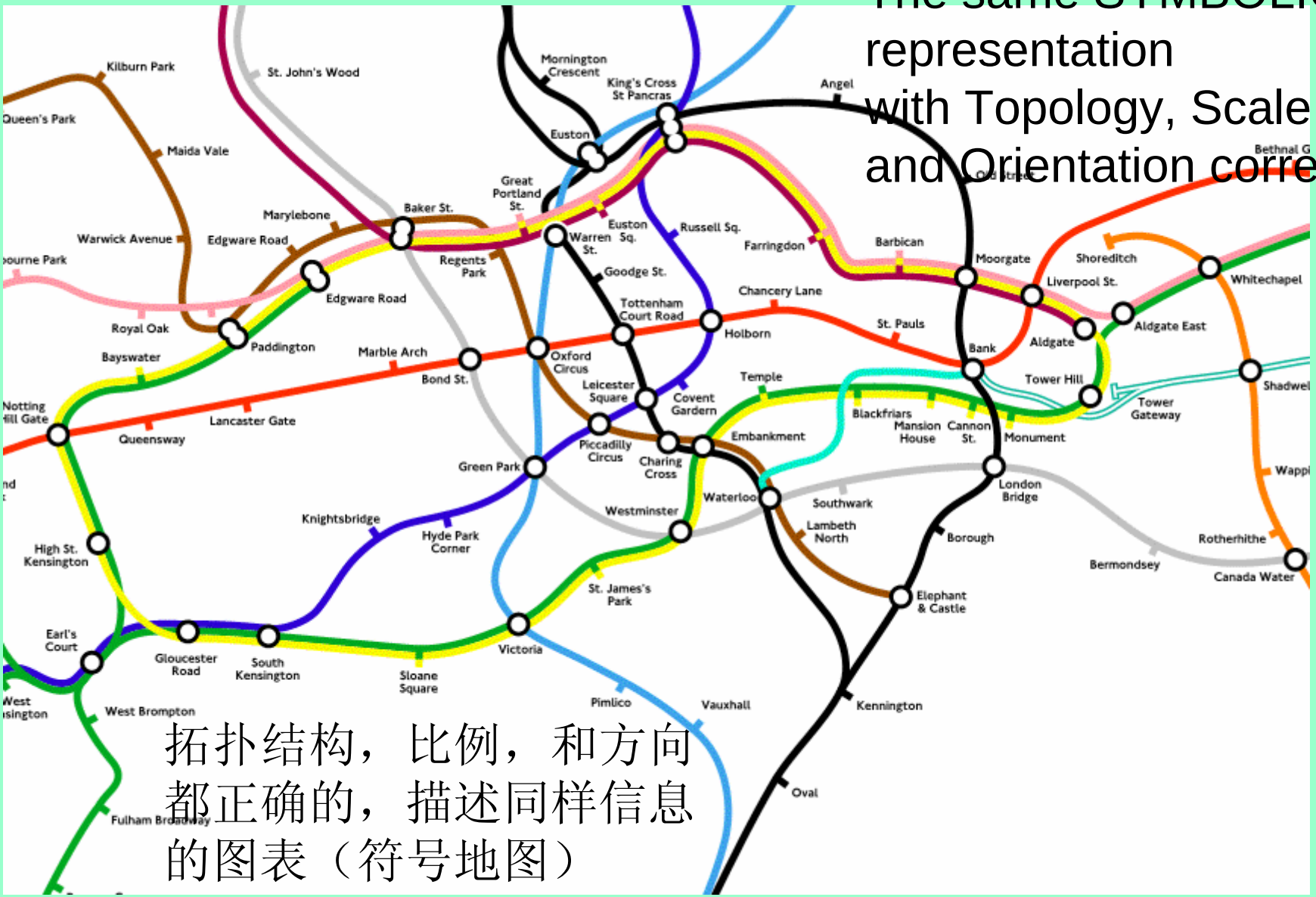
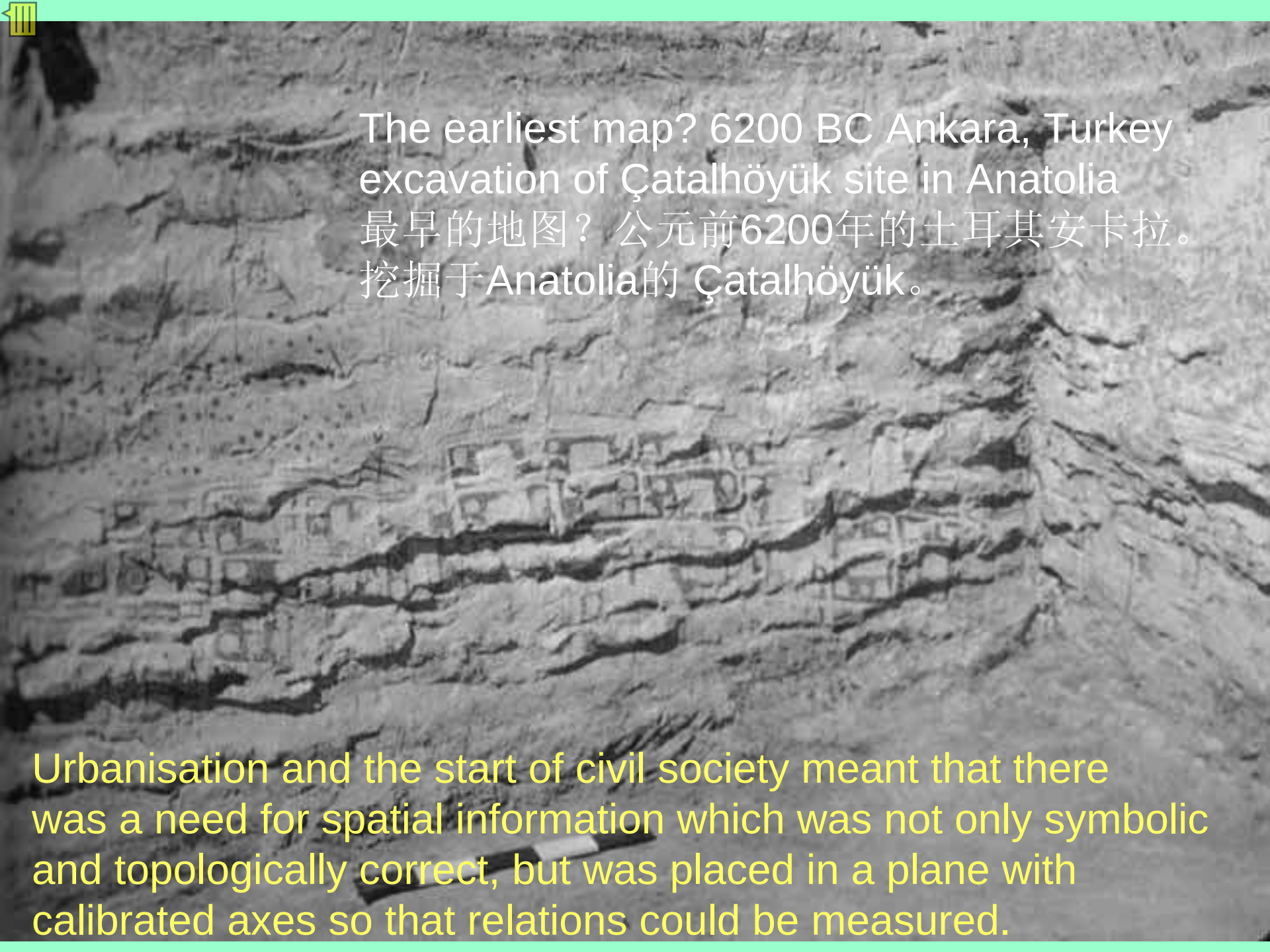
The same SYMBOLIC representation with Topology, Scale and Orientation correct



拓扑结构，比例，和方向都正确的，描述同样信息的图表（符号地图）

A REALISTIC image of London has so much information that the railway network is hard to see so a SYMBOLIC map is useful.

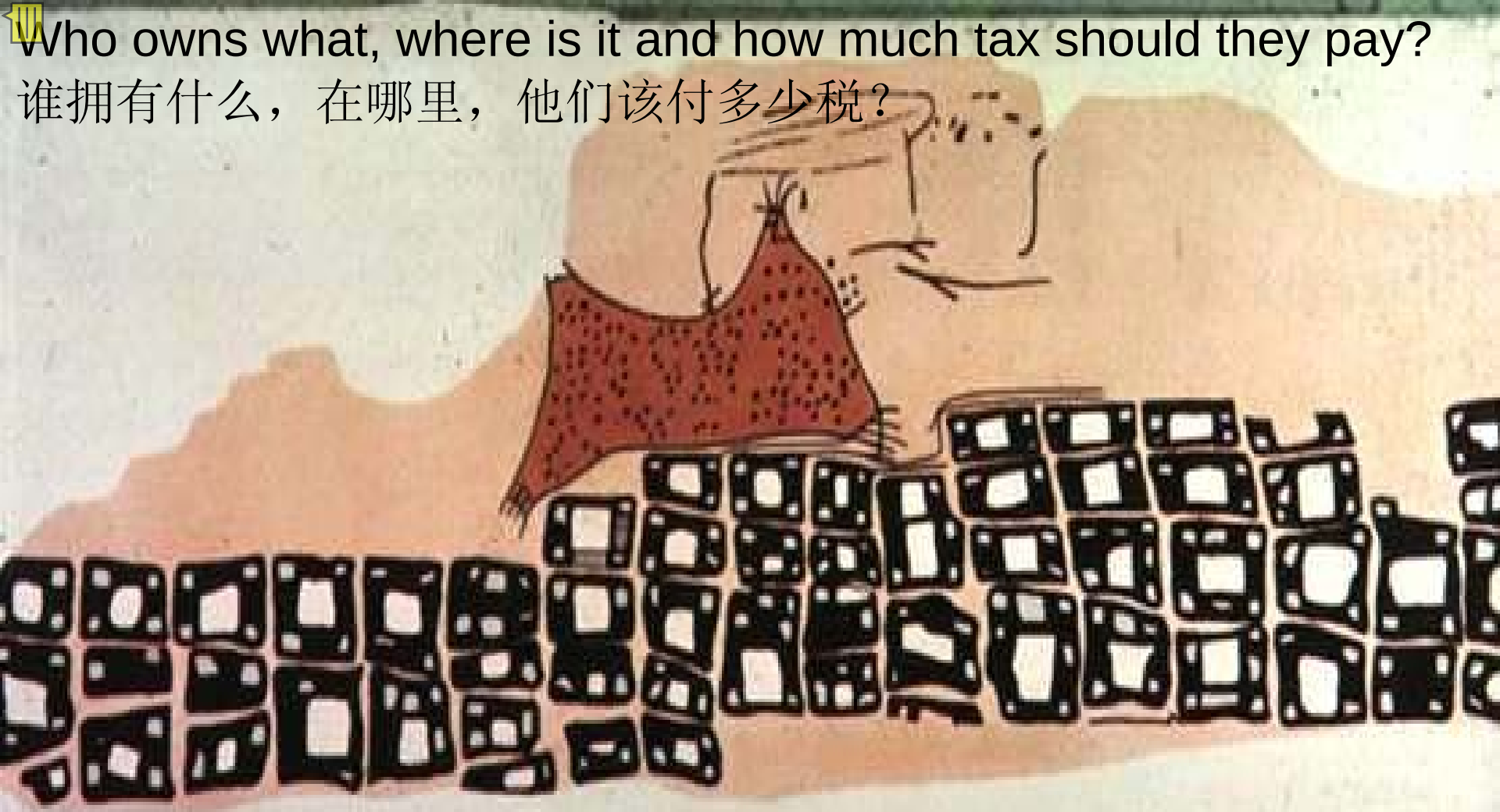
真实的伦敦图象包含太多信息，以致于难以看清铁路网络。所以符号地图是有用的。



The earliest map? 6200 BC Ankara, Turkey excavation of Çatalhöyük site in Anatolia
最早的地图？公元前6200年的土耳其安卡拉。挖掘于Anatolia的 Çatalhöyük。

Urbanisation and the start of civil society meant that there was a need for spatial information which was not only symbolic and topologically correct, but was placed in a plane with calibrated axes so that relations could be measured.

Who owns what, where is it and how much tax should they pay?
谁拥有什么，在哪里，他们该付多少税？



Topologically correct depictions were inadequate for the purposes of government. Consistent scale and consistent orientation appear by 8,500 years ago to meet the needs of government .对政府来说，拓扑结构正确的描绘是不够地，统一的比例和方向在8500年前就已出现来满足政府的需要。

- We appear to think spatially in topologically correct mappings, but we have disciplined ourselves to map geographically, as far as we are able, so that we can measure and calculate spatial qualities.
- 我们虽然具有拓扑结构正确的空间思维，我们还是训练自己尽可能地制做地理地图以便我们能计量空间属性。

- Maps and Space Images are part of a family of diagrams. There are rules which they need to conform to.
- 地图和空间图象都属于图表，它们需要遵从一定的规则。

TYPE OF DIAGRAM （图表类型）	CHARACTERISTICS	（特征）
Picture （图象） (Air Photo – space image) （航空照片，空间图象）	**Realistic; Planar metric combined with planar topology**	（真实感；平面计量结合平面拓扑）
Map （地图）	**Symbolic; Planar metric combined with planar topology**	（符号形式；平面计量结合平面拓扑）
Network Diagram （网络图表）	**Planar topology**	（平面拓扑）
3D/CAD Graphics （三维图形）	**Metric and topology in Cartesian 3-space**	（在笛卡尔三维空间上的计量和拓扑）

(Modified after Lemon and Engelhardt in TwD, 1997)

How do we (& others) think about data?
我们和他人是如何看和思考数据的？

- Descriptions, depictions, and diagrams. appear to form three distinct groupings which are processed by our brains in different ways.
- 描写，描绘，和图表形成三个不同的组， 我们的大脑用不同的方式来处理它们。

- The issue has been presented as a choice between reasoning being semantic or syntactic respectively. In terms of syntax, text and equations are essentially linear and diagrams and depictions need not be.
- 这个问题被认为是在语义推理和句法推理间的选择。就句法而言，文字和等式是线性的，图表和描绘可以不是。

- Most representations are Fregean -the symbol bears no resemblance to the thing it represents in terms of its behaviour or properties.
- But with analogical representations there is such a resemblance. This is a key difference between text and equations (Fregean) and diagrams (analogical).

- 大多数的Fregean表象，符号和它们所代表的事物在行为和属性上没有类同之处。
- 但是类似表象，符号和它们所代表的事物却有类同之处。这就是文字，等式（Fregean表象）和图表（类似表象）关键得区别。

Diagrams with text

- Diagrams are visual representations that appear to operate best when cognitive reasoning, which must extract the structural information from sentential, Fregean, data by laborious comparisons and computations, is assisted by a visual representation from which the perceptual system can infer the structure of the data.

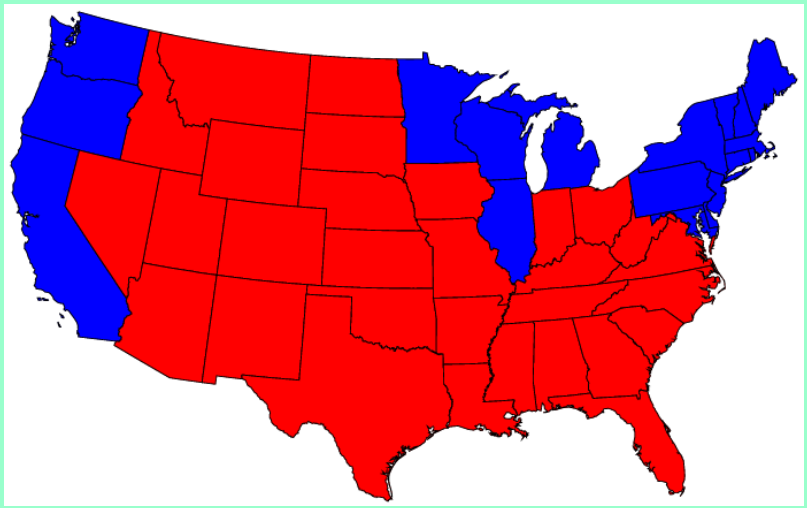
- 图表作为视觉表象最适用于认知推理。（它必须从感知， Fregean表象，和数据中通过艰辛地比较和计算来提取结构信息）。因为通过视觉表象，感官系统能够推出数据的结构。

- Most Spatial Data is model-based rather than Fregean. Much of the content is understood semantically, rather than sententially.
- 大多数空间数据是基于模型而不是Fregean表象。它的大部分内容是通过语义而不是感性来理解得。

- The geographic tradition is model-based and geographers explore data both semantically *and* sententially, rather than predominantly sententially.
- 地理学传统是基于模型的，地理学家是同时用语义和感性来探索数据的，而不是主要用感性。

Lets look at a US election….

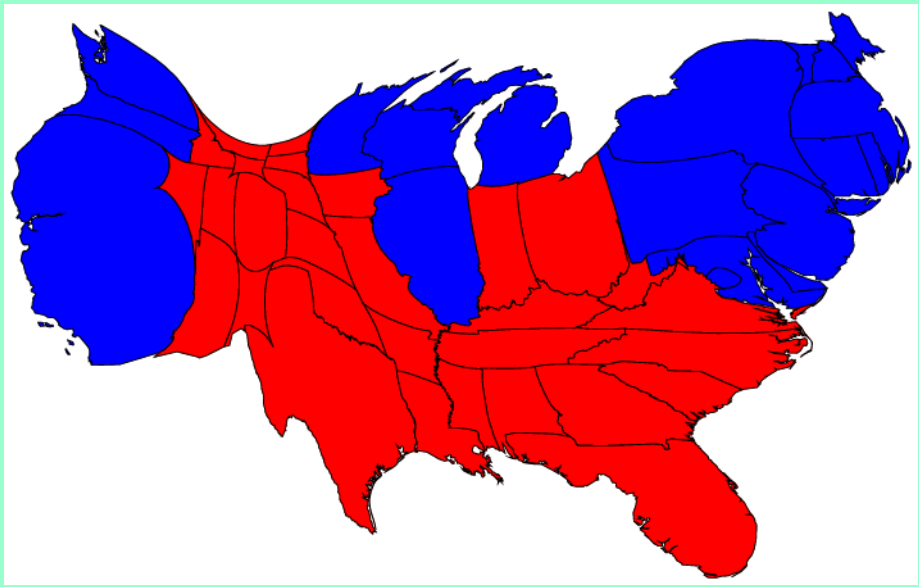
让我们来看美国选举



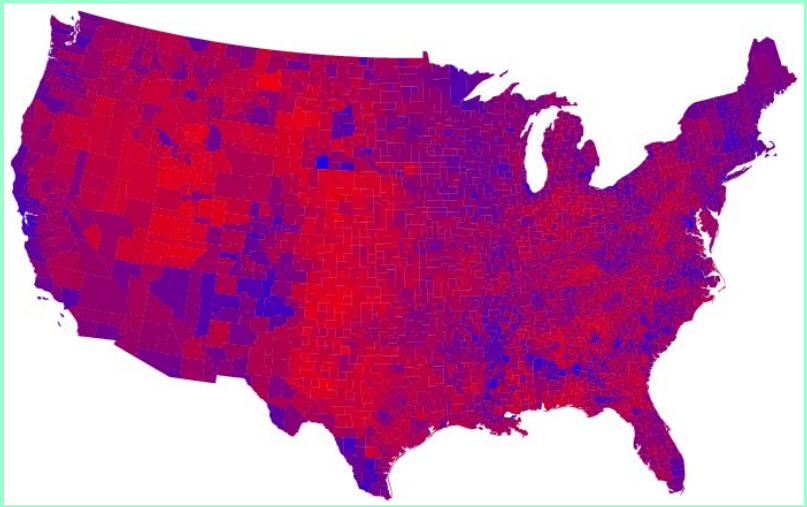
- A graphical structure created by the use of different colour hues is generally perceived as a relational structure of the categorical type.
- 利用不同颜色来建立的图形通常会被看作是代表分类型数据间的关系。

These are from http://www-personal.umich.edu/~mejn/cartograms/

- A graphical structure created by the use of different sizes suggests quantitative proportionalities between the represented elements.
- 利用不同尺寸来建立的图形通常暗示不同要素间的定量比例。



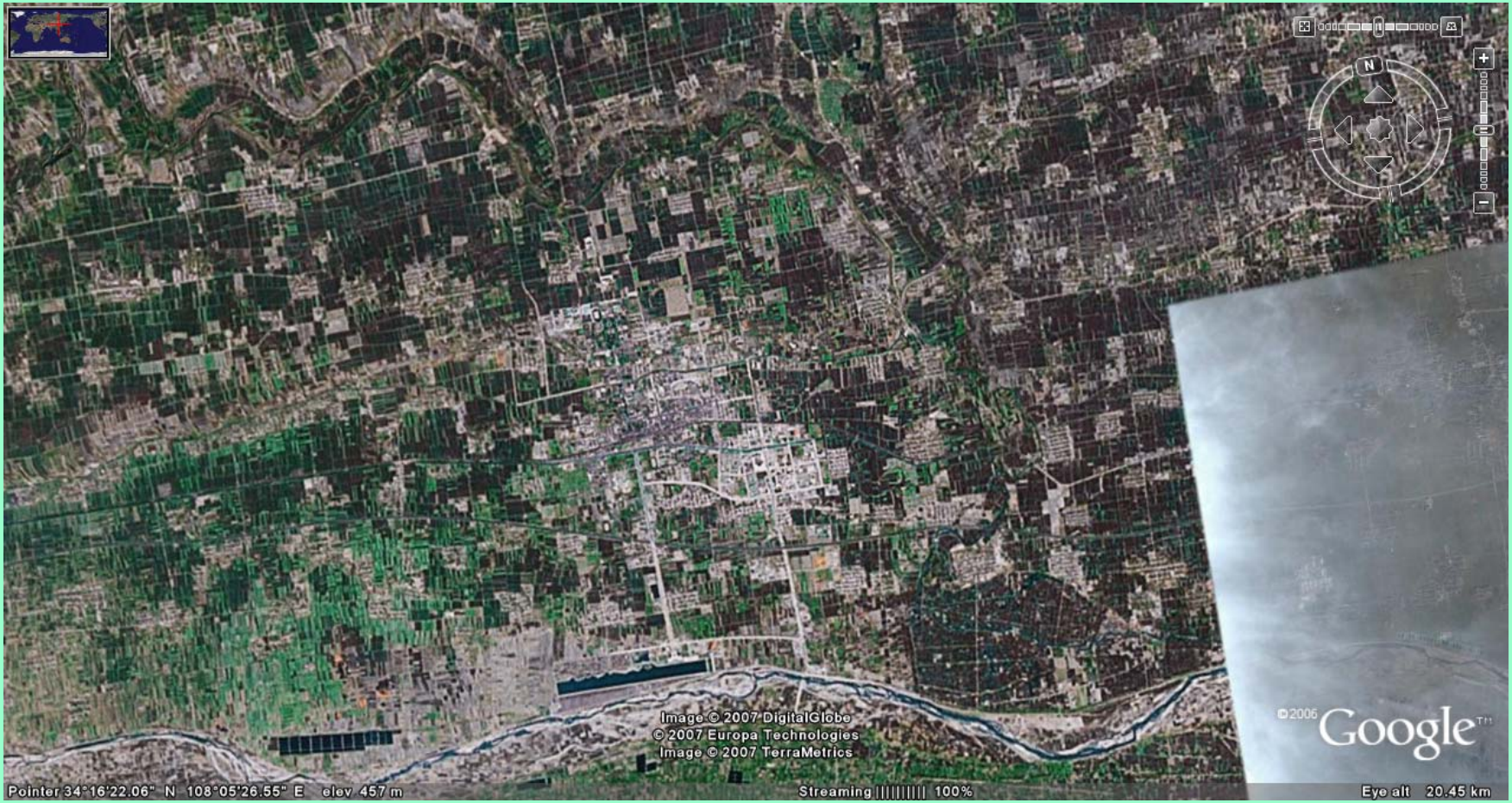
- A graphical structure created by the use of different colour saturations is perceived as the relational structure of the ordinal type.
- 利用不同颜色饱和度来建立的图形通常会被看作是代表顺序型数据间的关系。



Maps lie to tell the truth
地图通过欺骗来告知事实

- In this map the road symbol width does NOT represent the width of the road.
- 在这幅地图中，道路符号的宽度并不代表真实道路的宽度。

In this REALISTIC image which is the major road? 在这个真实的图象中，哪个是主要道路？



Combining

- In our Plank Road Project we wish to combine elements of both the map and imagery.
- 在我们的Plank Road 项目中，我们希望把地图和图象这两个要素结合起来。

BUT, In Conclusion （结论）

- To combine the two types of diagram (maps and space images) we must take care as their language and grammar are different.
- 在把这两种图表（地图和空间图象）结合起来的过程中，我们必须小心。因为它们的语言和语法是不同的。