

Science in Classics

经典中的科学

Tutorial 07: Needham



Today

- Discussion I (Text)
- Discussion II ('Associative thinking')



Discussion I (Text)

Group 1 (The five-element theory):

1. (Para. 13-16, 19) Explain the origin/significance/meaning (if any) of the four enumeration orders. Explain the Principle of Masking with an example from the star-pentagon (to be shown).

Groups 2 and 3 (Application of the five-element theory):

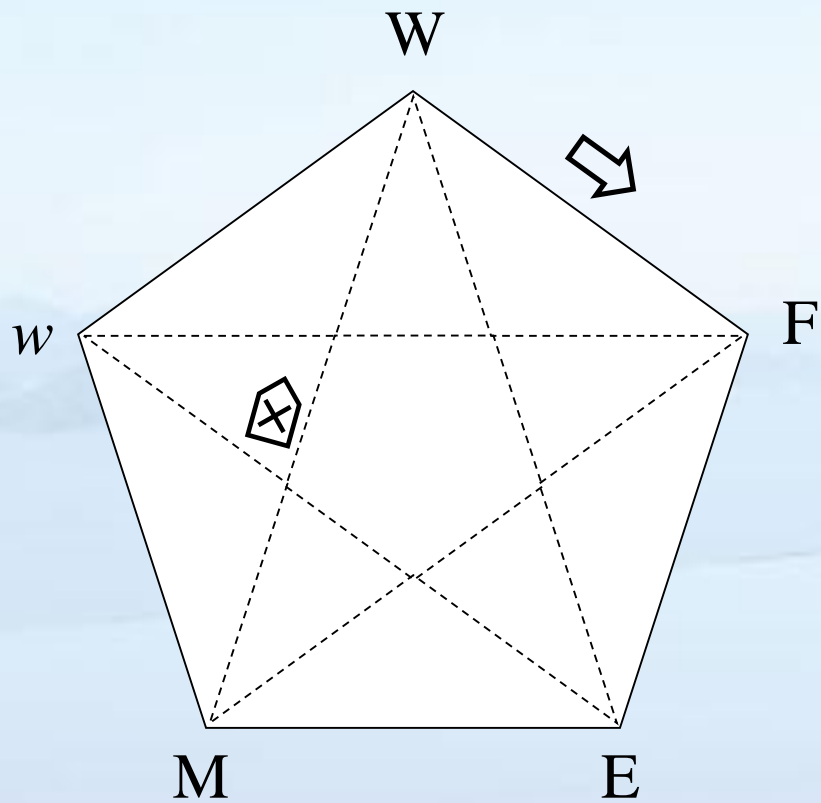
2. (Para. 17-18) Explain the Principle of Control with an example from the star-pentagon (to be shown). Needham says that it justifies a son taking revenge on his father's enemy. Explain the justification and comment on it. In what way is this 'associative' thinking?

Group 4 (The two fundamental forces):

3. (Para. 24) What animals are born of the power of Yang? What animals are born of the power of Yin? What is so special about Man? Give the most representative example of each category. (Table 9) Are Yin and Yang two additional elements to the five elements? How are Yin-Yang and the five elements related?

Groups 5 and 6 ('Associative' thinking):

4. (Para. 33, 36) What are the differences between modern science and Chinese 'associative' thinking? What is true primitive thought?



Connection

- How are *yin-yang* and the five elements connected?

Elements <i>hsing</i> 行	Rulers ^b <i>ti</i> 帝	Yin-Yang 陰 陽	Human psychophysical functions <i>shih</i> 事
WOOD	Yü the Great [Hsia]	Yin in Yang or lesser Yang	deameanour
FIRE	Wên Wang [Chou]	Yang or greater Yang	vision
EARTH	Huang Ti [pre-dyn.]	Equal balance	thought
METAL	Thang the Victorious [Shang]	Yang in Yin or lesser Yin	speech
WATER	Chhin Shih Huang Ti [Chhin]	Yin or greater Yin	hearing

(Part of Table 9)

Modern science vs. 'associative' thinking

	Modern science	'Associative' thinking
Ideas	classified in a series of <u>ranks</u>	arranged side by side in a <u>pattern</u>
Influence	mechanical causes	induction effect

time
distance
mass

→

velocity
acceleration
force

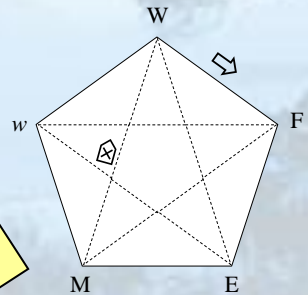
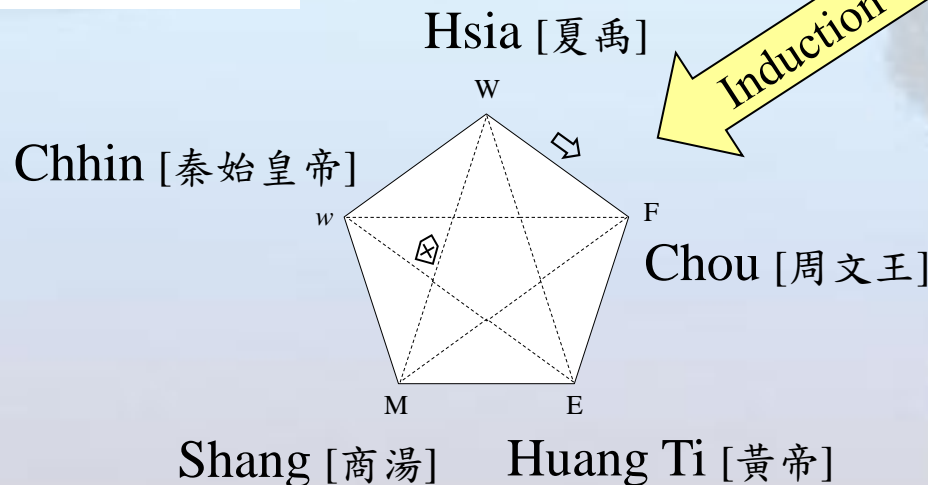
→

energy
force field

→ ...

iii The Mutual Conquest Order *W M F w E*

Elements <i>hsing</i> 行	Rulers ^b <i>ti</i> 帝	Yin-Yang 陰 陽
WOOD	Yü the Great [Hsia]	Yin in Yang or lesser Yang
FIRE	Wên Wang [Chou]	Yang or greater Yang
EARTH	Huang Ti [pre-dyn.]	Equal balance
METAL	Thang the Victorious [Shang]	Yang in Yin or lesser Yin
WATER	Chhin Shih Huang Ti [Chhin]	Yin or greater Yin



Was the Chinese view of nature primitive?

The classification which Tung Chung-Shu uses is the capacity of various things in the universe to fit into a fivefold, or some other, numerical grouping. And it is interesting that he takes the acoustic resonance of stringed instruments as an example of this, for to those who knew nothing of sound waves it must have seemed very convincing, proving his point that things in the cosmos that belonged to the same class resonated with, or energised, one another. He did not, of course, take the very primitive view that anything could affect anything else: his relationships were part of a closely knit universe with selective effects. Indeed, to Tung Chung-Shu, and to his successors, causation was something very special, since it acted in a sort of stratified pattern, not at random. Nothing was uncaused, but nothing was caused mechanically. The

(Para. 35)

Today

- Discussion I (Text)
- Discussion II ('Associative thinking')



Discussion II

‘Associative’ thinking



‘Associative’ thinking

- Associative thinking:
 - You eat a lot as a pig does, you will become piggish fat.
- cf. Analytical thinking:
 - You eat a lot. You will gain weight because of the nutrient-rich diet.

‘Associative’ thinking

- Perhaps the Chinese ‘associative’ thinking would be better called ‘**correlative** thinking’.
- Needham also called it ‘co-ordinative thinking’ (Para. 33).
- Patterns / relationships, not random, but stratified.

Pattern

34

In the Chinese thought with which we are dealing, the key words are *Order* and *Pattern*; or one might almost say there is only one key-word, *Organism*, for certainly the symbolic correlations, the correspondences, the hexagrams of the *I Ching*, all formed part of one gigantic whole. Things behaved in particular ways not necessarily because of the prior actions of other things, but primarily because their position in the ever-changing cyclical universe was such that they were endowed with intrinsic natures which made such behaviour natural for them. If they did not behave in those particular ways they would lose their positions, and their relations to other things (which made them what they were) would alter and would turn them into something other than themselves. Their existence depended on the whole world-organism, and they reacted on one another by a kind of mysterious resonance.

黄帝内经·灵枢经·邪客

黄帝问于伯高曰：愿闻人之肢节以应天地奈何？

伯高答曰：天圆地方，人头圆足方以应之。天有日月，人有两目；地有九州，人有九窍；天有风雨，人有喜怒；天有雷电，人有声音；天有四时，人有四肢；天有五音，人有五藏；天有六律，人有六府；天有冬夏，人有寒热；天有十日，人有手十指；辰有十二，人有足十指，茎垂以应之，女子不足二节，以抱人形；天有阴阳，人有夫妻；岁有三百六十五日，人有三百六十五节；地有高山，人有肩膝；地有深谷，人有腋腘；地有十二经水，人有十二经脉；地有泉脉，人有卫气；地有草蓂，人有毫毛；天有昼夜，人有卧起；天有列星，人有牙齿；地有小山，人有小节；地有山石，人有高骨；地有林木，人有募筋；地有聚邑，人有腠肉；岁有十二月，人有十二节；地有四时不生草，人有无子。此人与天地相应者也。

- Correlation between the heavens and humans.

Huang Di Nei Jing "Ling Shu" Chapter 71

Huang Di asked Bo Gao: I wish to be informed of how man's limbs and joints correspond to heaven and earth.

Bo Gao replied: Heaven is round, the earth is rectangular. Man's head is round, his feet are rectangular, thereby corresponding to the [measures of heaven]. Heaven has sun and moon; man has two eyes. The earth has nine regions; man has nine orifices. Heaven has wind and rain; man has joy and rage. Heaven has thunder and lightning; man has the sounds of his voice. Heaven has the four seasons; man has the four limbs. Heaven has the five tones; man has the five long-term depots. Heaven has the six pairs of flutes; man has the six short-term repositories. Heaven has winter and summer; man has cold and heat sensations. Heaven has ten [stems counting the] days; man has ten fingers. [The earth branches beginning with] *chen* are twelve; man has ten toes, the stalk, and the pendant to correspond to them. Women lack [the latter] two parts. [...]

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(Para. 35)

Examples of ‘Association’

Connection between similar patterns



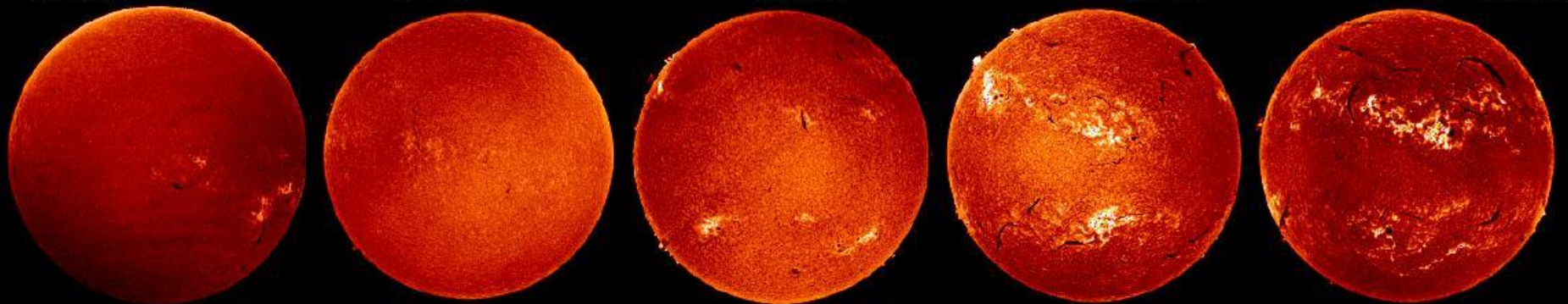
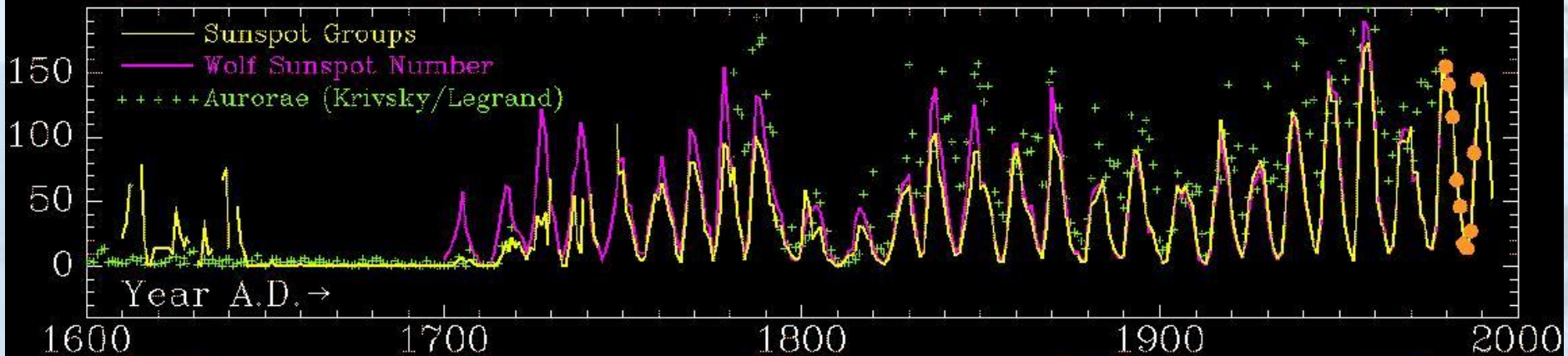
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10 Jul 1985

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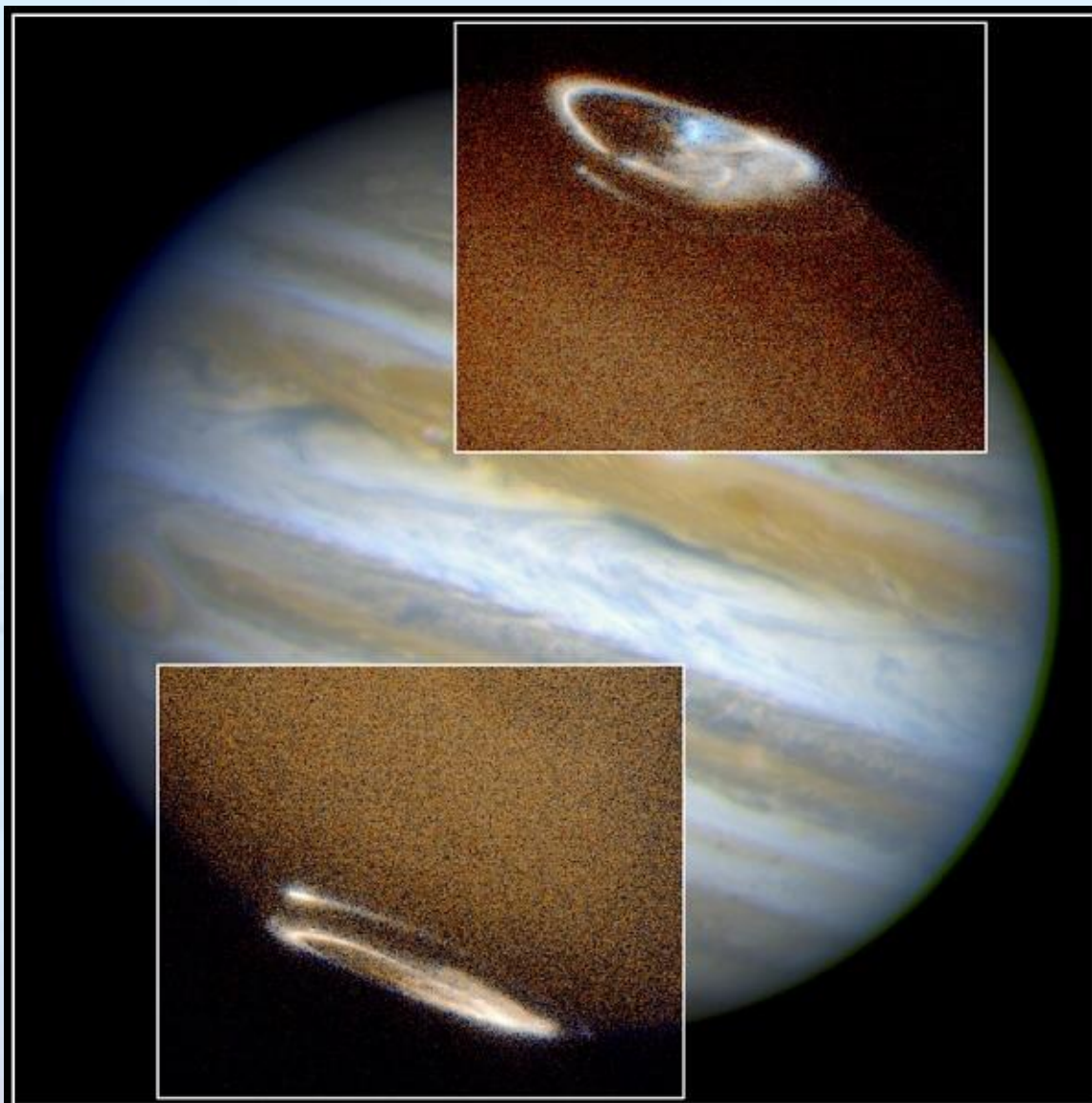
Source: NOAA+Zürich+RDC (D.V. Hoyt)+CNRS/INSU (J.-P. Legrand)+Ondrejov Obs. (K. Krivsky)

HAO A-017

The occurrence of sunspots and that of aurorae follow the same pattern.



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Jupiter Aurora

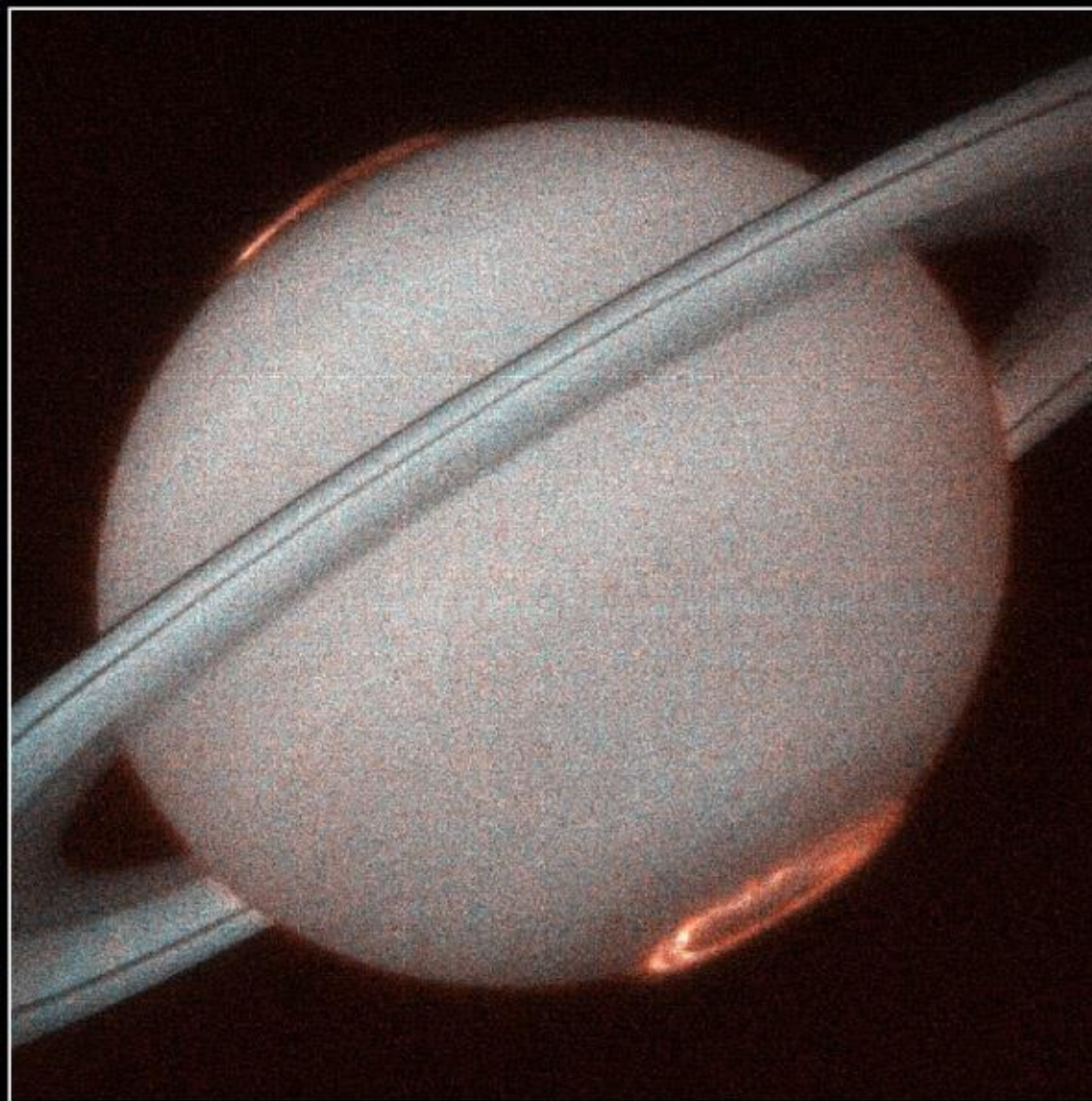
HST • STIS • WFPC2

PRC98-04 • ST Sci OPO • January 7, 1998
J. Clarke (University of Michigan) and NASA



www.sfsu.edu/~sfsu/astrocampus





Saturn Aurora

HST • STIS

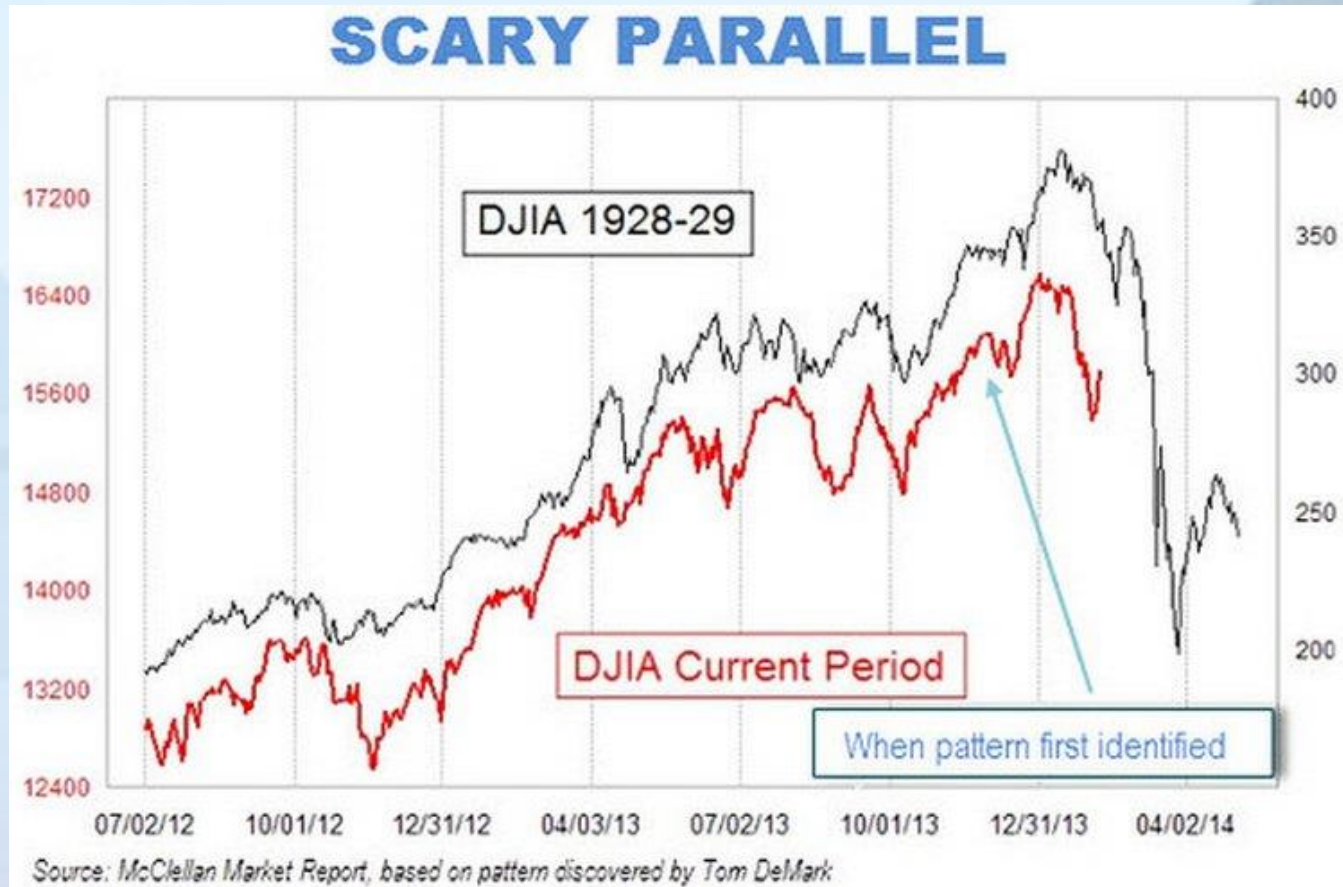
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www.sdsu.edu/~astro/trauger

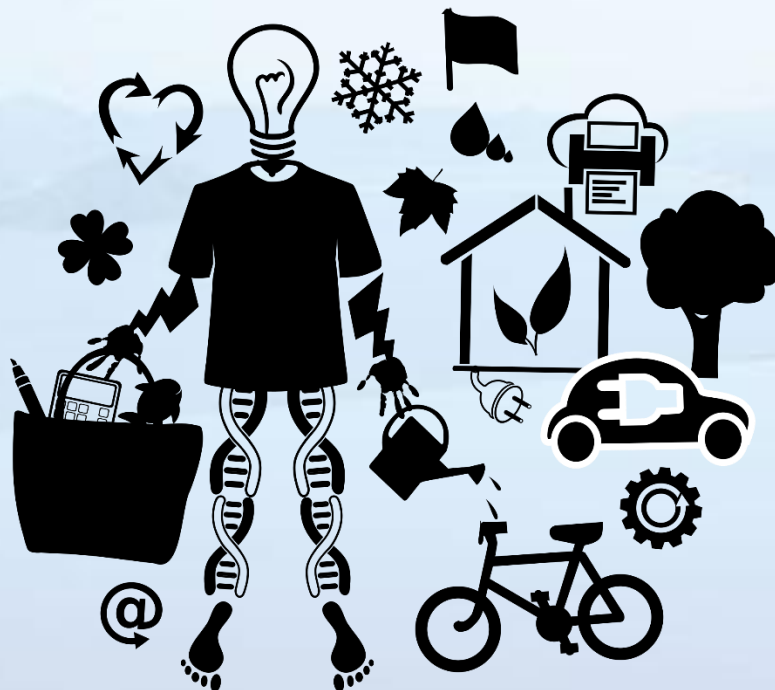


Recurring patterns make
the market predictable?



<https://www.businessinsider.com/1929-stock-market-crash-chart-is-garbage-2014-2>

Big data!!!!



Biomimicry (仿生学)

- also bionics, biomimetics, bio-inspiration, biognosis or bionical creativity engineering



inspiration

Technical problems:

Ventilation of a
building

Guide for the blind

Traffic congestion

Solutions

- The word bionics was coined by J. E. Steele in 1958.
- Emphasis of bionics: implementation of a function found in nature rather than imitating biological structures.

Example: Velcro

(魔术贴/魔鬼毡/尼龙搭扣)



- Invented by the Swiss engineer George de Mestral in 1948.
- Inspired by the burrs that hooked on his dog after a walk.



3 cases

1. Lotusan
2. Termite nest (白蚁巢)
3. A poem read in a funeral

What is dying?

Bishop Charles H. Brent

A ship sails and I stand watching
till she fades on the horizon,
and someone at my side
says, "She is gone".
Gone where? Gone from my sight,
that is all; she is just as
large as when I saw her...
the diminished size and total
loss of sight is in me, not in her,
and just at the moment
when someone at my side
says "she is gone", there are others
who are watching her coming,
and other voices take up the glad shout,
"there she comes!" ...and that is dying.

3 Questions

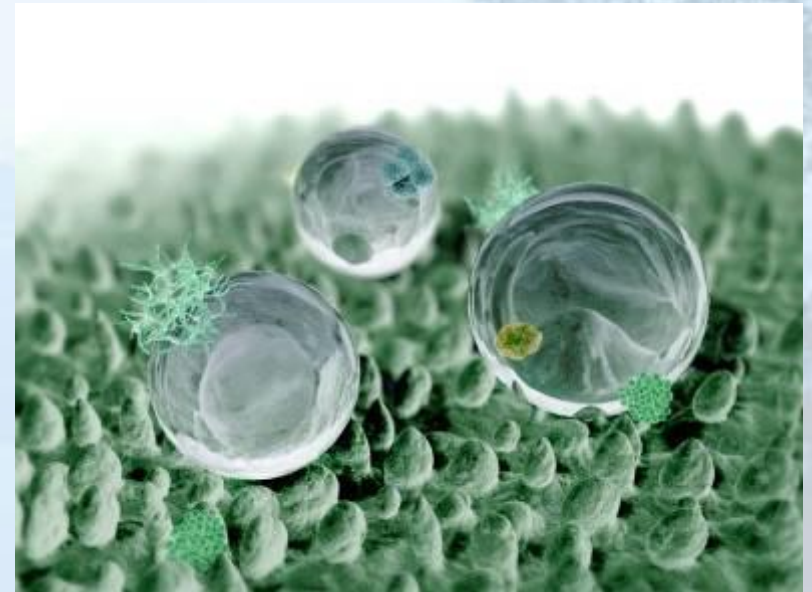
1. Name the **two things** that are associated.
 - [Velcro and burrs.]
2. What **similar patterns** do they have?
 - [Both have flexible hooks.]
3. What can we **learn** from the association?
 - [Invented reusable adhesive surfaces.]

Discussion (associative thinking)

- Let us read the following cases together.
 - Lotusan
 - Termite nest
 - A poem read in a funeral
- Answer:
 1. Name the **two things** that are associated.
 2. What **similar patterns** do they have?
 3. What can we **learn** from the association?

Self-cleaning paint

- Lotusan
- The idea is from lotus leaves.
- This paint is resistant to accumulation of mold and dirt.



<https://asknature.org/idea/stocolor-lotusan-paint/>

Ventilation

- The ventilation system of Eastgate Centre Building at Harare, Zimbabwe.
- modeled after the termite (白蟻) nest.



https://en.wikipedia.org/wiki/Eastgate_Centre,_Harare

The Allegory of the cave



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loss of sight is in me, not in her,
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says "she is gone", there are others
who are watching her coming,
and other voices take up the glad shout,
"there she comes!" ...and that is dying.

此岸彼岸（何巧嬋譯）

船要出海了，
我站在此岸目送著她，
直至她消失在地平線外。
身旁的人對我說：「她離開了！」

離開？往哪裡去？

她離開了我的視線，
她真正的大小沒有改變，
仍如當初我所看見的一樣，
她漸漸變小直至消失。

消失？消失在我視野之內而已。

船離開我所在的此岸，
開往我看見的彼岸。
當身旁的人對我說：「她離開了。」
也有人在彼岸揮手，
歡呼吶喊：「回來了，她回來了！」

What is dying?

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A labyrinth (明阵)



Chinese thought

- Associative (and creative).
- Also analytical: explained with basics
 - Five elements
 - Yin yang
- Perhaps not deep enough.

Announcement

- Reflective Journal 2 (9pm, Tue, June 7)

