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# Intelligence

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*What does it mean?*

*How is it measured?*

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# INTELLIGENCE

- Another concept which is difficult to define
  - Some cultures don't even consider it
  - Let's call it:
  - *The global capacity to think rationally, act purposefully, and deal effectively with the environment (Wechsler, 1944)*
  - Or is it just ..
  - *Whatever an IQ test measures (?)*
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# IS IT JUST ONE THING?

- Charles Spearman, in 1923, thought so
  - He noticed that high scores on tests of mental abilities correlated with each other
  - Proposed that it is a single factor, which he called *general intelligence* or *g*
  - *g* underlies all intellectual abilities
  - *s* deals with our level of prowess for specific aspects of intelligence
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# BIOLOGICAL BASIS

- The prevailing biological explanation is that high levels of  $g$  arise from a *greater ability to form new connections between neurons and dendrites*
    - 1) Better ability to learn from experience
    - 2) Better connections = faster processing, which seems to be the primary component of higher  $g$
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# MULTIPLE INTELLIGENCES

- It's not, "Are you smart?"
  - It's, "How are you smart?"
  
  - Howard Gardner argues that there are many kinds of intelligence
  - Perspective came from work with victims of severe brain injuries who still retained considerable "smarts" in some areas
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# THE EIGHT TYPES

- **Linguistic** – the ability to understand and use language, to write well, and to speak articulately
  - The basic skill utilized in most educational settings and intelligence tests
  - Measured directly by the Verbal portion of the SAT
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- **Logical/mathematical**

skill with problem solving and scientific analysis

Another skill widely used in educational settings

Essential to careers in science or engineering

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- **Musical**

skill with musical instruments, singing or composing

- **Kinesthetic**

skill with bodily movements  
dancers or athletes

- **Naturalistic** – highly attuned to nature

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- **Interpersonal**

- possessing strong social skills; knowing just how to talk to people

- careers in sales, politics, counseling, etc

- **Spatial**

- ability to understand how objects are oriented in space

- artists, architects

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# THE MOST IMPORTANT?

- **Intrapersonal**

- understanding your own emotions, and recognizing those which are self-defeating; setting realistic goals

- These abilities lead to increased success in almost everything we do
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# EMOTIONAL INTELLIGENCE

- Similarly, Daniel Goleman claims that being able to:
  - 1) accurately assess and manage our emotions,
  - 2) empathize with others,
  - 3) maintain satisfying relationships, and
  - 4) get along with people, are ....

The key aspects of *emotional intelligence*

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# SO WHAT!?

- In Goleman's view, these abilities, or their absence, explain why some who have plenty of intelligence fail to succeed, while others, with less, thrive
  - Essential for life, love, and work
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# TESTING INTELLIGENCE

- Amazingly the most common intelligence tests have little relationship to any of the theories
  - Are we measuring something we don't understand?
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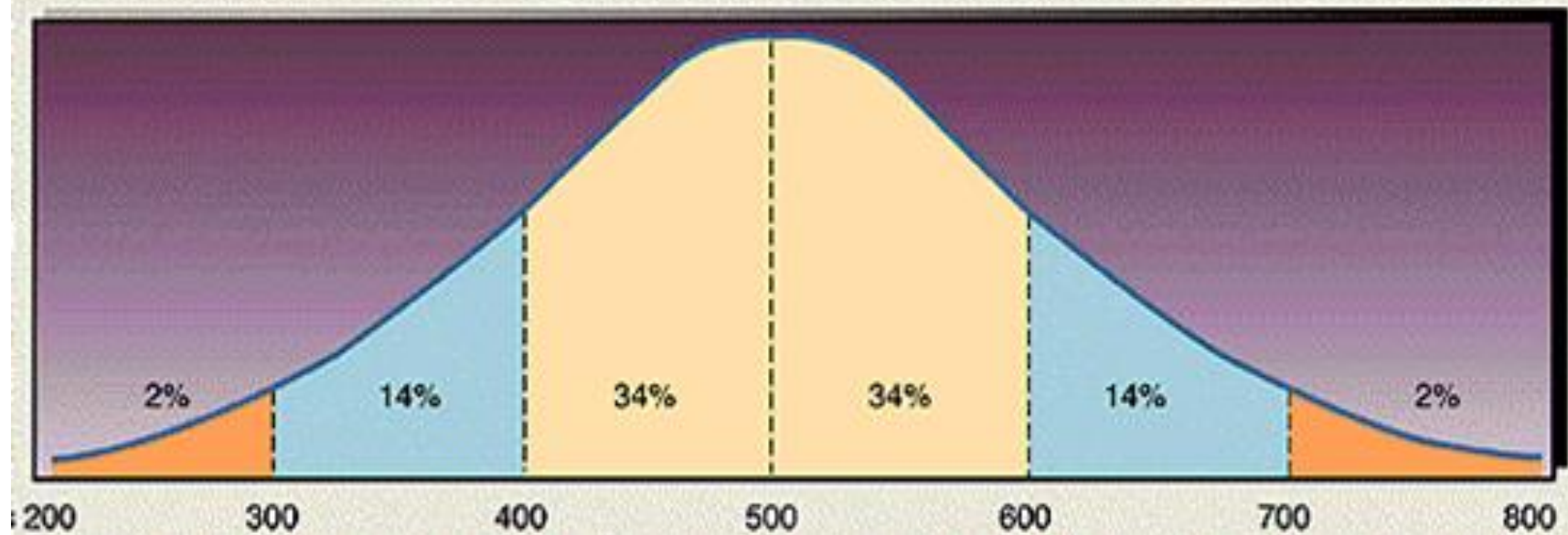
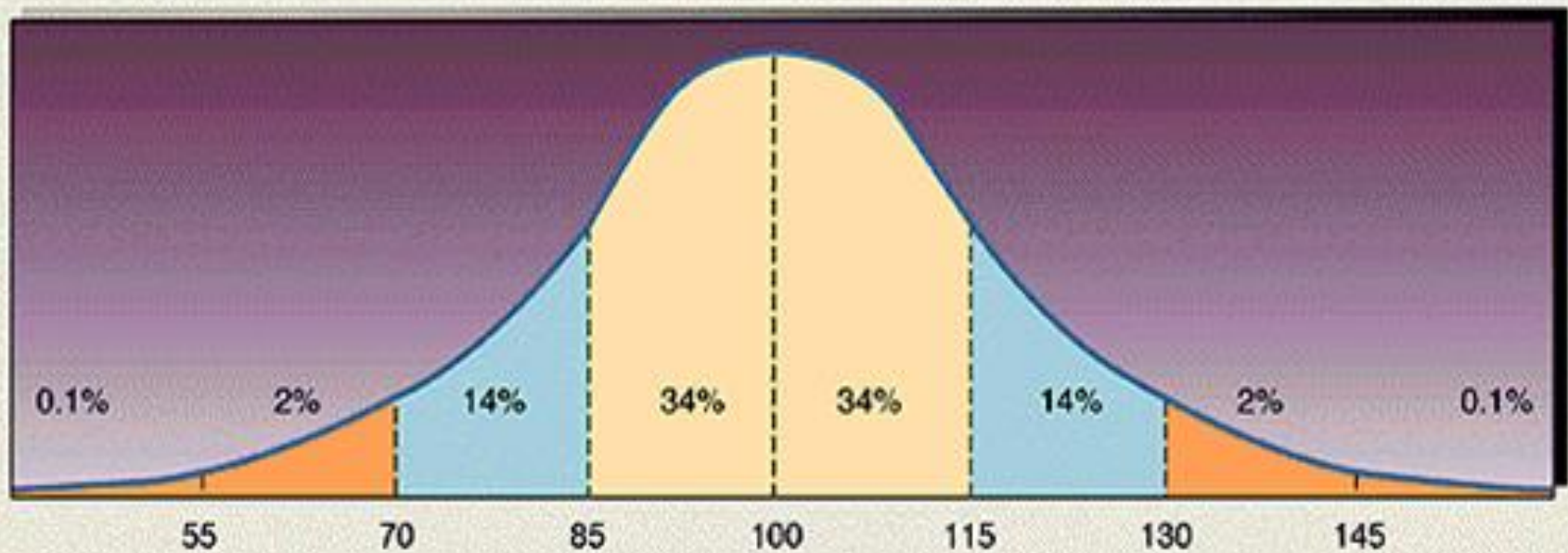
# THE REVERED IQ TEST

- Designed by Albert Binet in 1905 to identify which French school children would need special help
  - Assessed a wide variety of skills called upon in the academic setting
  - Adjusted by age
  - Administered one-on-one
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# INTELLIGENCE ON THE NORMAL DISTRIBUTION

- Calibrated, occasionally so that:
    - 1) mean, median and mode all = 100
    - 2) standard deviation = 15
    - 3) score > 130 – “gifted”
    - 4) score < 70 – mentally retarded
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# THE FLYNN EFFECT

- IQ scores have gone up 15 points per generation
- Are we getting smarter?
- Are better schools responsible?
- Or are we better test-takers?
- Or is it simply a matter of better nutrition?
- All explanations point to the importance of the environment.



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# WECHSLER

- Basically similar to Stanford – Binet
  - Adds breaking measures into Verbal and Performance
  - Also provides component scores
  - Commonly used to determine LD needs
  - Separate tests for kids and adults
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- But both IQ and Wechsler assume familiarity with our culture and language
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## **COMPREHENSION**

1. Why should we obey traffic laws and speed limits?
2. Why are antitrust laws necessary?
3. Why should we lock the doors and take the keys to our car when leaving the car parked?
4. What does this saying mean: "Kill two birds with one stone."

## **INFORMATION**

1. Who wrote Huckleberry Finn?
2. Where is Finland?
3. At what temperature does paper burn?
4. What is entomology?

## **ARITHMETIC**

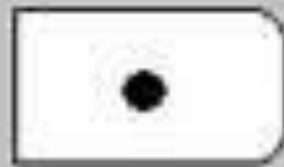
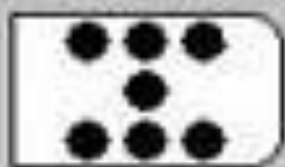
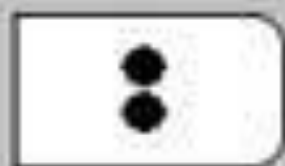
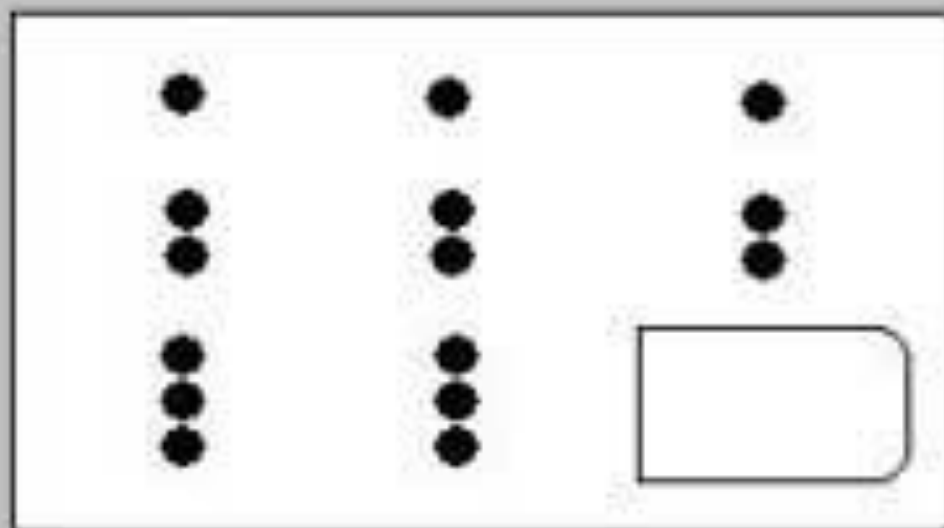
1. How many 15¢ stamps can you buy for a dollar?
2. How many hours will it take a cyclist to travel 60 miles if he is going 12 miles an hour?
3. A man bought a used stereo system for  $\frac{3}{4}$  of what it cost new. He paid \$225 for it. How much did it cost new?
4. Six men can finish a job in ten days. How many men will be needed to finish the job in two and a half days?

### **A. Verbal tests**

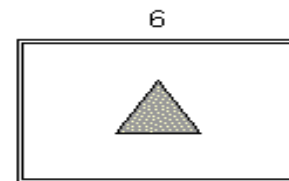
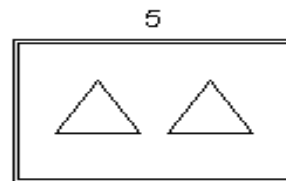
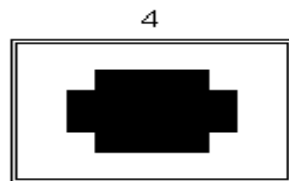
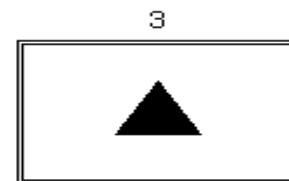
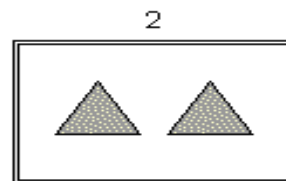
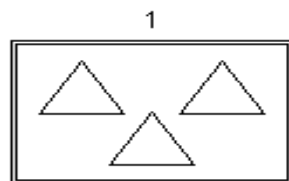
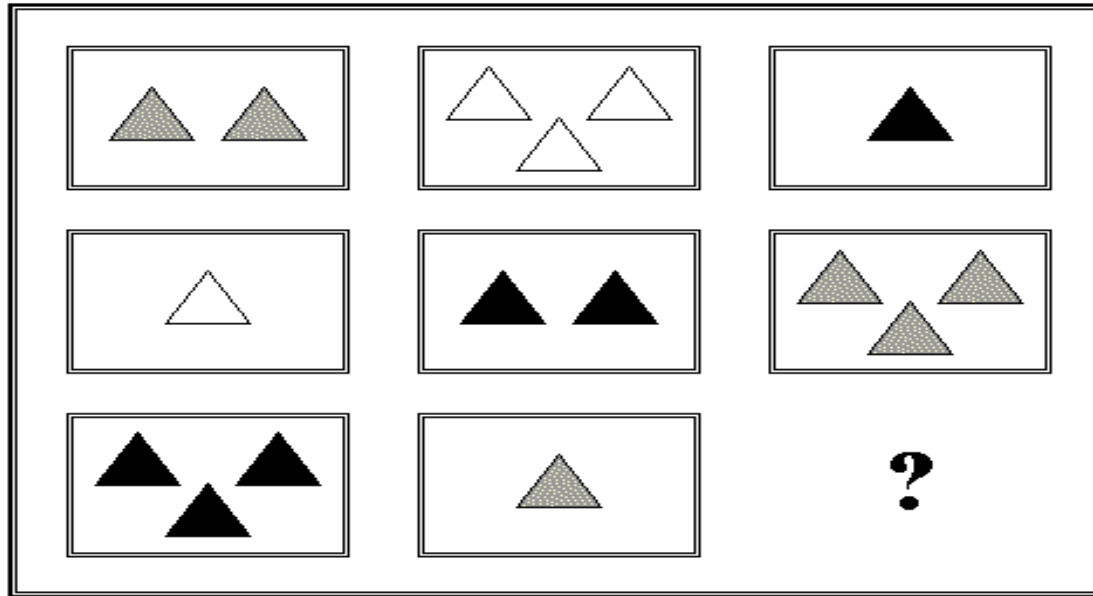
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# RAVEN'S PROGRESSIVE MATRICES

- A test which requires no particular language or cultural familiarity
  - Very simple instructions
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Which answer fits in the missing space to complete the pattern?



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# TERMIN'S STUDY OF THE GIFTED

- In 1921, Termin began studying 1500 people with an IQ > 140
  - He followed them throughout their lives
  - They excelled in school, socially and in their careers
  - But not all succeeded
  - High motivation and encouraging home environments were characteristic of the highest achievers
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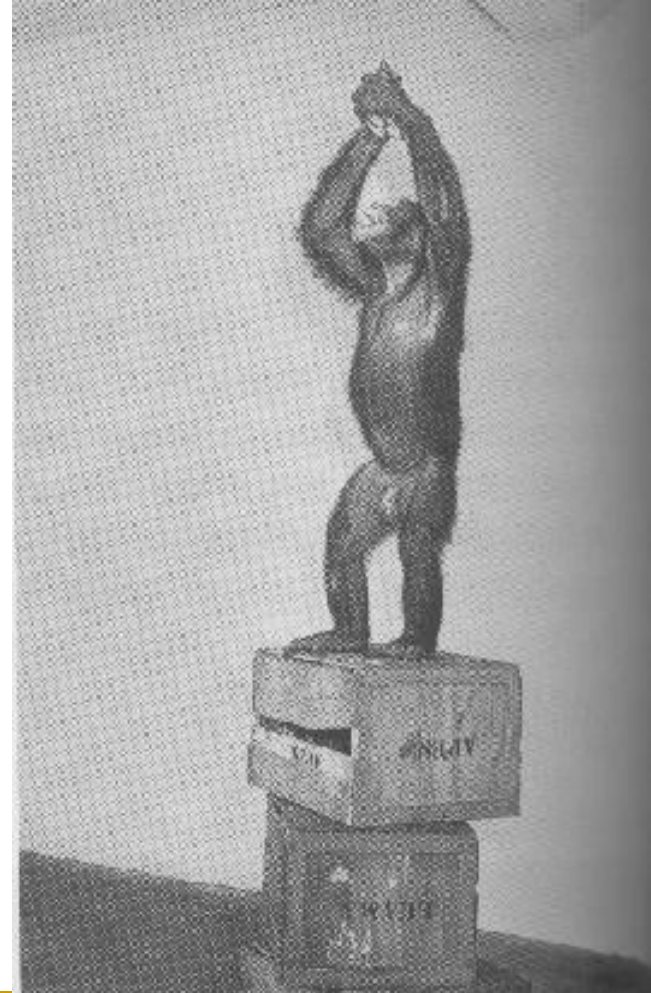
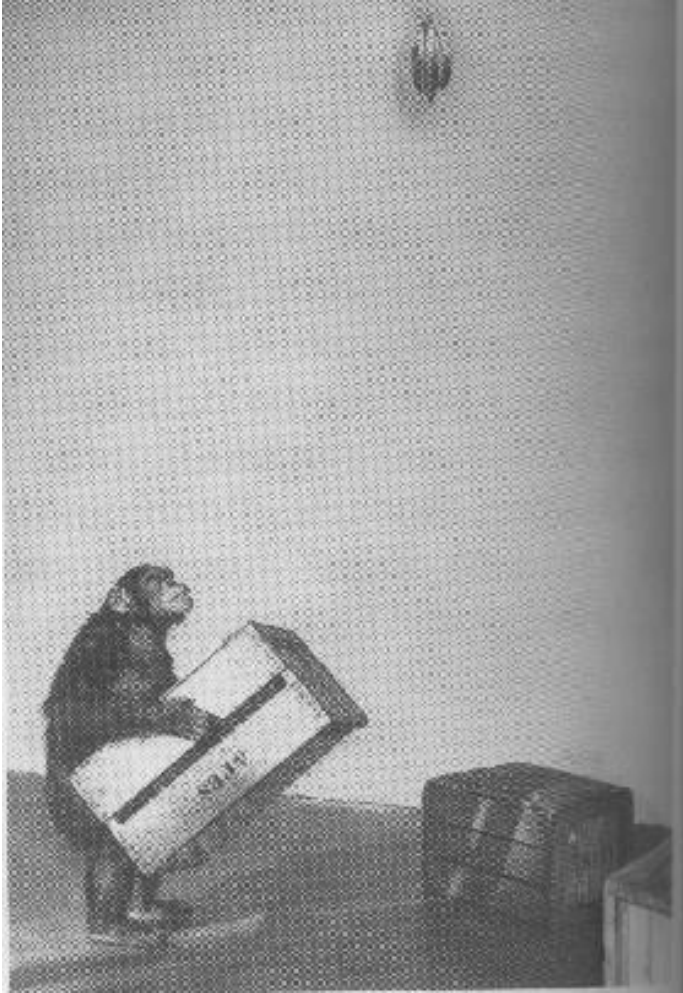
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# Animal Intelligence

- Kohler, in the 1920's, revealed the problem-solving capabilities of chimpanzees
  - Sultan demonstrated *insight* or did he?
  - Skinner would argue that operant conditioning explained it all
  - Today, *cognitive ethnologists* claim that animals can make plans, think about the future and collaborate with others
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# Sultan gets his



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# Animals & Consciousness

- But some still attribute many animal talents to mere instinct, not consciousness
  - Is this fair? Some animals certainly use tools.
  - Chimps and sticks
  - Otters and stones
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# Orangs and paper clips



# Ravens and string



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# More evidence

- Chimps understand numbers
  - At 2-3, better than humans
  - Ravens can count to 6
  - Alex, the recently-departed African grey parrot, could *sum* to six
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# Theory of Mind

- *A system of beliefs about how both our mind and the mind of other's work, and of how individuals are affected by their beliefs and feelings*
  - Animal deception
  - Self-recognition
  - Comforting others
  - Fairness
  - Pointing
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# Are we limited to invertebrates?



# What killed this?





# The Kraken's lair?

