A WONDER OF NATURE.

ANT ENGINEERS.

Ant Engineers. 1

- The *Eciton* army ants on Barro Colorado Island, in the middle of the Panama Canal, are nearly blind.
- To find their way about, they lay down and follow a trail of chemical signals.

Ant Engineers. 2

- When the lead ant of the column encounters a gulf, it immediately stops.
- There is no scent trail, just empty space.
- Other members of the colony that were following begin to climb over her.

Ant Engineers. 3

- Now, instead of walking in a line, they grip hold of one another using hooks on their feet, adding body after body to build an impromptu bridge.
- More and more join in, until they traverse the gap.

Ant Engineers. 4

- And there they remain until the entire foraging party, numbering hundreds, has crossed.
- Then, as suddenly as it came into being, the bridge disperses, and the ants continue on their way.

Ant Engineers. 5

- How do these creatures achieve such an impressive feat of coordination with very limited brainpower and no overview of the situation?
- That’s the question a group of researchers working on Barro Colorado Island set out to answer.
- Matthew Lutz, now at Max PlancK Institute.

Ant Engineers. 6

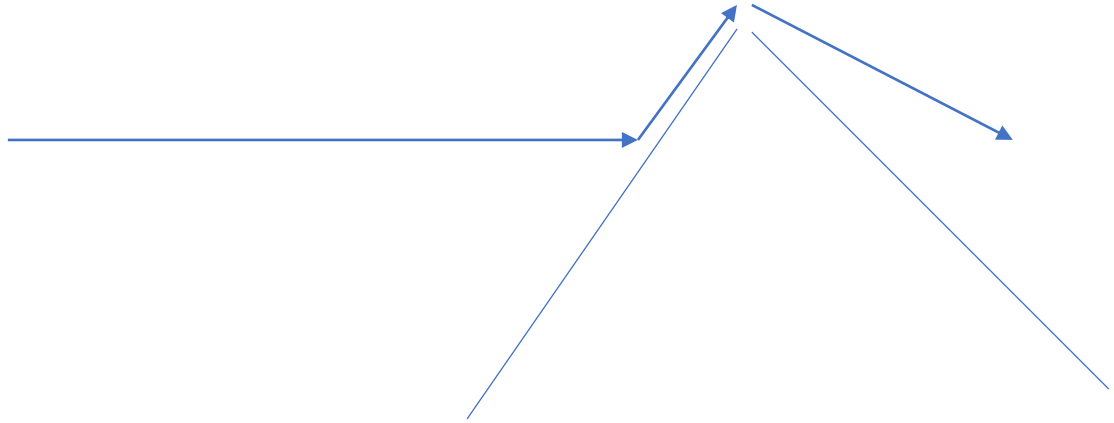
- Their efforts have revealed how ants use simple cues to organise themselves into complex living structures.

Ant Engineers. 7

- The habits of the ants did not make it easy for the researchers.
- Apart from biting and stinging at the same time, they build a temporary home (or bivouac), each day, which can be hundreds of metres from the previous day's home.

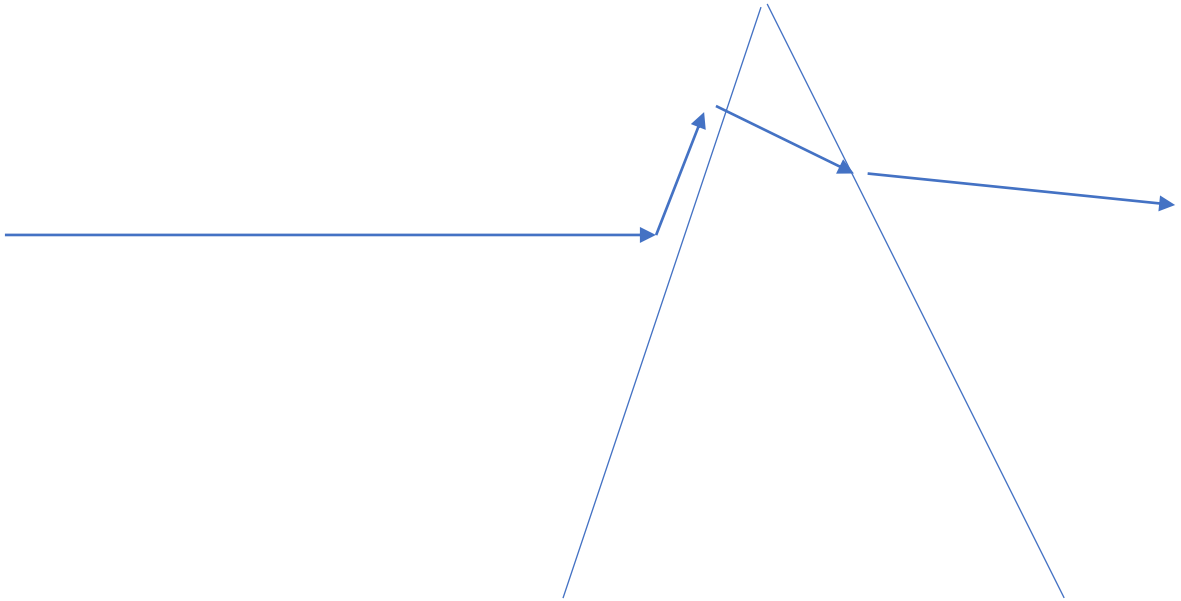
Ant Engineers. 8

- When the researchers had located the new bivouac and trail of the ants, they placed a V-shaped obstacle across the path, moving its position and adjusting its mouth to see what the ants would do.
- If the trail intercepted a ‘fat V’ near the apex then the ants would diverge left then right to resume their original tail:



Ant Engineers. 9

- With a ‘thinner V’ the ants took a zig-zag path - building a short bridge - which was not the shortest path.



Ant Engineers. 10

- Researchers suggest that the ants take the path that best allocates the labour between bridge-building and foraging.
- This is remarkable because all they have to guide them are their senses and their local knowledge.

Ant Engineers. 11

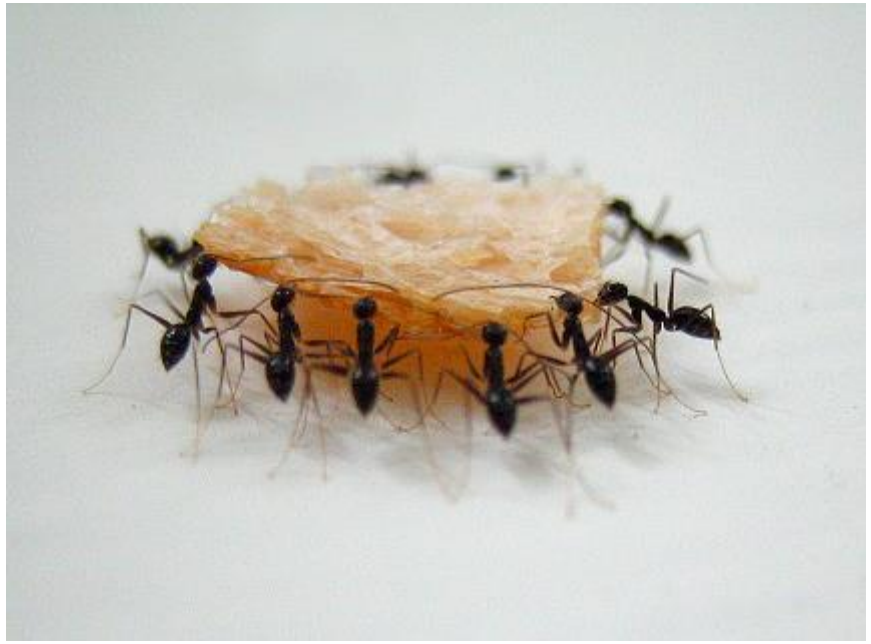
- Eciton ants, when walking on a vertical wall, will stop and hold themselves up against it.
- In doing so, they build up a safety net or scaffolding so other ants will be caught as they fall.
- As yet there is no definitive explanation of the mechanism for this behaviour but it is suspected to follow the same rules as bridge building.

Ant Engineers. 12

- Another form of co-ordinated behaviour, without brain power, in other ants, is when a group carries huge prey.
- “By exerting forces on the load and detecting counterforces, each ant can use that to adapt its own behaviour,” says Stephen Pratt of Arizona State University.

Ant Engineers. 13

- He says that they are using the load as a nexus, i.e. a link, to guide behaviour.
- Such co-operation is impressive but is also a conundrum.



Ant Engineers. 14

- We might assume that it is each individual ant's interest to let the others work together and simply accept the benefits.
- Why would an army ant become a building block in a bridge, and let others crawl over it, instead of simply crawling over the bridge?

Ant Engineers. 15

- Lutz suggests one possibility: being part of the bridge is easier than foraging.
- He suspects that, as soon as the ant becomes part of the bridge, it goes into a low energy state and simple hangs on by its hooks.
- Being a forager often risks its life while killing prey.

Ant Engineers. 16

- In evolutionary terms, competition comes down to producing more offspring, but ants are all sisters, with only the queen reproducing.
- Thus an ant is not in a position to make a profit on its own.

A queen ant accompanied by her workers:

Ant Engineers. 17

- Deborah Gordon at Stanford University likens an ant to a single cell in an organism.
- But there is one key difference.
- The ant colony's intelligence is distributed amongst its component parts.
- That makes it a 'superorganism' that has 'emergent' behaviour which is more sophisticated than the sum of its parts.
- Soldier ants coping with a flood: