**JA - Animal Cognition**

Animal cognition is the study of mental capacities of non-human animals. The goal is to understand the varieties of cognition, how humans are similar to other species, and how cognitive processes evolve. The information is gathered by comparative psychology, ethology, behavioral ecology, and evolutionary psychology.

- Types of animals

- Mention Alex (Parrot that has learned to count), Koko the Gorilla, Betty the Crow (creation and use of tools), Dolphins (image/sound identification)

- Bird & the worm in the water = use rocks to raise water level.

There are many experiments they did for each individual type of animals. Some of the experiments included mazes, skinner boxes, sign language, picture memorization and many more. Some of the information the experiments tried to gather was memory, spatial cognition, tool and weapon use, problem solving and animal language. The memory test included experiments such as squirrels remembering where they store things even through changes in the environment. Spatial cognition test included the study of ants and bees using beacons to direct each other. Tools and weapon were often observed in primates, such as certain chimpanzees using sticks as spears while hunting. Chimpanzees are also an example of doing problem solving. They were found to find creative ways to reach bananas that were normally out of reach.

The main studies are for mammals including elephants, primates, and dolphins. Birds, fish, and Lizards have also been studied.

**SW - Fruit Fly**

With regards to the field of animal intelligence research, fruit flies once again prove their scientific worth. Fruit flies are significant objects of study because of their simplicity; they demonstrate essential behaviors such as food acquisition, territory defense, basic navigational and time-telling skills, and the ability to learn from previous experience. Scientists hope that through the examination of the flies’ basic neural behaviors, we will be able to learn more about the foundations of basic behaviors.

**SW - Birds/Crows**

*Vending Machine Video*

TEDTalk - Joshua Klein

*Facial Recognition*

Researches at the University of Washington have discovered that crows have the ability to recognize human faces. A professor at the university who regularly trapped and released birds made this discovery through the use of masks; a caveman was the “dangerous” mask and a Dick Cheney mask was used as the control. The researchers found that the crows “scolded people in the dangerous mask significantly more than they did before they were trapped, even when the mask was disguised with a hat or worn upside down. The neutral mask provoked little reaction. The effect has not only persisted, but also multiplied over the past two years. “ The crows had shared information with each other about who to avoid.

*Nicky Clayton*

Nicky Clayton’s research on Western Scrub-Jays is focused on the levels of self-awareness, memory, and foresight. In particular, she wanted to “learn whether [the birds] are capable of deception, if they respond differently to individual competitors, how well they evaluate their degree of privacy, and other aspects of their mental processes...Many animals have impressive mental capabilities for certain narrow tasks”, but their abilities are not necessarily as flexible as human mental capability. Clayton discovered that “scrub-jays plan for the future, recall incidents from the past, and mentally model the thinking of their peers.” These time-related abilities were previously thought to be entirely human in nature. They also take precautions against theft via other birds, something that shows a great deal of foresight.

**SW - Elephants**

Self-portrait

Self-recognition

**SW - Sea Mammals**

Whale – Language

It has been discovered that humpback whales have a fully developed language that they use to communicate with each other. It has been mathematically shown that humpback whale song has its own unique grammatical structures, and these syntactic patterns remain consistent throughout the language’s use. The research team that discovered this adds “that whales are the only other animals beside humans to use hierarchical structure in language, in which phrases are embedded in larger, recurring themes. “

Dolphins – Names

It has also been discovered that dolphins create unique names for themselves when they’re young. These names are a series of distinctive whistles that dolphins use to identify themselves and each other, and, but using a computer synthezised voice, it’s been proven that dolphins can recognize their own name even when pronounced in a voice that is unfamiliar to them. Researchers also believe that parrots may have names for each other as the social structure of dolphins is similar to that of parrots and other birds.

**SW - Artificial Cognition - Definition/Explanation**

- "Artificial cognition lets you define words so the definitions are quantitative and operable directly - arithmetically and logically." (\*)

- Store and process the meaning of words, gives computers the ability to process non-computer information

- Helps to bridge the gap between human though and computer structure.

**JA**

Some types of artificial cognition include such programs as spam and virus filters. The spam filter takes instructions to screen out email that fit the criteria given. The criteria would be typed out such as “I do not want any mail about breast implants”. It also makes future spam filtration better by asking the user on other cases not normally included but close to the criteria. Virus filter with artificial cognition would can traffic at the server and identify threats by what they would do when activated. It would not have to a list of known viruses but would identify new ones. Another would be for search engines. It would take user input and they make inferences on them to give the user better results. An example that was given was a user searching for sports cars and the results depicting stuff not labeled as sports cars that should have been included such as roadsters or touring cars. This could be incredibly more time efficient to cut down on doing repeated searches to try and find exactly what you’re looking for.

**JA - Importance of lower-level modeling**

Grey Walter was the name of a neurophysiologist who created some of the very first autonomous robots. His goal was to prove that connection between a number of brain cells could give rise to very complex behavior. This might sound familiar of Braitenberg but came a bit before him. He constructed these robots, often called tortoises back in 1949. They would react to light and could even find their way into a recharging station when they ran low on power. They also were able to maneuver around objects. These types of actions resemble bacterial intelligence. They appear to have adaptive behavior and could possibly cooperate with more complexity.

Grey Walter Tortoises

- Goal of the Experiment

- 30 second video

- Bacterial Intelligence (Self-awareness of simple needs.)

Braitenberg

- Derivative of Walter

**SW - Conclusion - Systems don't have to be complex to be effective**

The study of animal and artificial intelligences demonstrates that cognitive systems don’t have to be complex to be effective. This is good news for artificial life design and research in general, and helps to reinforce the concept of ground-up development of cognitive complexity. Additionally, the study of animal cognition demonstrates that neural systems needn’t be as complex as the human brain in order to demonstrate a capacity for learning, decision-making, and self-preservation. Nevertheless, there is an added complexity in that the flexibility and robustness of biological systems cannot yet be truly matched in artificial systems. In the mean time, however, researchers have been working to develop artificial systems that combine the edge detection capabilities of Grey’s tortoises with the navigational and decision making abilities of a small insect.

Cat + Roomba (Video)