

外 国 語

次の英文は *New Scientist* 誌(2007年6月23日)に掲載された, Joanna Dally 氏の
記事 “Don't call me birdbrained” を一部改変したものです。この文章をよく読んで、
問題 ① から ⑥ に答えなさい。解答は解答用紙の指定された欄に記入すること。

*印のついている語句の注は本文のあとに示されています。

The working day of a western scrub-jay does not look very *impressive*. Like many birds and mammals, these members of the crow family put considerable time and effort into hiding food, which they recover later. That in itself is not the problem. It is the scrub-jay's habit of returning to a cache — a secretly hidden collection of items — digging them up and then hiding them again somewhere new that seems so *inefficient*.
(1)

Nicky Clayton first witnessed this strange behaviour on the campus of the University of California, Davis, where the birds would rush to *discarded* remains of student picnics and then *secrete* the scraps in nearby bushes. When she noticed that individuals sometimes returned later to secretly rebury the acquisitions, she wondered why they would go to so much trouble.

Now a professor at the University of Cambridge, Clayton is well aware that crows and related birds, known collectively as corvids*, are among the most intelligent of all animals. As well as caching food, scrub-jays habitually steal hidden items from one another. She suspected that the re-hiding might be a way of *foiling* potential thieves. If so, studying it could be a good way of finding out what these birds understand about the perceptions and intentions of others. What Clayton and her colleagues — including myself — have since discovered has caused some controversy because it challenges the belief that complex social intelligence is unique to great apes.

The crow family extends far beyond the black-feathered crows. In fact, it

encompasses around 120 species — including the colourful jays — and they are found in every environment except the polar ice caps. Their intelligence is well known and is often explained as an evolutionary adaptation to group living. Many species live in a complex social environment where it is necessary to keep track of not only their own relationships but also those of the others in their group. They are playful, especially the young birds who have a long developmental period during which they learn from group members. Several species have even been observed making tools — a talent that was thought to be unique to primates. Corvids also display levels of flexibility to rival great apes when solving *novel* problems.

Clearly, corvids are no birdbrains, yet getting an insight into the mental life of an animal so different from humans is not easy. Studying the food-hiding and stealing habits of scrub-jays and other corvids was the perfect opportunity to do just that.

In 2001, Clayton, working with colleague and husband Nathan Emery, carried out the first of many studies of the tactics scrub-jays use to protect their *hoards*. They allowed jays to hide worms either while they were alone or when another bird was watching, and to recover the hidden items in private later. The jay's favourite food is worms, so the researchers *anticipated* that birds would make every effort to protect their stores. They found that when jays were allowed to return to their cache, those that had hidden worms while being watched by another bird moved them to new sites. Birds did not move worms they had hidden in private, however. (3) "By selectively re-hiding those items others witnessed being cached, scrub-jays prevent their competitor using memory to relocate and steal their hoards," says Emery.

Re-hiding appears to be a strategy to limit the chances of being burgled — and it is not the only trick jays use to *outwit* potential thieves. In a study I carried out with Clayton and Emery, we found that when hiding worms with another bird around, jays prefer to cache their meal behind a barrier that blocks their rival's view. That might not sound very clever, but it suggests they may be able to see

things from the visual perspective of another individual. In other words, they might understand that another bird learns about the world through its sense of vision. This is an insight into the mind of another that has traditionally been thought to be limited to great apes. There is an alternative explanation, however. Perhaps jays don't think about their rival when they do not see their rival.

In another experiment we gave jays the option of hiding nuts in well-lit or shady sites. When no rival was watching, they showed no preference between the two, but when watched by a potential thief, the jays *shunned* bright sites, preferring to hide their nuts in the shadows. The potential thieves were always in view, suggesting that the decision to cache nuts in hard-to-see places does arise from an understanding of the visual perspective of others, rather than merely forgetting about those one can not see.

Given corvid feeding behaviour, you might expect the social life of these birds to be filled with suspicion and mistrust. You would be wrong. Members of the crow family are famed for their fidelity, often mating for life. Recognising your partner and maintaining that relationship is an important ability for a social animal. For jays this extends to caching: mated pairs are less likely to re-hide items that they have hidden while their partner was present, and even go so far as to chase potential thieves away from the stores of their spouse.

This got us wondering to what extent these birds can keep track of the competition. Remembering which other birds have witnessed particular items being hidden would increase a storer's ability to protect its cache. To look at whether jays are capable of this mental task, Clayton, Emery and I conducted another experiment in which jays hid food in two successive sessions, each in the presence of a different observer. Later that day, the hiders were allowed to return to their caches in the presence of one of the two observers. We discovered that jays tended to re-hide items if watched by the same bird that had seen them hiding the stash the first time. But they did not disclose the location of items hidden in the presence of the other bird by moving them. The discovery that jays can remember

who was present when they hid a cache suggests they can discriminate between individuals with different knowledge states.

Our studies have revealed much about the intelligence of caching jays, but the reason why hiding behaviour is so interesting is that it involves social interaction between two birds — the hider and the thief. Thomas Bugnyar and Kurt Kotrschal, who study caching in ravens*, liken it to a “cognitive arms race”. In these games of hide-and-steal, each bird has a dual role. “Every player not only needs to develop strategies to prevent other birds burgling their own caches but also must gather information on others’ caches, perhaps through spying,” Bugnyar says.

Like us, Bugnyar sees striking parallels between the human world of spies and that of feathered thieves. Just as secret service agents engage in covert surveillance, raven thieves keep their distance when spying on caching birds, Bugnyar and Kotrschal have observed. Watching from the edge of trees and rocks, these stealthy competitors generally wait for cachers to leave the scene before stealing their hoards.

The fact that both hiders and thieves can implement a wide variety of strategies flexibly, depending on the presence or absence of specific individuals, does indicate that they are more than simple instincts. So how do corvids acquire these behaviours?

In trying to answer this question, Clayton and Emery have made the exciting discovery that not all individuals re-hide food. While experienced thieves engage in high levels of re-caching after being observed hiding food, birds that had never stolen another bird’s cache move few, if any, items. It would appear that it takes a thief to know a thief. This suggests that scrub-jays use their past experiences of, say, having been a thief, to predict what another individual, in this case the potential thief, might do. “Experience projection has yet to be demonstrated in any of the great apes other than humans,” says Clayton. “Most people have assumed that it was a uniquely human trait, but the jay studies challenge this assumption.”

⁽⁵⁾ The possibility that scrub-jays appear able to simulate another’s viewpoint is

ruffling some feathers. If corvids can understand each other in ways that were once thought exclusive to great apes, then this challenges our assumptions about the evolution of social intelligence. Our common ancestor with these birds lived over 300 million years ago, so the capacity for social intelligence would have had to evolve independently at least twice. This evolutionary convergence in intelligence is all the more exciting given the divergent structures of the mammalian and avian* brain.

We don't know the extent to which social competition was responsible for shaping the advanced cognitive abilities of corvids. It is generally accepted, however, that so-called Machiavellian intelligence has been an important factor in the evolution of our own big brains. Recognising the parallels between apes and crows might give new insights into the evolution of both. "Corvids and apes are so similar in many aspects of behaviour and cognition that crows could be considered feathered apes," says Emery.

注

corvids カラス科
ravens ワタリガラス
avian 鳥(類)の

問題

1 The following words appear in italics in the text. On the answer sheet, circle the letter indicating the best definition for each italicized word (based on how the word is used in the text).

impressive

- | | | |
|-----------|----------------|----------------|
| a) tiring | b) busy | c) spectacular |
| d) fun | e) complicated | |

inefficient

- | | | |
|-----------------|----------------|---------------|
| a) enjoyable | b) indifferent | c) unpleasant |
| d) disorganized | e) interesting | |

discarded

- | | | |
|--------------|--------------|----------|
| a) spoiled | b) offered | c) sweet |
| d) delicious | e) abandoned | |

secrete

- | | | |
|------------|----------|--------|
| a) conceal | b) mix | c) eat |
| d) ignore | e) shred | |

foiling

- | | | |
|------------|-------------|------------|
| a) scaring | b) stopping | c) killing |
| d) taming | e) helping | |

novel

- | | | |
|-----------|--------------|--------|
| a) old | b) difficult | c) new |
| d) tricky | e) complex | |

hoards

- | | | |
|-------------|-----------|--------------|
| a) children | b) nests | c) territory |
| d) life | e) caches | |

anticipated

- | | | |
|---------------|--------------|-------------|
| a) disallowed | b) predicted | c) declared |
| d) proved | e) rejected | |

outwit

- a) fool b) overpower c) convince
d) destroy e) attack

shunned

- a) loved b) preferred c) created
d) avoided e) used

2 What do the following words, which are underlined in the text, refer to? Answer using one, two, or three English words.

- 1) them
- 2) They
- 3) them
- 4) it
- 5) it

3 According to the text, decide whether the following statements are true (T) or false (F). For each statement circle the correct answer on the answer sheet.

- 1) Scrub-jays are part of the crow family.
- 2) Western scrub-jays have been seen on campus at the University of California in Davis.
- 3) The findings reported in the article support the common belief that complex social intelligence is only found among animals related to or descended from the great apes.
- 4) Clayton doubts that the scrub-jay's habit of re-hiding its food is a way of foiling potential thieves.

- 5) The crow family has a great variety of species, but there are only a few that live in the south pole.
- 6) The author believes that only primates can make tools.
- 7) When faced with new problems, corvids seem to be flexible in how they solve them.
- 8) The crow family is known for its intelligence, playfulness, and for its only colour: black.
- 9) The scrub-jay is quite different from other crows because of its outstanding intelligence.
- 10) In Clayton's research in 2001, it was found that scrub-jays randomly re-hide food, regardless of whether or not they were seen hiding it.
- 11) When another bird is present, scrub-jays often prefer to hide food in a place where the other bird can not easily see them, such as behind a rock.
- 12) In some cases, scrub-jays do not show any preference between well-lit and dark places for hiding their food.
- 13) Jays have been observed protecting food which has been hidden by their spouse.
- 14) According to one of the experiments, jays did not move hidden food in the presence of a bird who had not seen it being hidden.
- 15) When ravens are watching another bird hide food, they tend to stay a good distance away, perhaps hoping the bird hiding the food will not notice them.
- 16) When comparing birds that have never stolen food with those that have, researchers found that the thieves are less likely to re-hide food.
- 17) The phrase *experience projection* refers to the ability to use one's own experiences in order to guess what others might do.
- 18) Due to the parallels between human and corvid social intelligence, the author believes that social intelligence developed at least 300 million years ago.

- 19) The author believes that the ability to simulate the visual perspective of another individual is not limited to great apes.
- 20) According to the author, many researchers believe that competition, including stealing, has helped humans to develop large brains.
- 21) Although many birds and mammals hide food, western scrub-jays are particularly interesting because they cooperate as a group to hide their food from other species.
- 22) The article strongly implies that scrub-jays have intellectual superiority over apes.
- 23) Scrub-jays seem to be able to identify other individual birds.
- 24) Scrub-jays favour a permanent cache where they hide their food.

4 ***BRIEFLY (10 to 20 words) answer the following questions in your own words, using complete English sentences.***

- 1) Why might the feeding behaviour of a western scrub-jay seem inefficient to a human observer?
- 2) Why does the author believe scrub-jays understand that other birds learn about the world through their sense of vision?
- 3) Using multiple examples explain why it is incorrect to assume that the social life of scrub-jays is filled with suspicion and mistrust.

5 下線部(ア)と(イ)を日本語に訳しなさい。

6 複雑な社会的知性は類人猿(*great apes*)だけのものであるという考え方が、なぜカラス科の鳥に関する近年の研究によって揺るがされるのか、日本語 300 字以内で説明しなさい。