Can birds think?

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MY TAME PARROT

Many years ago, we had a visit from a married couple of which the husband was a, clearly sexist, pastor. As soon as he came into the room and saw our parrot, which at that time was still in a cage, he exclaimed quite spontaneously: "*God has created the parrot, so we humans can learn what empty woman talk is*." The Reverend then gave our bird no more attention. While we now sat around the table and talked about the weather the clergyman's wife went to the parrot and studied it from all sides, while Jakob, as we called the parrot, studied her through the cage bars with equal interest. None of them said a word. After about 15-minutes of silence Jakob finally said with a clear and questioning voice: "*what are you glaring at*"? The priest's complexion became pale and during the rest of the visit he was conspicuously silent.

Was Jakob's statement just a random parroting of something he had previously heard, or was there really a form of thought behind it's issues? Of course, it might have been a coincidence that Jakob said the phrase that he did. The strangest thing was, however, that we never before or after this episode heard him say the same sentence: Only this one time. A more likely explanation might be that Jakob had previously heard another human say "what are you glaring at" in similar circumstances and upon experiencing his first subsequent analogous situation had his memory evoked of precisely this sentence. Parrots may have a fabulously good memory.

PARROTS MEMORY

The famous Austrian zoologist Konrad Lorenz, had, in his book *På Talefod med Dyrene* 1953 [Speaking Terms with Animals] described a good example of this endowment: Colonel von Lucanus once had a Grey Parrot (*Psittacus erithacus*) and a Hoopoe (*Upupa erops*), the latter called Höpfchen, and the parrot soon learned to say *"Höpfchen"*. One day the Hoopoe died and in the following years he never heard the parrot say the name of the Hoopoe. After nine years, he got a new Hoopoe, and as soon as the parrot saw it he immediately, and repeatedly, said "*Höpfchen"*. Dieter Hoppe (1997) recounts an even more spectacular event, which not only illustrates a good memory, but also tells of a parrot's faithfulness to a selected partner: A Grey Parrot had established a close friendship to the family's youngest daughter named Bärbel, and when she traveled abroad as an adult the parrot was deeply unhappy and over many months called constantly on his Bärbel and this lasted many years before the bird completely ceased to call for her. Bärbel finally returned home after 18 years and the parrot recognized her voice through two closed doors and, without being able to see her, called out her name.

WHAT IS THINKING?

I couldn't find a satisfactory definition of what it means to think. It is as if everyone knows what it is, but no one can explain or define it. Is thinking, for example, the ability to reason or weigh up from one's pre-existing knowledge, new knowledge, experience, symbolic and mental image, or like a chessplayer think out a situation? The greater the knowledge the deeper the memory, but any thing or concept must first have a name before it can be thought about as a perception. However, many and perhaps most, of the brain processes-are performed unconsciously; for example when we recognize a known person not seen in many years; just like a computer can identify a fingerprint in fractions of a second. Can this be called thinking? I suppose that the same must occur in an animals' brain, the greater its internal conceptual world is (e.g. is

something dangerous, inedible, a friend, an enemy, a thief, above or beneath me in social hierarchy etc.) the better it can react in any given situation. The open question is just how much of such information is innate instincts and how much is learned? The cost of being 'wise' in the form of the necessary 'hardware' such as the construction of a large brain, a complex central nervous system, and an extended pre-adult period of life means that the requirements are very costly. Therefore natural selection has only equipped a few bird families, such as that of the crows and the parrots, with this mental capacity. Most other birds are equipped with no more than the skills necessary for survival and procreation, these probably being in a fine balance between their cost and the advantages they offers in relation to their environment (Ricklefs 2004).

COGNITION

The Black-capped Chickadee (*Poecila atricapillus*) that stores food supplies, supports this theory, since part of its brain (*hippocampus)* shrinks during the part of the year when it does not need to store food (Barnea & Nottebohm 1994). In people new neurons are also formed in the *hippocampus* when challenged by learning tasks, e.g. a new taxi driver who formally must learn all the names and locations of many streets (Maguire et al. 2000). But what does it mean to be a wise and clever bird and can these traits also occur in other bird families? Like thinking, a definitive definition of what intelligence is does not, to the best of my knowledge, exist despite the fact that an infinity of literature has been written about it. Intelligence should not, however, be confused with habituation, such as occurs when animals eventually learn that a scarecrow does not constitute a threat (and birds actually come to build nest in them; Pagh 2007). The word cognition is defined as the ability to understand, learn, remember, and make decisions; opposite to emotion. But is the ability to grasp or understand events not also thinking? Is not a parrot that understands the meaning of what it says, or only remembering the circumstances under which it obtained a name, word, or phrase the first time, performing a kind of thinking or cognition? Brehm writes in a book by him about another Grey Parrot, that a Director Kastner in Vienna was in possession of. When someone knocked on the door of the room it was kept it, the Parrot yelled "*come in"* without delay, but if someone already in the room knocked on the door the parrot didn't react (Russ 1991). Before I continue I will talk about a few of the many other experiences our parrot Jakob gave us, because it was this parrot that inspired me to study the subject of thinking in birds in more detail.

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The author, as a youth, with the talking Yellow-naped Amazon parrot named Jakob.

JAKOB AGAIN

We got Jakob, a Yellow-naped Amazon (*Amazona auropalliata*) in 1963. He was then a young bird, without any yellow feathers in the neck. He could say three Spanish words and cackle like a whole farm full of chicken farm. Therefore, I guess that he had been captured in Costa Rica or Mexico where, where this species lives, and then spent some months in a small village before being sold to a buyer and exported to Denmark. The first hour Jakob lived with us one of our daughter's playmates, called Ulla, came visiting and the first time Jakob heard her name he repeated it at once as clearly as a human being. We soon began to recognize that we had got a language gifted parrot. It wasn't long before Jakob could emulate our three girls' voices to perfection, so we were wrong again and again in correctly identifying the children and the parrot voices. Our youngest was still a baby, and when she cried Jakob also started to cry. This was perceived by our daughter as teasing and so she started to cry even louder, and so did Jakob. Once, when we were not at home, my brother-in-law spoke for a quarter of an hour with the children through the mail slot in the front door, in order to get them to open the door to him, before it finally dawned upon him that it was a parrot he had spoken with and not the children.

Our female neighbor in Copenhagen often had loud quarrels with her husband. When they were visiting us one evening Jakob began to express her bickering voice so lifelike as to be very embarrassing for us. Fortunately she took it from the humorous side. Jakob must therefore have been able to recognize a voice

of a previously unseen person under the new circumstances of her speaking normally and not in an argumentative tone.

In summer, we camped in the north of Zealand and our tent was placed right up against a wooden fence, behind which thousands of bathers had to pass in order to get to the beach. We tied the bird to the wooden fence, while all the time something was going on there. When we drove home again on the Sunday evening Jakob spent the entire trip repeating hundreds of times: "*My God, there sits a parrot"*, but the most amazing thing was that he said it every time with a new voice! His ability to imitate was eminent, and his memory must have been fabulous. But it was only women and childrens' voices that he could mimic in a lifelike way.

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Jakob on a plank fence with admiring spectators.

One year I had forgotten to clip one of Jakob's wings and he managed to escape, and for a whole week he took the opportunity to get to know our local surroundings. One day there was a funeral, and the dean afterwards narrated what occurred to us: The whole entourage stood at the tomb, where the coffin was to be immersed in the earth, but suddenly there came a great green parrot flying and perched in a weeping willow just above the tomb where it continued to ask: "*Can you say something*?" That was a funeral the dean never forgot.

Jakob quickly became attached to me in a rare intimate friendship, and he followed me everywhere. When I worked his favorite place to perch was on my shoulder, and when I watched TV in the evening he laid on his back on my lap, and when I scratched him on his stomach he closed his eyes in well-being. Once I tried to count all the words that we had heard Jakob say and reached 241. This was probably only half of his vocabulary, which included many, many whole sentences. All possible sounds he echoed to perfection; and he could whistle two tunes, always with the left foot lifted up to his head. Our Jakob quickly learned to say his own name and could sit for hours and repeat it, which he said with much gentleness and seeming love in its pronunciation; unlike at other times. We therefore supposed that he knew that he was saying his own

name. When Jakob was alone, we heard him often sit and babble like babies and it was probably during such exercises that he learned to pronounce difficult words correctly.

It is not yet known exactly how a parrot proceeds to form words. They have, like us, a thick tongue but parrots lacks the lips to shape the sounds with. It is supposed they instead use the flexible windpipe and palate cleft (Pepperberg 1999).

The only time I was bitten by Jakob was when I had just returned from a trip to Africa, and when I for the first time took him on the hand again after my long absence he bit me emphatically on the finger. At the risk of being accused of anthropomorphism I will dare to write that Jakob did this to tell me how much he had missed me. As I did not again leave him for a long period of time I did not have to suffer another bite. More objective observers might want to claim that I had behaved differently than normal and this was the reason for the bite, because birds have a unique ability to interpret gestures and moods. Communal life among social birds such as our parrot tends to develop subtle relationships between individuals, which promote bonded relations, and I was clearly his chosen partner. Until a few decades ago it was not thought scientific to attribute animals with human experiences and feelings. About this subject Tim Birkhead wrote in 2012: “In humans, consciousness integrates the different senses. I have no doubt that the senses of birds are integrated as well, and that this integration creates feelings (of some sort) that allow birds to go about their daily lives, but whether they create consciousness as we understand it remains unknown. We have made a lot of progress in the last twenty years and the more we find out, the more likely it seems that birds do have feelings”.

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Jakob on the author's hand.

Jakob had not lived with us for more than a year before he got into the habit of flying up onto the dining table when we ate to taste our food. Soon it formed a large part of his daily diet, even the meat he valued as food. I can only speculate about the thoughts that have been behind such a course of action, but my intuition tells me that Jakob felt like a human being, and therefore it was natural for him, that he would eat

the same as us. Or, he came to the table for our company, because he saw us as conspecifics, and there he then found food, which he tried and liked and so continued to come for our company and to "flock feed" with us.

OTHER SPEAKING PARROTS

I'm not, as already mentioned, the only one who have had a language gifted parrot, who sometimes even says the right thing in the correct context. In Karl Russ's book *Speaking Parrots* (1991), several such episodes are reported. For example he retold Brehm about a corporal major, who one day with a brusque warrior voice ordered his Grey Parrot called Polly: *"get up on the stick, Polly"*. Polly was clearly disgruntled and laughed as it replied: "*up with you on the stick, major"*. Brehm adds that he cannot recite everything this parrot said and did, it was as if it were half ~~a~~ human. In the same book you can read about another parrot, that was in the possession of a Director Kastner in Vienna. A Grey Parrot had the company of a green parrot, and if the latter bird started to scream the Grey Parrot said "*hush"* to cause the green parrot to remain silent. If this did not help it cried out with a loud voice: "*Now stop, you just stop".* Brehm also recounts another Grey Parrot who could chatter in three languages, just as clearly as a human being. François Levaillant (1753-1824) told of a parrot in Amsterdam who could speak clearly in the voice of many different speeches, and without omitting a single syllable, so that it might be confused with Cicero. Here it must be added that this should be taken with a grain of salt, since Levaillant was known to be somewhat imaginative. Buffon (1707-1788) wrote: 'If the monkeys were equipped with the parrots voices, then would people be struck with astonishment, and philosophers would hardly have been able to document that a monkey was still an animal', and Nicola Clayton of the University of Cambridge referred to the corvids as "feathered apes" in 2004.

Captive birds that live closely connected with people are probably the best choice to investigate whether they can think or simply react innately or by instincts. This is because they are, in captivity, removed from their natural environment, and therefore are constantly exposed to influences they would never experience in nature. Maybe bird species under such challenges actually extend their brain capacity, just like the Black-capped Chickadee develops a larger hippocampus when it starts to save food supplies or the taxi driver who, forced to learn a lot of new street names, develops a bigger brain. It is a long known fact that many birds organs undergo changes in size the year round, e.g. length of intestine, size of liver, gonads, immune glands, gizzard etc., therefore it is not an impossible thought that birds in captivity also can change the size of their brain.

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EARLIER STATEMENT ABOUT THE INTELLIGENCE OF BIRDS

Until recently most scientists recognized birds as mentally simple and "bird brain" was a common term of abuse (Morell 2013). Behavioral researcher and Nobel Prize winner Konrad Lorenz wrote back in 1953 about the intelligence of birds: "Even the best speaking birds, which, as we have seen, are very well able to link their sound utterances thought links to specific incidents, but can strangely enough never connect even the simplest purposes with their skills". However, Lorenz admits elsewhere in connection with his tame Raven (*Corvus corax*) named Roa that this bird might have understood that the spoken word "Roa" was Lorenz's contact call. Welty wrote nine years later: "Flight has proved to be an enormously successful evolutionary adventure, but one that has had a high cost for the birds. The birds' ability to fly has replaced it to be wise, because the birds can cope with many problems that they encountered only by flying away from the problem "…" as a consequence, many of the birds' behaviour compared to the mammals' standard are fragmentary, stereotypical, and sometimes astonishingly stupid".

Holger Poulsen, who for many years was the zoologist in the Zoological Garden in Copenhagen, wrote in 1945 in an article titled *Can Birds be wise?* that birds with a real sense (clever birds) do exist, but was only demonstrated in the Raven and some parrots, otherwise birds are instinctive creatures. Alexander F. Skutch (2004) wrote in one of his many books that birds' behaviour is not always controlled by their genes: by choosing to imitate any sound, and by varying the frequency of its own and borrowed sounds, demonstrates that birds may enjoy a certain kind of freedom, the same as they do when choosing a partner or a territory after having viewed alternatives.

THE "CLEVER HANS" EFFECT

Animals are known to be able to read human facial expressions. The best-known example is probably a story about a horse, called Hans, who could respond on even fairly complicated mathematical questions by scraping the ground with one hoof the number of times that the answer required. In fact, it had only learned to read the questioner's body language or facial expressions to see when it should cease to scrape with it's hoof. The phenomenon has since been called the clever Hans effect (Lorenz 1953). Man can express almost anything with words, but animals cannot because they have no words. On the other hand, they have entire signal codes of expressions and sounds that they can send out and understand. A parrot cannot read minds but it can sense moods and can learn from what it sees and hears. K. Lorenz (1953) describes, for example, a parrot who, when a visitor made the first intentions movements to leave, with a deep voice said: "*well, see you soon again"* [in German: na denn, auf Wiedersehen]. So thus there are anecdotal examples enough to show that parrots are not only talented imitators but that they also have the ability to answer correctly to social circumstances. But is it real thoughts that underlie such achievements? Is the ability to observe and draw lessons from this the same as intelligence; for example the ability to discern between when someone knocks on the door from outside or inside as detailed above? Or is it only when the bird learns to combine and use the words in a meaningful context that we can talk about real intelligence? Or is the explanation for such behaviour hidden behind an impenetrable veil, which we will never clear away?

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MANY SORTS OF HUMAN INTELLIGENCE

Let us for a moment look at human intelligence. Prof. Howard Gardner from the Harvard University, renewed in 1983 the debate about what human intelligence in his book *Frames of Mind* and repeated 25 years later, by claiming that there are at least seven relatively separate and autonomous kinds of intelligence, namely: 1) the linquistic, 2) the logical-mathematical, 3) the musical, 4) the bodily, 5) the visual-spartial, 6) the interpersonal and 7) the interpersonal. This theory is still turning the education world around. Most people possess a combination of several of these intelligences (Wikipedia). Richard Byrne wrote in 1995 on human intelligence, that in order to be wise requires more than just being flexible to learn: that a person must also be able to think clearly, can solve difficult problems and reason well. I think that perhaps artistic sense and the ability to generalize or combine and plan must also be added to the list. In this connection I would recall Einstein's words that: "Everybody is a genius. But if you judge a fish by the ability to climb a tree, it will live its whole life believing that it is stupid".

THE THINKING GREY PARROT, ALEX

As already documented there was until recently considerable disagreement among researchers about birds' intelligence, but now a single Grey Parrot called Alex seems to have shed new light on the matter. American researcher Irene Maxine Pepperberg, professor at the University of Arizona, read countless reports ranging from Aristotle and up to the present about parrots who could speak meaningfully, and because most authors considered birds only to be talented imitators, she was convinced that here was a

rewarding topic to study. She collaborated with her students and studied and trained Alex since 1977 and achieved amazing results. Indeed, she managed to teach her parrot the first example of communication between a bird and a human.

In order not to be criticized for having chosen a particularly astute bird, she let the pet shop owner select one from among eight random Grey Parrots for sale. Her method of working was completely different from previously where correct responses by birds were rewarded with food. Irene Pepperberg always had a student to help her, and every interaction with Alex was carefully planned in advance. For example, the student was asked about the name of an object in Alex's presence that Irene Pepperberg had in her hand; it could be a key or an apple for example. The student replied immediately and if the object was named correctly was given the key or apple, but if the answer was wrong I.P. immediately said no and the object was removed. During these exercises Alex got only food when he asked for it. In this way he learned the name of about 40 different objects and materials like wood, paper and nut and how to count to six. Alex gave answers to many questions and was able to tell the difference between shapes, colors, quantity, and materials. When Irene Pepperberg introduced him to two differently colored rectangular wood pieces, and asked him, what is different, then Alex replied "*the colour,*" or she presented him for two things of wood but with different shape and asked him, “what’s the same?” he would answer “wood.” He was also, for example, presented with a tray with many different colored things and asked how many there were red, and he could immediately answer with the correct number. He also learned how to ask for what he wanted. For example he could say: "*go chair”* or: “*wanna go chair*", if he wanted to sit on the chair, or even more amazingly, he knew the difference between when he wanted corn*,* or cork, although only one letter is different between the two words. If Alex was given the wrong object he rejected the offer by saying: "*no*"*,* and he reiterated his desire, which showed that he not only knew the meaning of the two words, but also of want. He learned how to tell the difference between large and small. And, on the contrary, he also learned how to tell when two items were of equal size. If he wanted to interrupt a lesson he would said: "*go away”.*

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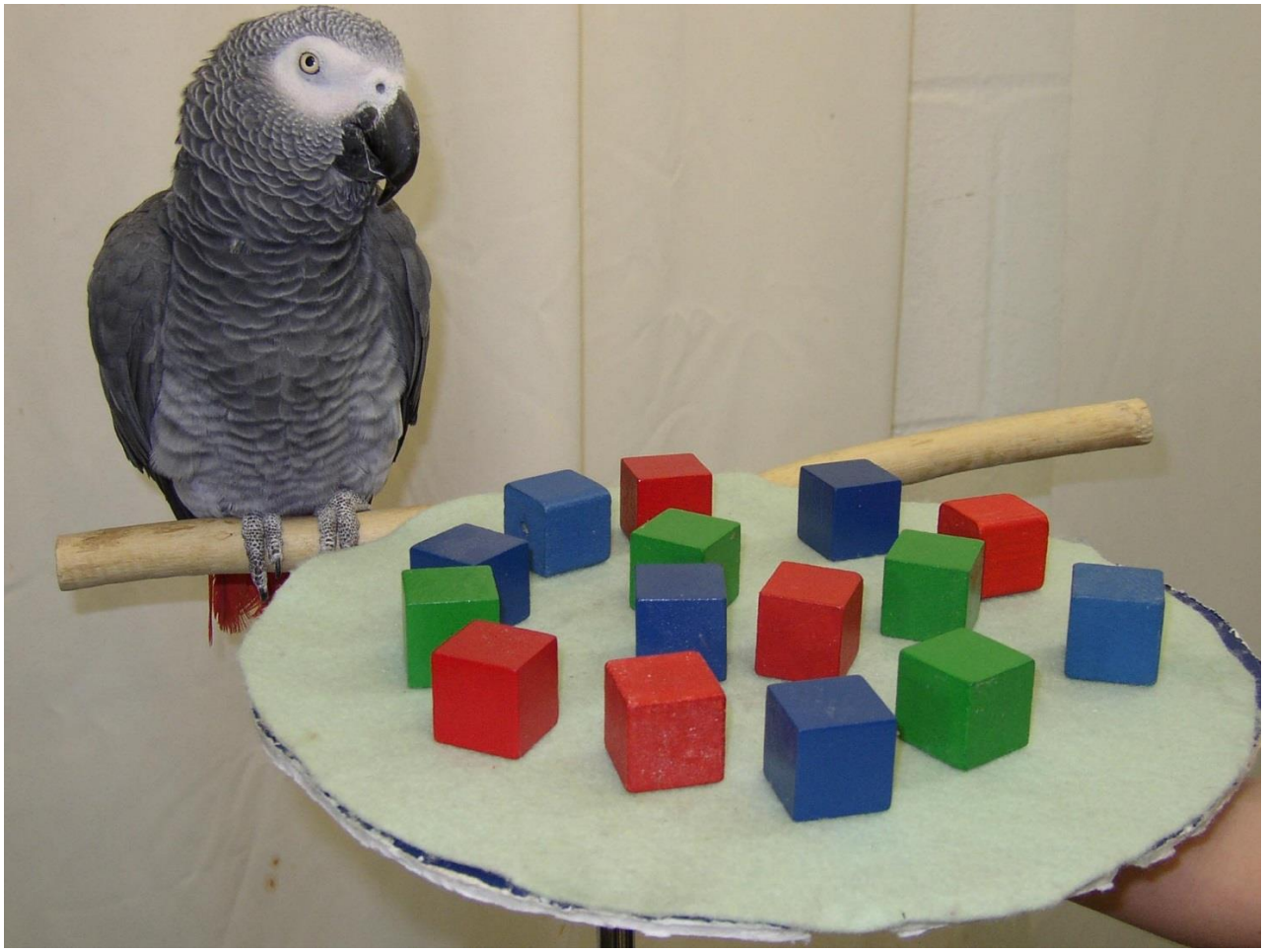
The work with Alex has revolutionized research on birds' cognition, their thought, or all ways in which it takes in information and retain and decide to act upon it. Alex's total repertoire was, however, not more

than 90 words after 16 years of intensive work. He first learned to pronounce the vowels, but his pronunciation at the beginning was very rudimentary, e.g. he said for a long time: “*whuuuwuus”* instead of wood and “*nuh”* instead of no, and it took 1-2 months, before he had learned to pronounce a word correctly. Some words he never learned, for example he said: “*mah-mah”* for matter and *“bok”* for box, and he always called apple “*banerry”.* It took him nine months to learn the difference between same and different. I must therefore conclude that compared to my Jakob, who never got any training, but acquired everything himself, and mostly at the first attempt said a new word correctly, that Alex was not particularly language gifted. To be fair I must add that if Alex was also kept in a family household, where he could hear and learn many words, and not under laboratory conditions, he may have been able to learn as many new words as Jakob did. Maybe he was instead rather language stupid. But that he could think, or perhaps rather that he learned to think, ~~s~~eems beyond doubt. I dare not fantasize about what Jakob might have learnt in communication had he been trained by Irene Pepperberg and her team. Unfortunately, Alex is now dead, having died at 35 years of age.



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Alex was asked: ”*how many are red”* and he promptly answered: *“five”*. Photo: Arlene Levis-Rowe i

However, not everyone is convinced by Pepperberg’s results with Alex. Is Alex only mimicking and repeating sounds ask somebody, or is it only the “clever Hans” effect, as is already mentioned above? Others think Alex’s achievements only reflect a learning process in which behavior is sensitive to, or controlled by, its consequences - termed operant conditioning. However, under a film shooting of Alex Irene Pepperberg was called to the telephone and Immanuel Birmelin got the opportunity alone to ask Alex about the number of first keys and then coins he had in his hand, and in both cases Alex answered correct (Birmelin 2012).

OTHER IMITATING BIRD FAMILIES

Among the birds there are members of groups other than the parrots and some of the crows that can imitate sounds. The Common Hill Myna (*Gracula religiosa*) is probably the best, and it can even imitate the human voice. A large number of bird species are good at imitating other birds' voices and sounds. Among Europe's native birds, the little Marsh Warbler (*Acrocephalus palustris*) occupies the first place. Isolated

from their winter quarters in Africa, it has been possible to identify the song of two hundred other bird species that Marsh Warblers have imitated (Meltofte & Fjeldså 2002). It is a well-known fact that many birds can distinguish between their neighbor's songs and those of intruders, and this is useful in the defense of their territories (Falls 1992).

Maybe music has the same stimulating effect on birds as it does upon people? For example, a the Java Sparrow (*Loncura oryzivora*) can tell the difference between Baroque music and dodecaphony music (Watanabe & Sato 1999). Darwin wrote in 1877: “Some intelligent actions can, after being formed through several generations, be transformed into actions and instinct is innate, such as when birds on islands in the ocean learn to avoid humans. But the largest party of more complex instincts seem to have been appropriated in a completely different way, through the natural selection of variations of more simple acts”. Moreover, Darwin believed that there is only one degree of difference between animal and human sense. The Raven seems from ancient time to have attracted special attention. Right from the ancient Norse sagas, where Odin's Ravens Hugin and Munin were the messengers from the gods; to the indians of America who regarded the Raven as the most omniscient and of God pardoned rascal; and to Konrad Lorenz who considered the Raven the most intelligent bird in the world (Heinrich 1995) the Raven has been noted for its intelligence.

BIRDS SOLVING PROBLEMS

There are many examples of the Raven’s capabilities for solving difficult tasks, such as a Raven who learned how to pull a 0.75-metre vertical string up in order to grab the bait tied to the end of the string. In order to do this it had to coordinate its movements with the beak and foot because for each loop raised by it's beak it had to hold the string firm with one foot before raising the next loop. If disturbed it did not try to fly away with the string-bound meat, which would have been the expected natural reaction, but rather it let the meat go before it flew off (Heinrich 1995). Ravens can even determine whether a competitor is ignorant or clever, and from this knowledge determine the method it should use, e.g. the tactic used when it stores it's food (Boynyar 2002, Bugnyar & Heinrich 2005). However, the most sophisticated method must go the crows in Akita in Japan, which use cars as “tools”. They drop the nuts on the street near a traffic light and when the nuts are cracked by cars and the traffic signal shows red they pick up the eatable. Video : https://www.youtube.com/watch?v=NenEdSuL7QU

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THE RECORD IN REMEMBERING

The absolute avian record for the ability to remember is held by Clark’s Nutcracker (*Nucifraga columbiana)* in winter. Birds are able to retrieve the numerous pine seeds that they stored hidden in over two thousand different sites before the landscape was subsequently made completely different by snow fall; and this is accomplished over large distances, 22km in one case observed. The stored food is retrieved up to 6-9 months after it is hidden; a capacity that most computers would not be able to cope with! Since Clark’s Nutcrackers breed very early in the year, when everything is completely covered by snow, they are completely dependent on their stores of hidden food. How do they manage to find the food? That it is not smell that the birds use was proven by researchers, who removed the food from storage locations only to observe that despite this the Nutcrackers continued to search in the right places. Whereas if they removed some of the land marks in the form of trees from the storage areas the birds gave up the search for food that they had stored! Thus they used land marks to aid their memories in relocating their food hidden from view.

The Clark's Nutcracker rates the quality of nuts with its beak by tapping on them, and thereby avoids storing inedible items. If a bird was seen hiding a nut by a conspecific it would dig it up and store it somewhere else just so long as no other bird was watching it (Balda 1980, Vander Wall 1982, Kamil & Balda 1985, Olsen et al. 1995, Balda et al. 1996). Birds even take the "shelf life" of the food they store into consideration, correctly deciding which stored food item they must dig up and consume while it remains edible (Clayton & Dickinson, 1998). This is called "episodic memory", an endowment to remember both time and place and combine this with practical knowledge, experience most people might think only human beings possess (Jakobsen 2009).

The American Willow Tit (Poec*ila montana*) stores two different kinds of food, and the tit can later find the preferred food item first, which suggests that it can remember which food is stored where (Sherry 1984).

Are the last two examples not a little like autistic people, who can remember the content of an entire phone book? But is the retrieval of stored food by birds indicative of genuine intelligence that requires thinking? Variations in the ability to 'encode' food hideouts and remember information about the surroundings of them can, however, probably be increased by natural selection (Balda et al 1996).

THE ABILITY TO FIND THE WAY

In addition to their purely linguistic abilities, a good memory and the ability to solve problems, the birds possess many other qualities, that were until recently regarded as purely instinctive acts. For example, the ability to find their way to their winter quarters over thousands of kilometers by using the sun and star positions over the different seasons, the earth's magnetism, an internal biological clock, odors, and their remembrance of landforms. In addition, they can even compensate for heavy crosswinds (Berthold 2001). Is it a visual-spatial intelligence as Gardner (2006) suggests? If we manipulate this so-called instinct, for example by capturing and transporting migratory birds away from their usual migration route, what will happen? In the 1950s more than 1100 Starlings (*Sturnus vulgaris*) were captured in the Netherlands, during their move to their winter quarters in north-western Europe, and transported to Switzerland and there let loose. All the young inexperienced birds continued their scheduled migration direction, and ended up at brand new sites, primarily Spain, whereas the old birds flew, instead of in the southwest direction as did the young birds, in a north-western course and therefore ended up on their normal wintering areas (Perdeck 1958, quoted in Berthold 2001). This could indicate that the Starling has not only an innate instinct, but that experience or visual-spatial intelligence also plays a role.

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SOCIAL BIRDS

Many social birds use sentinels to warn of perceived dangers. These individuals must have a good memory about what is normal for the area and what is abnormal, who is friend and who is foe, and make a decision in fractions of a second; something that may require both the ability to learn and memory to retain what is learned. In Florida Scrub Jays (*Aphelocoma coerulescens*) there is a coordinated rotation of the role of sentry (McGowan & Woolf end 1989, cited in Marler 1996). Can we call this intelligence? Social birds must also have a good ability to recognize conspecifics. For example, can a plain "stupid" domestic hen (*Gallus gallus*) learn to recognize up to 100 conspecifics (Guhl & Fisher, quoted in Marler 1996). The answer is yes: The pecking order within a flock of chickens could not function without this memory. Is that not thinking? Also Hooded Crows (*Corvus cornix)* are good at remembering, and can even remember the faces of different individual people. John Marzluff, at the University of Washington captured and ringed some crows while wearing a mask. Subsequently, any researcher who was wearing this mask, but only this specific mask, was greeted by agitated crows (Jakobsen 2009). Also other birds are good at recognizing people. Erik Petersen, from the Zoological Museum in Copenhagen, ringed Common Black-headed Gulls (*Larus*

ridibundus) back in the 1950s, and was very adept at catching them by hand in the air as he fed them. Soon all Black-headed Gulls in Copenhagen at once knew Erik and it was no longer possible for him to catch any. One day Erik dressed himself as an old woman with a baby carriage filled with gull food, but despite the costume he was identified by the gulls before he began to feed them (the author participated in this research). This is impressive when you consider how hard we have to try to recognize individual fellow human beings, especially if they have a different skin color to the observer.

Our cats have all stood in front of the mirror with their front scratched on the mirror feet for long periods of time, in order to fight with the alien cat that they see reflected back at them. The reaction was quite different with an ordinary Eurasian Magpie (*Pica pica*). Here Helmut Prior from the Goethe University in Germany put a coloured sticker on the bird's throat before it was placed in front of the mirror. The bird responded immediately by trying to remove the sticker (Jakobsen 2009). Does that not show self awareness or "intrapersonal" as Gardner call it, a sort of intelligence?

TOOL USE

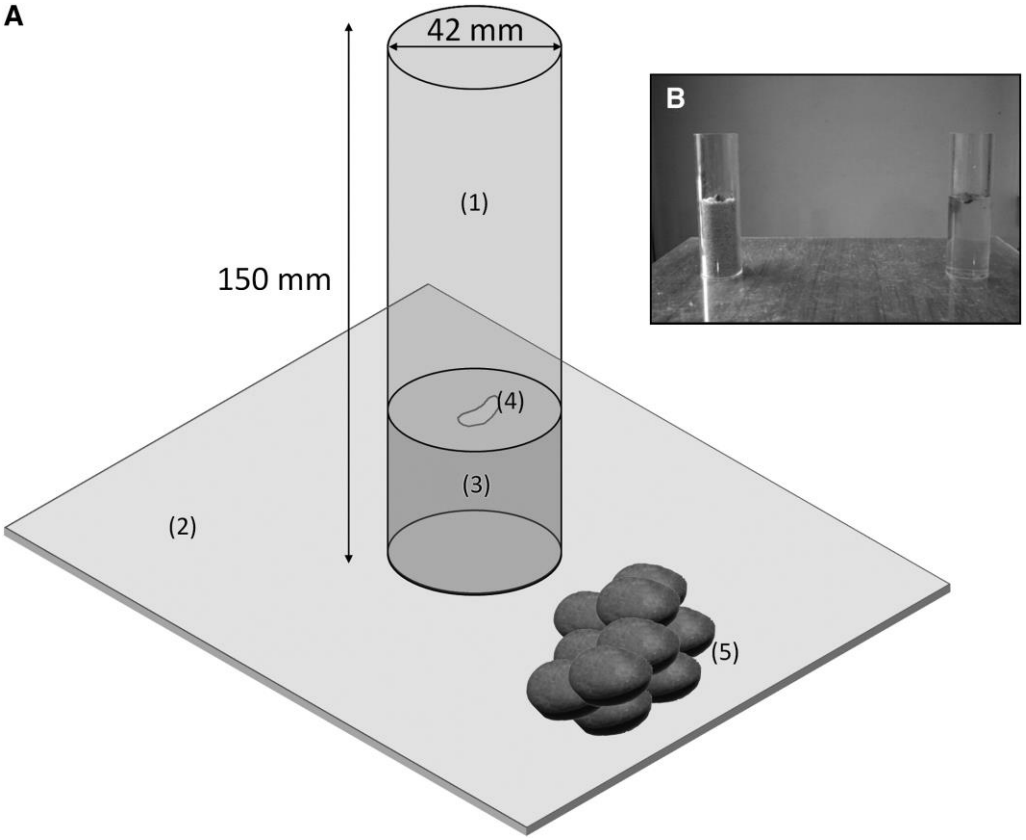
The use of a tool has been demonstrated in many crows (Rolando 1992). Brown-headed Nuthatches (*Sitta pusilla)* use bark pieces as a lever (Morse 1968); parrots use a tool to scratch their head (Boswall 1977); the Palm Cockatoo uses tools to drum on hollow tree limbs (Clifford Frith in litt.); some species of Darwin's finches (Geospizinae) are using cactus thorns and sticks as tools to pierce the larvae in tree fissures (Lack 1947); Egyptian Vultures (*Neophron percnopterus*) use stones to break open ostrich'~~s~~ eggs (Lawick-Goodall 1968), and The Australian Black-breasted Buzzard (*Hamirostra melanosternon*) does this to Emu eggs - a nice example of convergent evolution (Marchant & Higgins 2003); some bowerbirds (Ptilonorhynchidae) build 'avenues' and paint~~s~~ their edifices with fruit and saliva juices by using chewed leaves that acts like a sponge (Frith & Frith 2004). Some pittas (Pittidae) use a stone as an anvil to crush snail shells upon (Erritzoe & Erritzoe 1998). But as to if the use of tools requires intelligence or whether this just occurred by chance, step by step, as Darwin thought, is probably debatable. Some birds have, however, even learned how to improve their tools: for example Darwin finches remove side branches from a selected stick and a captive Blue Jay (*Cyanocitta cristata*) tore strips of a newspaper and used these to manouver food to within it's reach (Campbell & Lack 1985). Not to mention the Green Heron (*Butoides virescens*) that uses feathers as bait when fishing (Lowell 1957, Norris 1975). Clifford Frith (in litt.) once watched a Green Heron that suddenly perched just over the water in front of him in the Amazon basin pick live flies off its back time and time again to drop them into the water and then stare at them to see if fish came to take them! But perhaps most surprising that captive Caledonian Crows modify straight pieces of wire by bending one end of them, placed into an appropriate hole or crevice, to form a hook in order to get the otherwise unobtainable food they wanted (Mitchell 2013).

12

LEARNING FROM CONSPECIFICS

A tit discovered in the 1920s, probably purely coincidentally by accident, that by pecking a hole in the silver foil top of milk bottles that milkmen had left on the outside doorsteps of houses, that it could then eat the cream. This advantageous novel behaviour was observed by other tits and, as a result, was quickly spread throughout England by both Great Tits (*Parus major*) and Blue Tits (*P. caeruleus)* (Fisher & Hinde 1949). Is such learning by observing and imitating some sort of intelligence, or can learning be acquired without consciousness or some form of brain activity? I clearly remember in the 1950s, when the phenomenon was eagerly discussed, that there were some who even claimed that they had seen tits put pebbles in a milk bottle (to raise the level of the fluid) when they no longer could reach the milk. The scholars categorically

rejected this, as this would be proof that tits could think. I wonder if this “old wives’ tale” had its origins in Pliny's account of a Raven, who placed stones in a vase to get the water level to rise (Heinrich 1995:122) or Aesop's fable of the thirsty crow? First in 2004 Bird and Emery tested the story on captive Rooks (*Corvus frugilegus*) and three of four Rooks solved the problem immediately by dropping pebbles into the water container to be able to get a worm (Bird & Emery 2009)! Rooks in captivity were also able to stop the appropriate holes to prevent all of their drinking water running out of its container (Reid 1982). Here I think we have clear proofs of thinking.-



Rooks use stones to raise the water level to reach a floating worm. (Bird & Emery 2009).

13

EXPLOITATION OF RESOURCES

The central problem for all beings is the capture and exploitation of resources. All fruit-eating birds can learn the difference between a green unripe and bitter and a red ripe and delicious fruit (Alcock 2004. Some birds have a very refined hunting technique, where members of the group cooperate to help each other and share the prey afterwards. Ravens are known to use this approach when they hunt hares (Heinrich 1994); many birds of prey also use this method, it perhaps being most refined by Harris’s Hawk (*Parabuteo unicinctus*), in which several birds at once come from multiple directions to attack the prey animal. They can also use a drive and ambush tactics, or they take turns to attack the current prey (Bednarz's 1988 cited in Marler 1996). But such an exemplary behaviour of a social life is, unfortunately, not always the rule among birds. Just as in humans, there are also thieving individual birds, for example the

above mentioned Clark's Nutcracker and Raven. Thus the nutcrackers will dig up their hidden food stores and place them in a new location when another individual had observed where the food was initially hidden. It is not for nothing that we talk about the thieving magpie. There is a lot to keep track of when one lives intimately connected with others. Social interaction is therefore conducive to the evolution of intelligence.

THE AESTHETIC SENSE

The aesthetic sense should also be mentioned in this connection. The well known bowerbirds (Ptilonorhynchidae) decorate their bowers with assorted rarities, both natural and man-made. If one decoration is moved by another bowerbird in the absence of the bower owner it will immediately be removed back again to its favoured location on the bower by the owner upon his return (Frith & Frith 2004). Is that not a sort of intelligence? The nest structures of many songbirds are often pure works of art where alternately reversed windings, overhand knots, slip knots etc. are used to build the nest (Hansell 2000), and a pitta species can build a nest faster with age (Erritzoe & Erritzoe 1998). Many passerine birds use chemicals, such as formic acid from ants, to clean their feathers of parasites (but see Revis & Waller 2004). Perhaps a most amazing behaviour involved an American Crow (*Corvus brachyrhynchos*) that filled a plastic cup with water and transported it five metres to pour the water into a pot containing dried mashed potatoes (Campbell & Lack 1985). Another example of birds that appear to show behaviour with pre-conceived intention are the honeyguides (Indicatoridae) that upon finding an active bees nest, seeks out a human or Honey Badger (Mellivora capensis) and with loud utterances gets their attention, and then directs them to the bees' nest, (they follow the bird because experience tells them they will be able to obtain some honey). The bird's reward is that it gets the bee wax and the bees larvae, after the man or Badger has emptied it of most of the honey.

14

BIRDS PLAY

Finally, we must not forget birds' play or purposeless behavior, since this often requires delicate considerations. Amongst such observations stands not least Konrad Lorenz's (1953) glorious and vivid description of Western Jackdaw's (*Corvus monedula*) playing with the wind by flying together in it. Only the highest developed animals, birds and mammals, seems to play and often this is as part of a young bird's learning process, such ~~as~~ when a crow or a bird of prey flying in the air throws an object and tries to catch it again (Ficken 1977, Alcock 4004). I have seen on a video from Australia adult cockatoos playing on a wind turbine in operation. We once had a Rook (*Corvus frugilegus*), which we had raised from a nestling and it was therefore quite tame. I was once painting the house window frames, when the Rook snatched the brush in an unguarded moment and flew to the top of a tall beech tree, from which it apparently enjoyed my loud protests. Finally, however, it took pity on me, and let the brush fall to the ground. I dare to ask if that was it a kind of teasing play in spite of I know that is a very anthropomorphic interpretation of what happened? All here mentioned species belong to the birds which are born helpless and rely more on learning (artricial species), and only few more fully developed at birth (precorial species) – and therefore more independent of learning - have been observed playing (Ortega & Bekoff 1987).

The above is just a small selection of examples of unusual bird behaviour, some of which is difficult to explain, if avian thinking is not taken into account. As previously mentioned, Welty in his 1962 book stated that the birds stood far behind mammals in intelligence. In an edition of the same book from 1980, however, I haven't been able to find this claim repeated: Perhaps he changed his mind. In 1996 Marler, for

the first time in history, took up the task of using the literature to find out if mammals are “smarter” or more bright than birds, or in other words, if mammals have more complex thought processes. His conclusion was that birds are far superior to mammals in voice utterances, and in social contexts birds are fully on a level with the highest evolved primates except for humans. However, just as in humans, there are significant differences in birds in their mental capacities, even within species. Is Holger Poulsen therefore possibly correct when he claims that only a few birds are clever, and most birds are only instinctive creatures? Think, for example, of the Reed Warbler (*Acrocephalus scirpaceus*), which passively looks on that Cuckoo (*Cuculus canorus*) chick as it pushes all its own offspring out of it's nest to a certain death. But, on the other hand, the Reed Warbler is able to navigate at night in rumbling darkness during its migration southward all the way down to Guinea in West Africa; and next year back again to its old nest site (Bønløkke et al. 2006). Are we going to revise our view of avian intelligence and, just as we do in humans, recognize that intelligence in birds is also expressed in many ways and some species and individuals are more intelligent than others? Maybe the bird's brain will tell us anything about the development of our own brain at some point as a result of future research?

15

A Cuckoo chick (only its naked wings visible here) throws an egg of the Reed Warbler out of the warblers' nest while a parent fails to react to it's loss. Photo: Oldo Mikulica.

ADHUC SUB IUDICE LIS EST (the dispute is yet to judge)

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