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The aim of the SCHIENA PROJECT is to investigate the relations and communications between species and, more specifically, the possibility of communication between humans and other animal species. In our opinion, this question requires us to identify the various mental abilities which might underpin this type of communication. Our hypothesis, in effect, is that the mental abilities of different species define the "worlds" in which the members of each of these species live as has already been indicated by the work undertaken by Jacob von Uexküll [1965].[1]

Due to the space constraints here, it will not be possible to address all the abilities in question. That is why we choose to focus on the question of language and thought [Laplane 2000 and 2001]. To succeed in decoding the language and thought of other animal species would undoubtedly be the best way of identifying the conditions under which it might be possible to communicate with them without, however, falling into the trap of anthropomorphism. Since we have not as yet achieved such a state, when face-to-face with their animal companions, people sometimes feel as Egyptologists might have felt before the discoveries made by Champollion, or indeed as an archaeologist might feel today when confronted by a script in linear A, except for the fact that the difficulty is exacerbated by the diversity and multiplicity of the various species.

Quite independently of these considerations, the question of language continues to be a key issue in the debate concerning the continuities and discontinuities between animals and humans [Hauser, Chomsky and Fitch 2002; Premack 2007; Penn, Holyoak and Povinelli 2008]. Moreover, this question relates less to the existence or non-existence of animal language or animal thought - after all, everything depends on the way we define language and thought – than to the characteristics or properties of this language, compared with the characteristics and properties of the so-called "natural" human languages.

Our aim here therefore will be to provide a better characterization of the properties of the two types of language. To do this, we shall take as our starting point a recent study of the acquisition of vocabulary by a border collie [Pilley and Reid 2011], the conclusions of which

[1] Supporters of the idea of distributed cognition might make the criticism that this conception places too much emphasis on mental abilities and is therefore interested only in what goes on "in the heads" of organisms without taking account of the fact that these mental abilities are inseparable from the body which is itself situated in an environment which is rich in "affordances" [Gibson 1979; Barrett 2008]. Our answer here is that an element in the environment will only constitute an "affordance" for an organism that is capable of apprehending it as such. What will be an "affordance" for one organism will not necessarily be so for another [Osiurak, Jarry and Le Gall 2010].

we shall compare with those of other studies into animal language as well as, and above all, with the conclusions that can be drawn from the study of aphasias in humans.

John Pilley and Alliston Reid [2011] performed four experiments with this dog, which was named Chaser, in order to reveal:

- her ability to learn "proper-noun names";
- her ability to distinguish between the "proper-noun names" of objects, on the one hand, and command words (verbs) on the other;
- her ability to learn "common nouns"[2] ;
- her ability to learn the names of objects "by exclusion".

An ability to learn "proper-noun names"

The first experiment showed that Chaser was able to learn and remember the "names" of 1022 objects. However, this number did not represent any absolute threshold and resulted simply from the decision to stop the experiment after 32 months. It is likely that if the experiment had been continued, Chaser would have shown herself to be capable of learning more names.

According to the authors, this first experiment proves that Chaser possesses "several capacities necessary for learning receptive human language: the ability to discriminate many nouns phonetically, the ability to discriminate many objects visually, a sizable vocabulary, and a sufficient memory system" [Pilley and Reid 2011: 6]. This claim deserves to be discussed in the light of the experiment itself. In particular, the authors emphasize the fact that each of the objects was unique and had only one name which consisted of one or two "words". To prevent any naming errors on the part of the experimenters during the various learning and test phases, the name of each object was written on the object with a permanent marker. In other words, the authors had taken all the necessary precautions to ensure that the relation between all the objects and all their names (the entire set of their "proper-noun names") was perfectly bijective and continued to be so throughout the three years of the experiment: any given object only ever had one name and, conversely, a "name" was only ever used to designate one specific object.

The experiment therefore created a perfect labeling system with invariable "name-object" associations. It created a "name-giving system" ("une nomenclature") or, in other words, "a list of words, each corresponding to the thing that it names" [Saussure 1959 : 65][3]. However, human languages are characterized precisely by the fact that the set of designated things and the set of words that designate them is never bijective. Unlike in the case of the experiment conducted by John Pilley and Alliston Reid [2011], in human languages, each element of the set of objects (including abstract objects such as angels or spirits) can have several correspondences in the set of words (synonymy), just as every element in the set of words can have several correspondences in the set of objects (polysemy). In human languages, words are characterized by their lack of exclusive correspondence: there is no unequivocal relation between the word and the thing it designates.

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[2] The expressions "proper nouns" and "common nouns" are those used by the authors who also make use of the terms "nouns", "names", "words" and sometimes also "symbols" when referring to the "vocabulary" acquired by Chaser during the course of the experiments but without distinguishing between these.

[3] It must also be said that it does not go beyond "the superficial notion of the general public: people see nothing more than a name-giving system in language" [Saussure 1959: 16].

This first experiment reveals Chaser's auditory and visual perceptual discernment abilities. It also demonstrates her ability to learn and remember a large "vocabulary" in the form of a store of items. However, the authors' insistence on establishing a perfectly bijective relation between the set of objects and the set of "proper-noun names" also emphasizes a very clear difference between the ways in which Chaser and even very young children function.

In effect, when children gain access to language, they understand that words have no fixed "belongingness" and are thus able to make use of both polysemy and synonymy. Even better, children access language through polysemy and synonymy as is proved by the "mistakes" that they regularly make, starting with the incorrect generalizations that have been noted by all observers ever since the 19th century or earlier: children call all men "daddy"; they use "steam" for steam trains, steamboats or the coffee machine, and use "willy" to refer not only to a clysopump but also to all long, hollow, thin objects that resemble it [Taine 1870, cited by Quentel 1993]. In short, a child who makes a so-called incorrect generalization is using a single word to designate several realities which adults designate using a range of different words. However, this in no way means that adults' vocabulary has become monosemic and that the relation between the set of words and the set of realities they designate has become bijective. Polysemy persists, in adults as in children, as, in English for example, the multiple meanings of words such as "orange", "table" or "disk" testify. The neurologist Dominique Laplane, who cites some of the possible meanings of these last two words by way of an example, claims that polysemy is the true "soul" of language [2000]. Polysemy gives it its flexibility just as play lends flexibility to mechanical engineering:

Parts that are too tightly assembled cannot move against one another [ibid.: 119][4].

And he adds:

The very idea of a language that is in itself free of imprecision is absurd. It would require a vocabulary consisting of quasi-proper nouns, a nomenclature of tables based on their size, their purpose, their material, in the full knowledge that this nomenclature will never be complete [ibid.: 120].

This, however, is what John Pilley and Alliston Reid [2011] constructed with Chaser in this first experiment: a nomenclature that is so precise that each name designates only a single object and each object is designated by only a single name. Such a language is very uneconomical and would require an infinite number of names to designate an infinite number of realities. In contrast, polysemy enables human languages to designate an infinity of realities with an admittedly large but nevertheless finite number of lexical items.

This idea that human languages can produce an infinite number of meanings based on a finite number of items has been familiar to linguists at least since the work of Michel Bréal who first coined the term "polysemy" [1897, cited by Pergnier 1976].

This ability has been identified as one of the specifically human characteristics by a number of authors who also use the term "recursivity" in this context [Hauser, Chomsky and Fitch 2002: 1 571; Premack 2004]. It testifies to the abstract character of lexical items. Thus the word "bread" does not refer solely to the object "bread" with precise perceptual characteristics. It can also designate "gingerbread", the "bread of life", "the side the bread is buttered" or even "a punch in the bread basket". Children, with their so-called incorrect generalizations, make use of this abstraction when they ask for help "peeling a sweet" based on the model of "peeling a banana" [Quentel 1993]. It is necessary to turn to certain children

[4] Dominique Laplane borrows the example of the word "disk" from Maurice Pergnier [1976].

who present deficits in order to find the “nomenclature” type of functioning that the authors revealed in Chaser.

In his *Rapport sur Victor de l’Aveyron*, the doctor Jean Itard complained long ago of not being able to teach Victor anything other than this type of nomenclature [1806: § XXVI]. In the present case, one could object that this “nomenclature” type of functioning might be due more to the choices made by the authors and their conception of language than to Chaser's functioning itself. However, there is reason to doubt this since attempts to teach language to the great apes have not been any more conclusive: although these animals are undoubtedly capable of symbolization, that is to say the ability to associate a word (or a lexigram) with a meaning (which is not limited to the objects used in the experiment under discussion here), such attempts have failed to go beyond “associative connections” [Lestel 1995 : 55]. Several decades of intensive training have failed to equip these great apes with the grammatical abstraction which polysemy, among other things, presupposes [Penn, Holyoak and Povinelli 2008].

An ability to distinguish between and associate nouns and verbs

The second experiment consisted of testing Chaser's ability to understand, without learning or any prior training the associations between three verbs of command – “take”, “paw” (i.e. touch with the paw) and “nose” – and three objects used in experiment 1. These three verbs and objects were randomly combined to produce a series of 14 commands (the same combination out of the nine possible could therefore appear several times. She always performed the given instruction without error. The authors concluded that she was able to understand that a noun refers to an object independent of the action she is asked to perform on this object. They thus refute the hypothesis, put forward by other researchers [Kaminsky, Call and Fischer 2004] in an earlier experiment, that a sound item is simply interpreted as a command. They also concluded that she was able, “*as do children*, to understand the novel combination of two-word phrases” [Pilley and Reid 2011: 7; our emphasis].

As in the preceding experiment, we believe that this constitutes an over-interpretation of the results by the authors. The experiment is undoubtedly convincing regarding Chaser's ability to discriminate between items, some of which designate actions and others objects. It is also convincing regarding her ability to understand what is demanded of her in the form of combinations of these items. But can we deduce from this that Chaser here is acting “as children do”, that these items are, for her, “words” and “phrases”, and that she is able to understand that a sequence such as “take lamb” consists of two different morphemes that are independent of one another? Nothing could be less certain.

In effect, patients with Broca's aphasia who have lost their mastery of word units and, similarly, the syntactic relations between these units, are still capable of juxtaposing the items and of differentiating between them. Thus, in a naming task involving three items (a boy tying his shoelaces, a boy putting on his coat and a girl combing her hair), Broca's aphasia patients are able to produce utterances in which, although they are clearly “ungrammatical”, the items continue to be juxtaposed and differentiated: “the boy does the shoe lace” is different from “the boy does the coat” and “the girl does the hair” [Guyard 1987: 196; Sabouraud 1995: 209].

This is because a word, from a linguistic viewpoint and in its status as a unit, is not just a sound item like those that the experimenters taught Chaser. It is an abstract framework for variation. A phrase such as “take the ball” is a noun phrase that can be broken down into two

words: “take” and “the ball”. Each of these two words is itself a framework for variation: “take” (second-person imperative) is not “let's take” (first-person plural imperative) or “you take” (second-person indicative) or “let him take” (third-person singular subjunctive). In the opposition “take/you take”, the absence of the pronoun “you” is itself significant: it is this that indicates that we are in the presence of an imperative rather than an indicative phrase. Similarly, “the ball” is not “a ball” or “some balls”. Finally, “ball” is not “balloon” or “ballooning”, which can be produced by derivation.

Children use and understand this framework for variation, as a type of mistake different from the incorrect generalizations shows: the generalizations by analogy which they inevitably produce as soon as they start to speak. Having, for example, by themselves identified the relation between the “present” and “past” as it exists, in French, between “il est/he is” and “il était/he was”, and the relation between “singular” and “plural” as exists between “il est/he is” and “ils sont/they are”, they can say “ils sontaient” instead of “ils étaient” for “they were”[5]. Similarly, in English, children regularly produce “catched” for “caught” or “drinked” for “drank” or “drunk” based on the model “I love/loved” [Jespersen, 1922 : 130, cited by Quentel 1993 : 86]. There is no need to teach them the reasoning that leads to these “mistakes”: they produce them perfectly spontaneously by applying the grammatical rule that they have identified. The adult who has at no stage taught this logic then tends to intervene by explaining that “you don't say it like that”, thus emphasizing that the internal logic of language is often flawed due to the exceptions and irregularities which result from its history.

Broca's aphasia patients, in contrast, have lost the mastery of this framework for variation. As a result, they tend to reduce their utterances to a few items which bear the meaning of what they have to say. However, these patients are still capable of combining these items as Chaser does and as chimpanzees also do. This preserved ability of Broca's aphasia patients to combine items even though they have lost the mastery of the grammatical links between words is emphasized by Dominique Laplane who concludes from this observation that language is not the be-all and end-all of thought: the deterioration of language in aphasic subjects does not eliminate all forms of thought in them [2000 and 2001]. However, the consequence of this finding is that the observation of a form of thought or animal intelligence does not allow us to conclude that it is identical to human language: although Chaser combines many items, she does so in the manner of a patient with aphasia and not in the way a normal child does. With regard to this point, Jean Itard [1806, with Victor de l’Aveyron, arrived at the same result as our authors have done with Chaser. To summarize, if the sound items used are “words” or “morphemes” for the authors, the experiment in no way proves that they are also this for Chaser. It is also not necessary that they should be in order to account for the results of this second experiment. To do this, it is sufficient to note that Chaser is able to distinguish between the perceptual sound cues they constitute, that she is able to associate these with objects or actions and that she is able to combine them.

An ability to distinguish between “proper noun names” and “common nouns”

The aim of the third experiment was to determine whether Chaser was capable of distinguishing between a “proper noun name” (as defined in the first experiment: “single name-single object”) and a “common noun” (referring to multiple objects which share

[5] Personal observation by Jean-Michel Le Bot.

common characteristics). The task was to teach Chaser to associate three new nouns with objects belonging to three sets or subsets, i.e. to associate the word “toy” with the set of objects with which she was allowed to play (the 1022 objects which she also knew by their “proper-noun names”), to associate the word “ball” with the subset of these objects which looked like balls, and the word “frisbee” with the subset of these objects that resembled disks. The experimenters' viewpoint was as follows: all the “ball” objects (116 objects) and all “frisbee” (26 objects) were also a “toy”, whereas not everything that was a “toy” was necessarily either a “ball” or a “frisbee”[6].

Following the end of the learning period, the tests consisted in asking Chaser to take 8 objects of each category one-by-one from among a set of 16 objects. Thus, for the test conducted for the “toy” category, Chaser had to take a toy from among 16 objects (8 toy objects and 8 non-toy objects), then a toy from the 15 remaining objects (7 toy and 8 non-toy objects), and then a toy from the 14 objects that still remained (6 toy and 8 non-toy objects), etc. Chaser showed herself to be able to choose objects belonging to the requested category and distinguish these from the other objects. The authors concluded from this that Chaser was able to map “one label onto many objects”, thus showing that “words” could “represent categories” for her [Pilley and Reid 2011: 9].

However, once again, we wonder whether the authors might be over-interpreting their results. Might it not be necessary to ask in a little more detail just what a category is? To do this, let us take another look at the experiment. The authors wanted to test Chaser's command of what they termed “common nouns”. They define a “common noun” as “a symbol that refers to a category of objects” in contrast to a “proper noun”, tested in the first experiment, “that refers to a particular object” [Pilley and Reid 2011: 7].

To linguists, these definitions are somewhat ambiguous. In effect, in human languages, common nouns do not constitute a specific set of words characterized by the fact that they designate an object within a set of objects that share a common perceptual property or common usage while, for their part, the proper nouns refer to one object and one only. It should also be noted here that definitions of proper and common nouns given by the authors of the paper differ from the traditional definitions found in works of grammar. The *Grévisse*, for example, a well known french grammar, states that the way common nouns are used depends on the meanings and definitions they possess, whereas proper-noun names possess no real definition or meaning but are associated “through a special convention” with the thing they designate: people, places, epochs. A large volume of linguistics literature has been dedicated to this question and it is not our intention to review it here.

Here, it is particularly important to note that the relation between the set of proper nouns and the set of realities they designate (people, places, epochs) is no more bijective than the relation between the set of common nouns and the set of realities that they designate [Urien 2009: 203]. Even people's names are not absolutely unique and associated with one single person alone. They, too, comply with a principle of economy since there are not as many personal names of person as there are people (there are several Jean-Michels, several Le Bots and even a number of different Jean-Michel Le Bots). Proper nouns do not therefore establish a perfect association, or “nomenclature”, between an item and a thing of the type constructed by the experimenters in order to test vocabulary learning in Chaser. The non-bijective nature

[6] The absence of the plural is important here: the authors did not test Chaser's ability to discriminate between singular and plural (toy/toys).

of words in human languages can be observed both at the level of proper-nouns and at that of common nouns.

As far as categorization is concerned, this relates less to the fact that a single word can designate several objects that have at least one characteristic in common than to the phenomenon whereby semiological identities can vary within a unit, itself semiological, which is disrupted in Broca's aphasia. In the field of semiology, categorization takes the form of variations based on a paradigm or, in other words, inflection (in the case of conjugation and declension in particular) or derivation. Thus the grammatical relations expressing partial identity which exist in English, for example, between "I sing/you sing/he sings/we sing/you (plural) sing/they sing", between "they/them/theirs" or between "song/to sing/singer/singing"[7] are all related to categorization. This categorization phenomenon is used by speakers when they form semantic fields based on inclusion and exclusion relations and which can be traversed with equal ease from the most specific to the most general or from the most general to the most specific ("carrot" is included in "vegetables", which is included in "plants"; "plants" includes "vegetables", which includes "carrot").

In the light of this exposition, what exactly does Chaser do in terms of categorization? After having learned them, she already knew the "proper-noun names" of most of the objects used in this third experiment for which she then learned, at the instigation of the experimenters, the "common nouns" which the latter had attributed to them. However, the case of "ball" is, in reality, very similar to what took place in the first experiment: Chaser was trained to associate this item with objects that have certain perceptual characteristics in common (they are all round and elastic). Admittedly, the item is no longer associated with the object in the same way as a body that can be manipulated independently. Nevertheless, it remains uniquely associated with a perceptual characteristic of the corresponding objects. The case of "frisbee" is similar: Chaser was trained to associate this item with disk-shaped objects. In the case of "toy", Chaser was trained to understand that this item could be associated with any of the objects that she already knew, with any object already associated with a "proper-noun name" and with which she was allowed to play. However, this item was not associated with other new objects introduced by the experimenters during this experiment, i.e. objects which had hitherto been visible in her environment but were out of her reach and with which she had never had any particular relation (she was not explicitly forbidden to play with them but had never had the opportunity to do so). The authors put it as follows:

Chaser learned that she could play with toys; she could not play with non-toys. [Pilley and Reid 2011: 7].

"Toy" therefore introduced an association not between an item and the physical characteristics of objects but between an item and the fact of being able to play with certain objects. In all three cases, Chaser gives the impression, as the authors stress, of having "mapped one label onto many objects". However, this is because these objects possess a shared perceptual property: a round, elastic shape in the case of "ball"; a disk-like shape in the case of "frisbee"; and the fact of "being able to play" in the case of "toy". There is therefore still a close association between a sound item and a percept (what is perceived) and the most important difference between this third experiment and the first lies in the fact that in this experiment the percept is common to several objects. This result makes it necessary to take

[7] The first example is, of course, an example of conjugation (categorization or inflectional paradigm) and the third an example of derivation. The second example is a surviving English declension that is quite similar in its operation to the Latin anaphors *is, ea, id*: "they are here" (subject: nominative), "I see them" (direct object: accusative), "I have theirs" (possessive pronoun: genitive).

account of the complexity of the perceptual ability or “gnosia” [Charnallet and Carbonel 2000].

In the field of visual perception, researchers into human clinical neuropsychology have found it necessary to distinguish between various agnosias including aperceptive agnosia and simultagnosia [Cambier 1995]. In the first, even though patients are perfectly able to perceive the qualities of objects (dimension, texture, color), they no longer recognize these objects since their perception of the shape of these objects is purely fragmentary. They therefore find it “impossible to match two objects that have an identical shape or to associate an object with a picture that corresponds to it” [ibid: 185]. In the second, patients perceive the shape of objects but find it difficult to see multiple objects at the same time and thus localize one object in relation to others[8]. The above observations are sufficient to show that, with regard to object recognition, perception combines the identification of qualities and the delimitation of units, thus making it possible to match them both on the basis of their qualities and on the basis of their shape.

It is this complex character of perception that the authors asked Chaser to exhibit in this third experiment by teaching her to associate not a sound item with a unique object but a sound item and a quality common to several objects. It seems to us that the principle of parsimony should apply here as much as in the first two experiments and that there is still no need to seek an explanation in terms of semiological abilities and verbal categories[9]. It should also be noted that the experimenters tested Chaser's ability to discern category-by-category (“toy” objects among “non-toy” objects, “ball” objects among “non-ball” objects, “frisbee” objects among “non-frisbee” objects). What would Chaser have chosen if she had been asked to take a “toy” and then a “ball” from a group of objects that are, by definition, both “toy” and “ball”? Or a “toy” followed by an object belonging to the “frisbee” category and designated by its “proper-noun name” and then any “frisbee”?

This question is related to an observation made by David Premack [2007] who noted that even if it is possible to prove that chimpanzees are able to sort objects “by category” (placing, for example, apples and grapes in one box and bread and biscuits in another), it has never been proven that they are able to comprehend the non-reversible relation between an object and its category (by recognizing, for example, that “apple” is included in “fruit” but that “fruit” is not included in “apple”). For their part, Hubert Guyard and Jean-Claude Quentel showed that two young girls who resided in a mental health institution due to their mental retardation (one had an IQ under 40 and the other an IQ under 25) and who had never acquired language capabilities were nevertheless able to form “ideatory fields”, such as those corresponding to fruits, animals or eating utensils. They sometimes confused items designating objects within a given field but never when the objects belonged to different fields [Guyard and Quentel 1984; Quentel 1993]. These observations also tend to indicate a discontinuity between Chaser's performances and those of normal children while also

[8] In the literature, the distinction between these two agnosias is traditionally considered to correspond to the distinction between the two “pathways” involved in visual perception: the occipito-temporal (or ventral) pathway and the occipitoparietal (or dorsal) pathway. The former is frequently referred to as the “what” pathway (since it permits the recognition of objects) and the latter as the “where” pathway (since it makes it possible to locate them) [Charnallet and Carbonel 2000].

[9] Instead, it is necessary to consider, in animals, the distinction between auditory gnosia and visual gnosia which is attested to in humans by a number of distinct pathologies. It also appears to be necessary to consider the distinction between “perception” and “association” whose existence in humans is proven by the difference between aperceptive agnosia and associative agnosia [Cambier 1995; Eustache 1995 ; Béland et al. 2000].

providing support for the idea that a certain amount of “categorization by matching” is possible at the perceptual level in the absence of grammatical categories.

An ability to learn “by exclusion”

Finally, the aim of the fourth experiment was to determine whether Chaser was able to reason and learn words “by exclusion”, that is to say by “inferring the referent of a new word through the logical exclusion of the other alternatives” [Pilley and Reid 2011: 9) and then remembering the association between the new word and the new object. The material used was the same as in experiment 1 extended by 64 new objects whose names Chaser had not previously learned.

The experimenters started by excluding the hypothesis that Chaser might have a preference for new objects by asking her to fetch, one at a time, eight objects whose names she had already learned and which were presented in combination with two new, unknown objects. Chaser passed this test without making any mistakes and always ignored the two unknown objects which she was not asked to retrieve. She therefore showed no preference for new objects.

The “reasoning-by-exclusion” experiment itself consisted of placing seven objects whose names Chaser already knew and one new object whose name she did not know in an adjoining room. This experiment was repeated eight times at the rate of one pass per day over a period of eight days. During each pass, the experimenters first asked Chaser to fetch two objects which she was familiar with among the seven selected objects and then spoke the name, which was new to her, of the novel object. When Chaser returned with the correct novel object, the experimenters greeted her with “good dog”. On the first trial, however, Chaser did not immediately return with the novel object. A quick glance showed that she stood among the objects without doing anything. She needed repeated encouragement (the authors do not say what this consisted of) before taking the novel object and bringing it to them. The same was true of the second trial, in connection with which the authors refer, without further details, to “special” encouragement. In contrast, on the final six trials, Chaser returned with the novel object unaided. The authors conclude that Chaser succeeded in the test each time, thus demonstrating her ability to reason by exclusion.

The authors also tested Chaser's retention of the novel name immediately after the reasoning by exclusion test, then 10 minutes afterwards and finally 24 hours later. While the success level was good immediately after the trial and ten minutes later, it was nevertheless very poor 24 hours afterwards. Thus, in the absence of any particular association and retention work, Chaser forgot the novel word quite quickly (unlike the words learned in experiment 1). This rapid forgetting is consistent with what has been observed in similar experiments.

The entire procedure used in this fourth experiment was replicated two years later with a new group of objects that were entirely unknown to Chaser. The results were very similar. However, the authors, concluding once again that Chaser had succeeded in the test, do not indicate whether or not she again needed encouragement during the first two trials.

What can linguists tell us about this new experiment? Is it possible to speak with such assurance as the authors of “reasoning by exclusion” or the “logical exclusion” of the other alternatives?

It is clear that, although initially confused, Chaser finished by retrieving the correct objects. However, to achieve this it was necessary – as the authors acknowledge - to provide

her with “special” and repeated encouragement. It would be interesting to know more about the nature of this.

What did Chaser do? Chaser was confronted with a new “name” and a novel object whereas everything else was known to her and was clearly not what she had been asked to fetch. She could see all the items and, after encouragement, finally associated the new sound item with the novel object in the same way that she had previously associated other items with other objects. This result, no more than others, requires us to postulate an ability to perform grammatical abstractions. Nevertheless, it confirms that a certain level of perceptually based deduction by exclusion is possible.

This deduction by exclusion had already been seen to be effective in the young girl with the higher of the two IQs but who, like the other, was still unable to acquire language [Guyard and Quentel 1984; Quentel 1993]. It should be noted here that, in terms of the principle involved, the test used by John Pilley and Alliston Reid [2011] was similar to that employed by Hubert Guyard and Jean-Claude Quentel several years earlier. This consisted of presenting the young girl in question with three pictures which she had already associated with a word and one picture that was still unknown to her. The young girl had to indicate the picture corresponding to the spoken word (the three words already associated with the known pictures and one unknown word). In this test, she showed that she was capable of associating, by exclusion, the unknown word with the unknown picture. The learning experiments conducted with Victor de l’Aveyron more than two centuries earlier also yielded similar results [Itard 1806: § XXVIII].

Conclusion

There are clearly similarities between what Chaser is able to achieve and what is achieved by human beings. Chaser is undoubtedly able to discriminate visually between objects on the basis of perceptual cues. She is able to discriminate between the sound sequences which correspond to the different items or “names” that she has been taught[10]. She is capable of the bijective association of a large series of items with a large series of objects and of permanently remembering these associations. She is also able to discriminate and delimit two items included in a single sound sequence and to spontaneously understand their combination. These similarities are not, however, sufficient to claim that what Chaser does and what children do are the same thing - as John Pilley and Alliston Reid [2011] do with undue haste. It is on this point that we believe the authors seem to be a little incautious in the conclusions they draw, speaking too readily of “words”, “nouns”, “phrases”, “phonetics”, “logic” and “categories”.

As David Premack [2007] points out, the observation of a similarity between an animal behavior and a human behavior does not make it possible to conclude that these behaviors are identical. To do this, it would also be necessary to prove that there are no differences. However, there are very great differences between what Chaser is capable of doing and what normal children are able to do. The most important of these differences, the one that is immediately obvious to linguists and which we have already stressed here is the absolutely bijective nature of Chaser's vocabulary which refers, without any trace of polysemy, either to a single object or to a perceptual quality that is present in several objects. The authors are

[10] On this point, we cannot fail to be in agreement with what the authors say: “She revealed no difficulty in discriminating between the many different sounds of the nouns given to her as names for objects” [Pilley and Reid 2011: 11].

clearly not aware that they have proved the precise opposite of what they set out to demonstrate: as has been found with other experiments, the tests conducted with Chaser actually confirm the existence of a discontinuity between the capabilities of animals and humans. Chaser's performances can all be explained on the basis of perceptual skills whereas children's performances, including their "mistakes", require the mobilization of structural skills [Penn, Holyoak and Povinelli 2008].

Here, we see again the clear difference between animals and humans observed by Marc Hauser, Noam Chomsky and William Tecumseh Fitch [2002: 1577] with regard to the learning of numbers by chimpanzees. In effect, these animals are perfectly able to associate a digit with a corresponding number of objects, place digits in order and even indicate the digit corresponding to the addition of two sets of objects (two times two oranges for example). What they do therefore seems to be identical to what children are able to do. However, a more careful examination reveals a difference of scale in the approach. It takes a long and laborious period of training, often extending over several years, before a chimpanzee acquires the list of digits up to 9 without ever achieving "the kind of "aha" experience" which allows children to produce this list of digits all at once as soon as they have understood the principle (exactly in the same way as they make, by themselves, mistakes of the same type once they have understood the grammatical principle that governs "I love/loved"). In chimpanzees, the process of learning the associations between digits and numbers has to be repeated for each new digit, whereas children, by contrast, make use of the generative properties of human language in order to create the open-ended list of numbers themselves.

It is this observation of a difference between the perceptual processes, on the one hand, and the "recursive" [Hauser, Chomsky and Fitch 2002; Premack 2004] or "structural" processes [Penn, Holyoak and Povinelli 2008] on the other that has led Marc Hauser and his co-workers [2002] to make a distinction between language in the broad sense, which is common to both humans and animals, and language in the narrow sense, which seems to be specific to human beings. And it is here that, starting from the work conducted into the study of aphasias, clinical anthropology is able to propose a new hypothesis which consists of re-examining, in terms of "axes", the perceptual association, accessible to animals, between a cue and a meaning [Gagnepain 1990]. The experiment conducted with Chaser provides additional evidence in support of this hypothesis.

This idea, which suggests that we should study the perceptual processes themselves has been revisited and developed by Clément de Guibert, Gilles Clerval and Hubert Guyard [2003]. Distancing themselves from a formalist or structuralist position as advocated by Ferdinand de Saussure, according to which "our thought – apart from its expression in words – is only a shapeless and indistinct mass" [1959: 111], and drawing their inspiration from the idea of the "Gestalt" taken from the German psychological tradition, these authors wish to show that there is a prelinguistic organization of thought or, more precisely for our purposes here, of perception[11]. There would therefore be two levels of formalization: the linguistic level of structure (as Saussure used the term), which is specific to humans and is at least partially destroyed in aphasia; and the Gestalt level of the "configuration"[12], which is damaged in agnosias. And in the same way that it is possible to distinguish between two structural axes,

[11] Defined here as the processing of visual information, such as the visual gnosias [Charnallet and Carbonnel 2000].

[12] The authors use this term as a translation of "Gestalt" because it seems to them to be more precise than "form".

that of “taxinomy” and that of “generativity” (of “differentiation” and “segmentation”[13]), it should also be possible to distinguish between two axes of configuration which Clément de Guibert, Gilles Clerval and Hubert Guyard [2003] propose calling “discrimination” and “delimitation”.

While the use of structure is specific to humans – it corresponds to language as conceived of by Dominique Laplane [2000], or “language in the narrow sense”[14] as described by Marc Hauser, Noam Chomsky and William Tecumseh Fitch [2002] –, configuration, by contrast, is common to both humans and animals and would make it possible to account for the performances of Chaser as well as the chimpanzees studied by David Premack [2004 and 2007][15]. In the same way, it would make it possible to account for thought without language, for the “concepts without words” which persist in aphasia [Laplane 2000 and 2001] or, indeed, for the “nonlinguistic conceptual representation” that Marc Hauser and his co-workers [2002] include in language in the broad sense[16].

However, we believe that this discussion also has something to teach us with regard to the interdisciplinary dialog that Marc Hauser, Noam Chomsky and William Tecumseh Fitch [2002] wish to instigate in order to comprehend the faculty of language: while we can sometimes justifiably reproach the human sciences with sometimes completely ignoring the work conducted in the life sciences, the reverse is no less true. The result, ultimately, is a sort of scientific anthropomorphism which is prejudicial to our understanding of animals: due to an excessive desire to affirm, despite the presence of very real differences, that the abilities and performances of animals are identical to those found in humans, we risk not paying sufficient attention to the specific nature of these performances and therefore of not coming to a just appraisal of animal capabilities.

Thus, in the case we are examining here, although the experiment confirms the absence of a grammatical mode of structuring in animals, it simultaneously invites us to explore the perceptual process in greater detail by contributing additional arguments in support of similarities between animal and human functioning.

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[13] Which represent a substantial reworking of the concepts of “selection” and “combination” used by Roman Jakobson [1963].

[14] That is to say the ability that “breaks down” in aphasia, a pathology which, it must be pointed out, never occurs in animals.

[15] Their ability to discriminate between perceptual cues and contents and perform substitutions between these; their ability to delimit percepts and combine these.

[16] Language in the broad sense or “thought” which can also – although this is outside the scope of the current paper – be conditioned by activity and makes writing possible in humans, by the ability to engage in social interaction or by affectivity.

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