Deceit and Self-Deception

The Relationship between Communication and Consciousness

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Everyone seems agreed that there is some kind of intimate connection between the topics of communication, on one hand, and consciousness, on the other. I think there are several good reasons for this. For example, as I shall discuss later, the ability to communicate directly with other animals may draw us much more quickly and deeply into their social lives, thereby giving added insight into their consciousness. But there is one relationship between communication and consciousness that I particularly wish to stress. This is the tendency for processes of deception *between* individuals to generate patterns of self-deception *within* individuals. That is, the way in which we communicate with others—the degree to which we attempt to deceive them—may affect our own degree of consciousness, the extent to which we apprehend reality *correctly*.

Deception Causes Unconsciousness

Just as biologists have long appreciated that deception is a pervasive feature of predator-prey relations, so we now see that deception may also be a widespread pervasive feature of communication within many social species (for a recent review with numerous references, see Trivers 1985, chap. 16). Since deception is usually costly to the victim, deception generates evolutionary powers for its own detection. A coevolutionary struggle is induced, with more skillful deception being matched by greater powers of detecting deception. We have good reason to believe that selection to spot deception may have improved cognitive capacity, including elementary abilities to count, but also including very subtle kinds of discriminations between two nearly identical forms (model and mimic).

In highly social species such as ourselves, spotting deception may involve close scrutiny of the behavior of another individual and of the apparent mind behind the behavior. The stress that accompanies consciously mediated deception may provide information useful to an observer. Quality of voice, eye movements, small movements of the extremities, may all provide information suggesting attempted deception. In this situation, there may be selection to render the fact of deception *unconscious,* the better to hide the attempt from others. As language arises, there may be new opportunities for self-deception, rendering various true facts and motives unconscious, the better to hide them from others. According to theory, then, the practice of deception may over a period of time engender unconsciousness *in the deceiver.* The deceiver begins by deceiving one and ends up deceiving two!

I pause to point out that emphasis on deception and self-deception gives little support to the notion that communication can be conceptualized solely in terms of "information." There was a period of time about fifteen years ago when for one wild moment it looked as though the concept of "information" was going to provide some key integrative function stretching from physics right through to complicated ecosystems, and including animal communication somewhere along the line and even computers and artificial intelligence as part of the whole achievement. Various mathematical definitions of information have been produced, useful in various contexts. In physics, the notion is that entropy, or lack of structure in the environment, can be defined in terms of lack of information.

One bar to the generality of information, at least where animal communication is concerned, is that along with selection for conveying "information" in the usual sense there must also be selection to convey misinformation and lack of information, to hide information, to give biased samples of information, and so on. Thus, to me, theoretical efforts to reduce communication to information transfer, mathematically defined and inferred by the change in behavior of the other organism, had a certain illusion of rigor and generality, but had very misleading connotations. In particular, without having thought about it very carefully, I felt that it tended to sweep deception and self-deception completely out of sight.

In evolutionary biology, incidentally, the sophisticated literature regarding deception has been the wonderful work, largely in entomology but spread throughout the living world, on the predator-prey relationship and the nearly endless variety of deception it has engendered (see Cott 1940, Wickler 1968, and Edmunds 1974, among many others). It is, of course, more difficult to study deception *within* a species, but with the rebirth in interest in individual reproductive success, much work is now pouring out on this subject (see Trivers 1985, Mitchell & Thompson 1986).

Self-Deception Can Be Studied Experimentally in Humans and Other Animals

Philosophers at times have been tempted to see some kind of deep paradox in the concept of self-deception, since there would seem to exist some active entity outside the self but still within the individual doing the deception. I believe the simplest way out of this is to equate the self with the conscious mind. I follow Gur and Sackeim (1979) in expecting to find three features in self-deception:

1. True and false information are simultaneously stored in the same individual.
2. The true information is in the unconscious, the false information in the conscious.
3. We can effect the form of an individual's self-deception by changing its relationship to others.

To demonstrate these three things experimentally, Gur and Sackeim made use of an interesting fact of human physiology: we respond to the sound of the human voice with increased arousal, as measured, for example, by the galvanic skin response (GSR); but this jump is especially large if we are hearing a tape recording of our own voice. Since we are unconscious of our own galvanic skin responses, Gur and Sackeim used them as a measure of unconscious self-recognition. To determine conscious self-recognition, they used verbal reports of self-recognition in response to the same voice stimuli (and interviews after the fact concerning whether mistakes had been made). A person listens to a master tape consisting of matched short segments of voices reading the same material and including some of the person being tested. For each little segment the individual must say whether the voice is his or her own voice or another's. At the same time, measurements of galvanic skin responses give an independent index of unconscious self-recognition. One part of the body has it right and one part has it wrong, and it turns out almost always to be the voice that has it wrong and the galvanic skin response that has it right. This immediately satisfies the first two criteria above: true and false information with a bias toward false information in the conscious mind. Finally, Gur and Sackeim showed that they could influence the kind of mistakes that were made. People told they had failed an exam tended more often afterward to *deny* their own voice some of the time and to *project* it after having been made to feel good about themselves.

I think this methodology could be applied to the study of self-deception in other species. Of course, we cannot ask the question in English, but we can train the animal to perform some task when it recognizes its own voice and take performance of this task as something the organism is likely to be conscious of. It is known that birds respond with greater arousal to the sound of their own species' song compared to those of others, and assuming the same difference is found between self and other *within* species, then we could train a bird to turn on a light when it hears its own voice and thereby see whether it makes mistakes, whether the bird's GSR has it right, and whether we can manipulate a bird to change its form of self-deception. You could subject your bird to a defeat or humiliation of some sort and see whether it tended to deny its own voice more frequently thereafter. So, in principle, it seems to me that processes of self-deception could be studied in other creatures.

This suggestion just scratches the surface of what can be done, and here I agree with Don Griffin on the marvelous dexterity possible in experimental work. You can never quite guess what ingenious experiment is going to turn up next. When early work showed that other animals often had episodes of REM sleep, suggesting dreaming (an observation which of course can be made on one's own dog), some diehards on the animals *un*consciousness side said, "Yes, but how do you know the animal sees movies like we do?" The matter never troubled me for a moment, but I still remember the delight of learning that some ingenious soul had then trained a monkey in a dark room to press a bar at the sight of visual images projected on the screen. Sure enough, during REM sleep its foot "involuntarily" began to bar-press!

The Split Between Conscious and Unconscious Precedes Self-Deception

I operate on the assumption that the split between conscious and unconscious evolved long before processes of deception and self-deception affected transfers of information between the two spheres. The split itself probably related to energy efficiency: consciousness is an energy-expensive state that permits much more concentrated mental attention. We can imagine that over long periods of evolutionary time the brain either turned a whole series of functions over to the unconscious or left them there. Thus, under normal circumstances, we run our heart rate, our breathing, and other internal processes unconsciously. We only choose to be conscious about them [by assumption] under conditions in which it makes sense to invest the extra energy and faculties to scrutinize something carefully.

The image I have of a conscious animal is one in which a light is on inside the organism. In this sense, insects are certainly conscious: there is a light turned on inside them when you interact with them. For example, I may try to countersing with a male or make a series of little threatening moves or even friendly ones, pseudofriendly ones. You can certainly see the insect cock its head and try to get a fix on me from several angles to figure out what on earth I am doing. So there appears to be a conscious entity in there, in this metaphorical sense.

But I do not assume from this anything about *self*-consciousness in the insect, or degree of self-deception. This has to be argued separately on both theoretical and empirical grounds. If within a species insects have been selected to pay close attention to the moves of others, such as opponents, the insects may indeed be selected to shunt some true information preferentially to the unconscious, the better to manipulate an opponent during an ongoing evaluation.

It is perhaps worth emphasizing that the hallmark of self-deception is a biased system of information transfer from conscious to unconscious and back. In an original world in which the conscious-unconscious split is based on energy conservation, I see no reason for storing true information preferentially in the *un*conscious. If anything, a bias would exist in favor of true information being found in the *conscious* mind, the better to make use of the special powers of consciousness. Self-deception involves the counterintuitive fact that the conscious actor is kept in the dark regarding relevant pieces of information. Our interpretation is that others are cueing in on the actions of the conscious actor, so that keeping it in the dark may be one's first line of defense from others. Notice the self-serving way in which this was just put. Given the aggressive nature of deception, I could as easily have argued for conscious ignorance as one's first line of offense!

There Are Levels of Consciousness

It follows from this kind of approach that consciousness should not be treated as some simple unitary concept; one must usually consider levels or degrees of consciousness: how deeply in the unconscious is something buried, how inaccessible is it? Sometimes this takes the form of: how much is the mind willing to deny in support of a given proposition? According to the concepts emphasized here, attitudes toward deception, degree to which it is practiced, and denial surrounding it may be central forces in organizing our level of consciousness. We can fail to practice deception. We can practice deception but fail to deny it to ourselves. We can practice deception, deny the deception, deny the denial, and so on. Indeed, at each stage we can challenge the organism and see whether it continues to deny. The logic of self-deception

suggests there may be situations in which a growing pattern of denial must be blocking out successively deeper portions of reality!

Consider verbal behavior and consciousness. Certainly we hear ourselves talking most of the time. We are conscious of our words spoken, but not invariably so. I make linguistic slips, my audiences wrap themselves in laughter, and I have to figure out what it is I just said that is making them act that way. I have become so conscious of this predicament that I sometimes warn myself prior to a talk that I will almost certainly invert a phrase and should be on the lookout for unexpected hilarity on the part of the audience. My most memorable case occurred in 1975 at the Fifteenth World Entomological Congress, where I reviewed my work on the ratio of investment in the social insects, especially ants. As I followed a shapely and dear female friend of mine into the auditorium prior to my talk, I warned myself that I would surely invert a phrase; so when halfway through my talk the room erupted in unexpected laughter, I backed up in my mind and found the offending phrase. I had been trying to say "rear the brood," as in ants "raise the larvae." Instead, I had said "brood the rear." Perhaps it is really true in life that we have a greater need to slip sexual material into normal discourse than other kinds of unconscious material, but toward what end is an interesting question.

John Eisenberg mentioned the test in which you ask a person to say one word with forty different meanings. My favorite word for that test is the word *yeah.* It is not quite a full *yes* and always has, to my ears at least, a little bit of *no* in it. There are places in Maryland I am told where the word *yes* has disappeared entirely and people are capable of saying the word *yeah* almost so it sounds like a 100% *yes;* but you can always add some *no* to it. Using *yes* so as to add a *no* to it is more difficult, and one has to be inventive. For example, you can say "Yes, *sir*!" so that it sounds like "Yes, but up yours," metaphorically speaking. Incidentally, at the University of California at Santa Cruz I have the students under a heavy discipline which they do not like. I do not accept "yeah" as an answer in class or in person. I usually ask "yes or yeah?" and make them jump one way or the other.

Some people are conscious *after the fact* some of the time of the difference between *yeah* and *yes.* People are generally less conscious of just how they have said the word *yeah.* When asked to mimic their earlier usage, for example, they usually increase its resemblance to a complete *yes.* Thus people

can be more or less conscious that pronunciation may have connotations. Some resist any association, however, whereas others are conscious both of the general principle and of their own usage. To me this suggests again that consciousness is a very layered kind of phenomenon, not all or nothing. We wish always to know what is rendered unconscious and where the exact limits of consciousness are.

Talking to Other Animals in Their Own Language

Martin Moynihan mentioned the value of talking to animals in their own language instead of just training them to understand English. I think this is a very important area of evolutionary biology, and one which I hope is going to be developed much more fully. There are several advantages to doing this. For one thing, it may allow you to slip inside the social system of the animal itself, becoming a participant and experiencing the social system from the inside. Communicating with other animals in their own language immediately changes your relationship with them, often in a dramatic way. We are usually trapped in a predator-prey relationship with other creatures, so that we only see of them as little as the potential prey can reveal. Adding binoculars may draw the creatures in closer, but the sight to them of a creature with greatly enlarged eyes may cause them to increase their distance in response, with little or no net gain. Thus studying bird behavior is often reduced to watching birds flicker from behind one bush to behind another at a distance of several hundred yards.

All of this was changed one day for me in what was my most vivid moment in nature to date. My friend and teacher, Bill Drury, invited me to go bird-watching one day on a small island off the coast of Maine. We left bird books and binoculars behind and strode to the nearest small tree growing alone in the open. He then made a series of high-pitched bird sounds and soon the tree began to fill up with birds, themselves making a series of calls. As the tree started to fill up, it seemed to attract more and more birds, so that as if by magic all small songbirds in the area were streaking toward the tree under which we were standing. By this time Bill was down on his knees, bent over, and most of the time making a deep kind of moaning sound. The

birds actually appeared to wait in line to get the closest look at Bill they could; that is, they hopped from branch to branch until they rested on a branch about eight feet off the ground and not more than two feet from my face. As each bird hopped down, Bill, as if on cue, would introduce them. "This is a male, black-capped chickadee. You can tell because of the black along the neck and shoulders. I would guess he's about two to three years old. Can you see if there is yellow on his back between his shoulders? This is a good index of age."

For me the moment was utterly magical. In a matter of minutes Bill had reduced the distance between us and these birds by orders of magnitude, both physically and socially. Our relationship was so completely different that I was permitted individual introductions at a distance of a couple of feet. Obviously Bill was pulling some kind of trick and had induced some kind of trance through his bird song. Of course, as many of you know, Bill was at first only imitating the mobbing calls of a couple of the small passerines in the area and interspersing these with occasional owl hoots. The owl is deadly at night but is vulnerable in the daytime, and groups of songbirds will mob it in order (presumably) to run it out of their area, or even harass and kill it on the spot. This drew them into the tree at an ever-increasing rate, since mobbing assemblages gain in individual safety with each new arrival (as well as gaining in power to harass the owl). Once they landed in the tree, however, they could see two four-eyed human beings but could not see the owl. Bill's bending over and hooting from the ground was meant to suggest the owl was hidden underneath him. This drew them as close as they could get for a good look, which put them two feet from my face. Unlike some magic tricks, knowing how Bill's was done did not detract from my enjoyment. What remains vividly etched on my mind is a beautiful moment when I actually saw wild songbirds at the distance at which they might interact with each other.

Note that Bill had replaced the usual predator-prey relationship and its caution, concealment, and avoidance with a novel predator-prey relationship in which the predator feigned vulnerability so as to induce attack. To me this is the essence of communicating with members of other species, to replace the boring predator-prey relationship with something far more revealing. So I have been hooked on this line of research ever since. The results of my interactions are sometimes somewhat unexpected. A particularly memorable

case concerns the time I made a squirrel paranoid or, perhaps better put, the time a squirrel made *me* even more paranoid. This happened about ten years ago when my son was a year of age. We were outside in Cambridge, and I spotted a squirrel in a tree while my son was in my arms. I was pointing out the squirrel to my son, but he could not spot it. The squirrel was not moving. So I started a very melodious, inviting sort of song, a siren song toward the squirrel. The squirrel was interested and apparently liked it, for it responded positively and crept toward us, which was what I expected it to do. But my son still had not spotted the squirrel, so I decided to reverse action and make a hostile gesture to the squirrel, expecting it to turn immediately and rush in the opposite direction, at which point my son would spot the movement and the squirrel. Of course, this would destroy my relationship with the squirrel, but I gave scant concern to the possible consequences and instead suddenly threatened the squirrel by stamping my foot and perhaps making a move in its direction. Well, the squirrel moved, but he came *toward* us at about a hundred miles per hour, rabid, chattering, and rushing out to the very edge of the branch nearest us, his sharp teeth unexpectedly close to my neck and my son's neck. The organism was not that large, but in its present state of mind I moved back thirty feet with my son before you could say, "Who, me paranoid?" By then my son had seen the movement; it was coming right at us.

So one realizes that there is a natural syntax to animal communication in which the order of presentation of positive and negative signals may signify different meanings. The squirrel expects you to act hostile or indifferent. If you keep to this mode, you will neither much surprise it nor, I believe, anger it. But if your first message is melodious, signifying that you are a friendly organism who would not dream of harming the squirrel's self-interest, you may, in fact, be intending to trap it, to kill it. There is the risk of deception. So when you turn around and reveal through your foolishness the underlying hostility of your posture, the organism comes straight at your throat, in this case because it has been, as I imagined, badly manipulated and hoodwinked. Put another way, there seems to be a moralistic or moral quality to the squirrel's anger. The squirrel seems to be saying with considerable feeling, "Your act of fooling me in order to harm me is not a morally neutral act." Incidentally, the squirrel reminded me rather vividly of the importance for a small creature of *agility* in aggressive encounters rather than brute force.

With a skillfully placed leap and a couple of rapid movements and bites to the right places, the squirrel could, in fact, have killed both myself and my son!

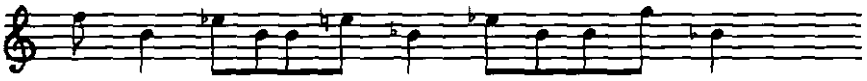
Another example of syntax in animal signals was observed by Irven DeVore and me in East Africa. As recounted in some detail elsewhere (Trivers 1985, 368–72), during a day of exceptionally memorable interactions between adult male baboons in a troop in Gilgil, Kenya, over access to a female in estrus, we saw one male send another male what looked like a double message. He was already threatening the animal from close quarters, sometimes with canines fully bared, because the other male had supported his opponent, now sitting nearby with the female in contention. Yet while threatening the male, the first male also turned his rear end toward the second male, a behavior which in another context appears to be submissive. The translation seemed to be: "Don't ever support my opponent again and, by the way, how about switching sides?" This immediately suggested to us that creatures without language (in the human sense) could nevertheless engage in complex strategic negotiations in which the *order* in which various signals were presented determined meaning: inviting followed by threatening suggested deception and required rabid counteraction, while threat followed by appeasement suggested the possibility of a new relationship.

I have been having a lot of fun trying to talk to birds (and even lizards) by whistling with them and, in the case of the birds, counter-singing to them. Unless you have a tape recorder and you try to fool them in a sophisticated way, any old whistle that is more or less the same pitch as the bird's own sound will do. It is, in fact, amazing how much males wish to counter-sing with a sound that is roughly like their own. I have gotten into extended bouts with mockingbirds at 2:00 in the morning outside my home in Santa Cruz. Shortly after you start singing back to a mockingbird, he is so delighted to have a competitor that he immediately floods the airwaves with a whole set of new sounds and you are sometimes forced to jump around to keep up with him. And you can just imagine the other birds laughing in the dark at my efforts to join mockingbird society.

While whistling, you must be highly conscious of what Eugene Morton has taught us about the importance of body size in determining the pitch of voice. Remember that the birds are very tiny and that they generate high-pitched sounds and hear such sounds best themselves. Since larger organisms naturally tend to produce deeper sounds, deep sounds have themselves

evolved a signal function as threats, while high-pitched sounds indicate submission, as if the organism, in response to an attack, in effect squeals out, "I'm tiny, and therefore harmless." A very important application of this line of logic is that the pattern of pitch which conveys meaning in human conversation obeys a simple underlying logic. For example, questions end with the pitch going up because asking a question is a polite or submissive act compared to making an assertion, on which the voice may drop (Ohala 1984). This suggests immediately that the music in our everyday speech or in song may consist of a sequence of relatively positive (high) notes with relatively negative (low) ones. It also suggests immediately that other creatures may be sensitive to melodies and intonations much in the same way that we are.

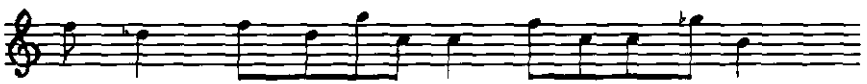
In any case, enough of rationale. Let us amuse ourselves with some examples. Let us say that I have struck up a relationship with a bird or two in my yard, and Ed Wilson pays a visit, and I want to show him this little trick. Then I will stand outside with Ed and introduce him, in my mind, in English. In my mind I'll say, "Hi, this is Ed Wilson. He is my friend." Only the birds will not be able to hear it or make anything out of it in my own range, so I whistle it up there at about the range that I think goes with their size, and I emphasize the highs and the lows. So I go:



"Hi-i. This is Ed Wil-son. He is my fri-end."

Notice I start with a nice high "Hi," then my voice goes up when I mention Wilson and again when I mention friend. This suggests that Wilson is a positive force in my life. If I turn toward Ed as I introduce him, then there will be gesture coupled with the high notes, so that, it seems to me, the birds might reasonably quickly understand that I am introducing them to a friend.

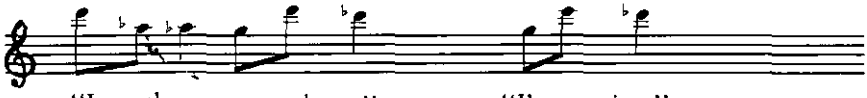
Now I have actually done this with my son. I have taken him out when he was four or five (for some reason he has to suffer along with a lot of episodes of trying to talk with the lower orders), in which case I say:



"Hi-i. This is Jo-na-than. He is my so-n"

Notice again that my voice goes way up at the beginning of my son's name and then on the word *son*. The generally higher pitch of my voice is consistent with the fact that my son is smaller, relatively more subordinate to me than Dr. Wilson, and enjoys a closer relationship. Perhaps we whistle the words *son* and *friend* slightly differently as appropriate to their different weighting.

The assumption behind this, of course, is that birds are sensitive to this, that they will come to understand things and perhaps say something novel back. My son and I have even acted out sequences in which he will agree to answer to his whistled name so that the birds can connect my whistling of my son's name not only with hand gestures toward him but with his whistling back and then running toward me:



"Jo-na-than, come he-re." "I'm co-ming."

Sometimes these kinds of antics on my part elicit some countersinging. They almost always elicit intense interest but are frequently cut short by the nervousness of the birds. When this kind of thing goes well over a period of several weeks, you can believe that my arrival in the backyard is greeted by a good deal of interest from a variety of birds, and whether they make any more sense out of this than I, I cannot say. So I would say both on scientific grounds and as a way of raising one's own consciousness, being able to mimic the sounds of animals and attempting to communicate with them has a lot of value. On the scientific side, it is worth noting that some of our nicest evidence regarding reciprocal altruism in nature comes from playback experiments. It was playback experiments of territorial song that demonstrated reduced aggressive response to the sounds of neighbors *coming from the neighbor's territory*. This suggested the value of mutual restraint among neighbors. More to the point, sounds of the neighbor's voice from inside one's own territory elicited the full-scale aggressive response (see Trivers 1985). In a more dramatic usage, Seyfarth & Cheney (1984) played vervet alarm calls to other vervets within two hours of the time the alarm caller had groomed the target subject or at some other times. This device allowed them to show that unrelated vervet monkeys are more likely to orient toward an alarm call (which would be the first move in giving aid) when they have

received a grooming from the caller within the preceding two hours than if no such interaction has occurred. Among related vervets prior grooming has no such effect.

Notice in principle that Cheney and Seyfarth could have made these observations without experimental manipulation. The problem is it would have taken several hundred years. Andre Dhondt (pers. comm.) in Belgium has recently shown that endurance while counter-singing in a songbird at one year of age correlates positively with life span. He did this by creating through tape recording a continuously counter-singing opponent. The time before a male in nature induced to counter-sing finally quit was taken as a measure of endurance. As Dhondt explained it to me, he is attracted to using playbacks because they can condense a lifetime of research into a few months. One is thus permitted in the short span given us to move much more rapidly and deeply in our understanding of nature.

Does Consciousness Require a Central Nervous System?

Griffin has proposed that consciousness depends upon the existence of a central nervous system. We can see that the area of consciousness has been a contentious one because when I suggest keeping an open mind on the subject of whether plants may have some form of consciousness, Griffin accuses me of being a pan-psychicist, which I am not. I just believe in keeping an open mind, especially where it is unclear exactly what position logic forces us to take. Of course, the cost of *not* keeping our minds open is always that there is some deeper, unconscious assumption, often biased, which may blind us more than the initial distinction helps us. I do not take a position on plants, but I do wonder sometimes. People in rural areas or people with gardens often say during a drought, "My plants are suffering." You see some dreadful phenotype that is obviously barely making it, and you wonder: is there any sense in which the word *suffer* could be used besides the obvious one that the morphology is in sad shape? When the rains come, we say, "The trees are happy." They certainly look good, leaves and branches once more reaching for the sky, color returning. But perhaps the happiness is entirely in ourselves. Perhaps inside the tree all is quiet and there is nothing

resembling internal pleasure or satisfaction in the new state of affairs. Seems a shame, if true, but this sentiment itself may merely be the bias of a relatively sentient animal.

Incidentally, for feats of *un*consciousness on the subject of feeling pain, we can hardly do better than the medical profession. As recently as thirty years ago—in defense, for example, of the practice of greeting newborn sons by lopping off their foreskins—it was claimed that, since the cortex was not turned on or connected until several weeks later, *young infants feel no pain!* They may writhe, turn red, and scream until tears roll down their faces. But relax, inside everything is calm—blank, in fact. This rather supports the old adage that "there is no fool like an educated one." Call it the dark underbelly of instruction: education permits marvels of reality orientation (witness our knowledge of how to combat bacterial infections), but it gives its strengths to self-deception, as well, in the form of logic, evidence, and the backing of venerable authority (witness the wonderful body of knowledge in support of setting leeches upon individuals suffering from malaria).

Sea anemones are to us distantly related, mostly sessile animals, which lack a central nervous system. They do have nerve cells, however, and these are organized into at least one extensive nerve net permitting the organism rapid, coordinated action in certain circumstances (e.g., quick contraction when disturbed). It has been known for some time that in some anemones individuals will fight with members of their own species concerning space, using specialized structures to sting—and sometimes kill—neighbors. In several cases individuals discriminate between clone mates and nonclone mates, only attacking the latter, but they make no discrimination in regard to sex, attacking males and females alike. It was commonly assumed that these simple creatures were incapable of making the discrimination. Then Kaplan (1983) showed for one species, the plumose anemone, *Metridium senile,* males fight only males and females fight females (nonclone mates).

This startling discovery suggested the possibility that sexual selection may be operating in these lowly organisms, so Kaplan and I brought these sea anemones into the lab and set them up in little experiments that were designed to heighten any kinds of sexual concerns they might have had. Each individual sat touching two unrelated individuals of the opposite sex while a same sex member was seated diagonally opposed and within range of tentacles. The anemones were placed in their seating positions on the bottom of

glass fish tanks, and they had a considerable amount of mobility on this surface. Movements were tracked for twenty-four hours, and intensive behavioral observations were made during the first two hours after release. We were amazed to see a pattern of sex differences emerging. Males seemed to be more mobile than females, a male more likely to follow a female or to lean over her and caress her with his tentacles. In some cases, when a male spotted that a female was next to him, he raised out pseudopods, or legs filled full of water, and extended these toward the female as if touching her. The female might lean away from this attention, and it all looked somewhat familiar on the great vertebrate-insect paradigm. So we certainly believe now that the sea anemones can apprehend sex, that they appear to act very differently toward male and female nonclone mates, and I would be inclined to imagine there is some internal representation of ongoing experience. When one plumose anemone is stung by another, it recoils sharply and shrinks in size very dramatically. Ocontia (small defensive filaments) extrude copiously from the body wall. Certainly it *looks* painful, watching it.

Consciousness and communication enjoy a complex relationship. For example, selection for deception may induce self-deception—the better to remain undetected—thus inducing a form of unconsciousness. The split between conscious and unconscious mental functioning almost certainly predates selection for deception and evolved as an energy-saving device, but once the split emerged, selection to hide deception must have favored biased transfers of information between the two spheres. Information may be held at different levels of consciousness, signifying the differing degrees to which the information is inaccessible to consciousness.

One of the best ways to get close to other creatures is to communicate with them in their own language or a facsimile thereof. Casual experiments in this vein suggest that there is a natural syntax in animal communication such that the order in which positive and negative signals are presented itself signifies meaning. In both animal and human communication high-pitched sounds are relatively positive, and low-pitched, negative. This suggests that whistling sounds which mimic human intonation during speech may be a vehicle for conveying complex information from humans to birds. Experiments on sexually directed behavior in sea anemones suggest that a central nervous system may *not* be a prerequisite for low orders of consciousness.

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