

CHAPTER 1

The Consciousness of Consciousness

WHEN ASKED the question, what is consciousness? we become conscious of consciousness. And most of us take this consciousness of consciousness to be what consciousness is. This is not true.

In being conscious of consciousness, we feel it is the most self-evident thing imaginable. We feel it is the defining attribute of all our waking states, our moods and affections, our memories, our thoughts, attentions, and volitions. We feel comfortably certain that consciousness is the basis of concepts, of learning and reasoning, of thought and judgment, and that it is so because it records and stores our experiences as they happen, allowing us to introspect on them and learn from them at will. We are also quite conscious that all this wonderful set of operations and contents that we call consciousness is located somewhere in the head.

On critical examination, all of these statements are false. They are the costume that consciousness has been masquerading in for centuries. They are the misconceptions that have prevented a solution to the problem of the origin of consciousness. To demonstrate these errors and show what consciousness is not, is the long but I hope adventurous task of this chapter.

The Extensiveness of Consciousness

To begin with, there are several uses of the word consciousness which we may immediately discard as incorrect. We have for

THE ORIGIN OF

CONSCIOUSNESS IN

THE BREAKDOWN OF

THE BICAMERAL MIND

- JULIAN JAYNES,

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example the phrase "to lose consciousness" after receiving a blow on the head. But if this were correct, we would then have no word for those somnambulistic states known in the clinical literature where an individual is clearly not conscious and yet is responsive to things in a way in which a knocked-out person is not. Therefore, in the first instance we should say that the person suffering a severe blow on the head loses both consciousness and what I am calling reactivity, and they are therefore different things.

This distinction is also important in normal everyday life. We are constantly reacting to things without being conscious of them at the time. Sitting against a tree, I am always reacting to the tree and to the ground and to my own posture, since if I wish to walk, I will quite unconsciously stand up from the ground to do so.

Immersed in the ideas of this first chapter, I am rarely conscious even of where I am. In writing, I am reacting to a pencil in my hand since I hold on to it, and am reacting to my writing pad since I hold it on my knees, and to its lines since I write upon them, but I am only conscious of what I am trying to say and whether or not I am being clear to you.

If a bird bursts up from the copse nearby and flies crying to the horizon, I may turn and watch it and hear it, and then turn back to this page without being conscious that I have done so.

In other words, reactivity covers all stimuli my behavior takes account of in any way, while consciousness is something quite distinct and a far less ubiquitous phenomenon. We are conscious of what we are reacting to only from time to time. And whereas reactivity can be defined behaviorally and neurologically, consciousness at the present state of knowledge cannot.

But this distinction is much more far-reaching. We are continually reacting to things in ways that have no phenomenal component in consciousness whatever. Not at any time. In seeing any object, our eyes and therefore our retinal images are reacting to the object by shifting twenty times a second, and yet

we see an unshifting stable object with no consciousness whatever of the succession of different inputs or of putting them together into the object. An abnormally small retinal image of something in the proper context is automatically seen as something at a distance; we are not conscious of making the correction. Color and light contrast effects, and other perceptual constancies all go on every minute of our waking and even dreaming experience without our being in the least conscious of them. And these instances are barely touching the multitude of processes which by the older definitions of consciousness one might expect to be conscious of, but which we definitely are not. I am here thinking of Trichener's designation of consciousness as "the sum total of mental processes occurring now." We are now very far from such a position.

But let us go further. Consciousness is a much smaller part of our mental life than we are conscious of, because we cannot be conscious of what we are not conscious of. How simple that is to say; how difficult to appreciate! It is like asking a flashlight in a dark room to search around for something that does not have any light shining upon it. The flashlight, since there is light in whatever direction it turns, would have to conclude that there is light everywhere. And so consciousness can seem to pervade all mentality when actually it does not.

The timing of consciousness is also an interesting question. When we are awake, are we conscious all the time? We think so. In fact, we are sure so! I shut my eyes and even if I try not to think, consciousness still streams on, a great river of contents in a succession of different conditions which I have been taught to call thoughts, images, memories, interior dialogues, regrets, wishes, resolves, all interweaving with the constantly changing pageant of exterior sensations of which I am selectively aware. Always the continuity. Certainly this is the feeling. And whatever we're doing, we feel that our very self, our deepest of deep

identity, is indeed this continuing flow that only ceases in sleep between remembered dreams. This is our experience. And many thinkers have taken this spirit of continuity to be the place to start from in philosophy, the very ground of certainty which no one can doubt. *Cogito, ergo sum.*

But what could this continuity mean? If we think of a minute as being sixty thousand milliseconds, are we conscious for every one of those milliseconds? If you still think so, go on dividing the time units, remembering that the firing of neurons is of a finite order — although we have no idea what that has to do with our sense of the continuity of consciousness. Few persons would wish to maintain that consciousness somehow floats like a mist above and about the nervous system completely ununited to any earthly necessities of neural refractory periods.

It is much more probable that the seeming continuity of consciousness is really an illusion, just as most of the other metaphors about consciousness are. In our flashlight analogy, the flashlight would be conscious of being on only when it is on. Though huge gaps of time occurred, providing things were generally the same, it would seem to the flashlight itself that the light had been continuously on. We are thus conscious less of the time than we think, because we cannot be conscious of when we are not conscious. And the feeling of a great uninterrupted stream of rich inner experiences, now slowly gliding through dreamy moods, now tumbling in excited torrents down gorges of precipitous insight, or surging evenly through our nobler days, is what it is on this page, a metaphor for how subjective consciousness seems to subjective consciousness.

But there is a better way to point this out. If you close your left eye and stare at the left margin of this page, you are not at all conscious of a large gap in your vision about four inches to the right. But, still staring with your right eye only, take your finger and move it along a line of print from the left margin to the right, and you will see the top of it disappear into this gap and then

reappear on the other side. This is due to a two-millimeter gap on the nasal side of the retina where the optic nerve fibers are gathered together and leave the eye for the brain.¹ The interesting thing about this gap is that it is not so much a blind spot as it is usually called; it is a non-spot. A blind man sees his darkness.² But you cannot see any gap in your vision at all, let alone be conscious of it in any way. Just as the space around the blind spots is joined without any gap at all, so consciousness knits itself over its time gaps and gives the illusion of continuity.

Examples of how little we are conscious of our everyday behavior can be multiplied almost anywhere we look. Playing the piano is a really extraordinary example.³ Here a complex array of various tasks is accomplished all at once with scarcely any consciousness of them whatever: two different lines of near hieroglyphics to be read at once, the right hand guided to one and the left to the other; ten fingers assigned to various tasks, the fingering solving various motor problems without any awareness, and the mind interpreting sharps and flats and naturals into black and white keys, obeying the timing of whole or quarter or sixteenth notes and rests and trills, one hand perhaps in three beats to a measure while the other plays four, while the feet are softening or slurring or holding various other notes. And all this

¹ A better technique of noticing the blind spot is to take two pieces of paper about a half-inch square, and while holding them about a foot and a half in front of you, fixate on one with one eye, and move the other piece of paper out on the same side until it disappears.

² Except when the cause of blindness is in the brain. For example, soldiers wounded in one or the other occipital areas of the cortex, with large parts of the visual field destroyed, are not conscious of any alteration in their vision. Looking straight ahead, they have the illusion of seeing a complete visual world, as you or I do.

³ This example with similar phrasing was used by W. B. Carpenter to illustrate his "unconscious cerebration," probably the first important statement of the idea in the nineteenth century. It was first described in the fourth edition of Carpenter's *Human Physiology* in 1852, but more extensively in his later works, as in his influential *Principles of Mental Physiology* (London: Kegan Paul, 1874), Book 2, Ch. 13.

time the performer, the conscious performer, is in a seventh heaven of artistic rapture at the results of all this tremendous business, or perchance lost in contemplation of the individual who turns the leaves of the music book, justly persuaded he is showing her his very soul! Of course consciousness usually has a role in the learning of such complex activities, but not necessarily in their performance, and that is the only point I am trying to make here.

Consciousness is often not only unnecessary; it can be quite undesirable. Our pianist suddenly'conscious of his fingers during a furious set of arpeggios would have to stop playing. Nijinsky somewhere says that when he danced, it was as if he were in the orchestra pit looking back at himself; he was not conscious of every movement, but of how he was looking to others. A sprinter may be conscious of where he is relative to the others in the race, but he is certainly not conscious of putting one leg in front of the other; such consciousness might indeed cause him to trip. And anyone who plays tennis at my indifferent level knows the exasperation of having his service suddenly 'go to pieces' and of serving consecutive double faults! The more doubles, the more conscious one becomes of one's motions (and of one's disposition!) and the worse things get.⁴

Such phenomena of exertion are not to be explained away on the basis of physical excitement, for the same phenomena in regard to consciousness occur in less strenuous occupations. Right at this moment, you are not conscious of how you are sitting, of where your hands are placed, of how fast you are reading; though even as I mentioned these items, you were. And as you read, you are not conscious of the letters or even of the words or even of the syntax or the sentences and punctuation,

⁴The present writer improvises on the piano, and his best playing is when he is not conscious of the performance side as he invents new themes or developments, but only when he is somnambulist about it and is conscious of his playing only as if he were another person.

but only of their meaning. As you listen to an address, phonemes disappear into words and words into sentences and sentences disappear into what they are trying to say, into meaning. To be conscious of the elements of speech is to destroy the intention of the speech.

And also on the production side. Try speaking with a full consciousness of your articulation as you do it. You will simply stop speaking.

And so in writing, it is as if the pencil or pen or typewriter itself spells the words, spaces them, punctuates properly, goes to the next line, does not begin consecutive sentences in the same way, determines that we place a question here, an exclamation there, even as we ourselves are engrossed in what we are trying to express and the person we are addressing.

For in speaking or writing we are not really conscious of what we are actually doing at the time. Consciousness functions in the decision as to what to say, how we are to say it, and when we say it, but then the orderly and accomplished succession of phonemes or of written letters is somehow done for us.

Consciousness Not a Copy of Experience

Although the metaphor of the blank mind had been used in the writings ascribed to Aristotle, it is really only since John Locke thought of the mind as a *tabula rasa* in the seventeenth century that we have emphasized this recording aspect of consciousness, and thus see it crowded with memories that can be read over again in introspection. If Locke had lived in our time, he would have used the metaphor of a camera rather than a slate. But the idea is the same. And most people would protest emphatically that the chief function of consciousness is to store up experience, to copy it as a camera does, so that it can be reflected upon at some future time.

So it seems. But consider the following problems: Does the

door of your room open from the right or the left? Which is your second longest finger? At a stoplight, is it the red or the green that is on top? How many teeth do you see when brushing your teeth? What letters are associated with what numbers on a telephone dial? If you are in a familiar room, without turning around, write down all the items on the wall just behind you, and then look.

I think you will be surprised how little you can retrospect in consciousness on the supposed images you have stored from so much previous attentive experience. If the familiar door suddenly opened the other way, if another finger suddenly grew longer, if the red light were differently placed, or you had an extra tooth, or the telephone were made differently, or a new window latch had been put on the window behind you, you would know it immediately, showing that you all along '*knew*', but not consciously so. Familiar to psychologists, this is the distinction between recognition and recall. What you can consciously recall is a thimbleful to the huge oceans of your actual knowledge.

Experiments of this sort demonstrate that conscious memory is not a storing up of sensory images, as is sometimes thought. Only if you have at some time consciously noticed your finger lengths or your door, have at some time counted your teeth, though you have observed these things countless times, can you remember. Unless you have particularly noted what is on the wall or recently cleaned or painted it, you will be surprised at what you have left out. And introspect upon the matter. Did you not in each of these instances ask what *must* be there? Starting with ideas and reasoning, rather than with any image? Conscious retrospection is not the retrieval of images, but the retrieval of what you have been conscious of before,⁵ and the reworking of these elements into rational or plausible patterns.

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⁵ See in this connection the discussion of Robert S. Woodworth in his *Psychological Issues* (New York: Columbia University Press, 1939), Ch. 7.

Let us demonstrate this in another way. Think, if you will, of when you entered the room you are now in and when you picked up this book. Introspect upon it and then ask the question: are the images of which you have copies the actual sensory fields as you came in and sat down and began reading? Don't you have an image of yourself coming through one of the doors, perhaps even a bird's-eye view of one of the entrances, and then perhaps vaguely see yourself sitting down and picking up the book? Things which you have never experienced except in this introspection! And can you retrieve the sound fields around the event? Or the cutaneous sensations as you sat, took the pressure off your feet, and opened this book? Of course, if you go on with your thinking you can also rearrange your imaginal retrospection such that you do indeed 'see' entering the room just as it might have been; and 'hear' the sound of the chair and the book opening, and 'feel' the skin sensations. But I suggest that this has a large element of created imagery — what we shall call narrativizing a little later — of what the experience should be like, rather than what it actually was like.

Or introspect on when you last went swimming: I suspect you have an image of a seashore, lake, or pool which is largely a retrospection, but when it comes to yourself swimming, lo! Like Nijinsky in his dance, you are seeing yourself swim, something that you have never observed at all! There is precious little of the actual sensations of swimming, the particular waterline across your face, the feel of the water against your skin, or to what extent your eyes were underwater as you turned your head to breathe.⁶ Similarly, if you think of the last time you slept out of doors, went skating, or — if all else fails — did something that you regretted in public, you tend not to see, hear, or feel things as you actually experienced them, but rather to re-create them in objective terms, seeing yourself in the setting as if you were

⁶ An example taken from Donald Hebb's provocative discussion, "The mind's eye," *Psychology Today*, 1961, 2.

somebody else. Looking back into memory, then, is a great deal invention, seeing yourself as others see you. Memory is the medium of the must-have-been. Though I have no doubt that in any of these instances you could by inference invent a subjective view of the experience, even with the conviction that it was the actual memory.

Consciousness Not Necessary for Concepts

A further major confusion about consciousness is the belief that it is specifically and uniquely the place where concepts are formed. This is a very ancient idea: that we have various concrete conscious experiences and then put the similar ones together into a concept. This idea has even been the paradigm of a slew of experiments by psychologists who thought they were thus studying concept formation.

Max Müller, in one of his fascinating discussions in the last century, brought the problem to a point by asking, whoever saw a tree? "No one ever saw a tree, but only this or that fir tree, or oak tree, or apple tree . . . Tree, therefore, is a concept, and as such can never be seen or perceived by the senses."⁷ Particular trees alone were outside in the environment, and only in consciousness did the general concept of tree exist.

Now the relation between concepts and consciousness could have an extensive discussion. But let it suffice here simply to show that there is no necessary connection between them. When Müller says no one has ever seen *a* tree, he is mistaking what he knows about an object for the object itself. Every weary wayfarer after miles under the hot sun has seen *a* tree. So has every cat, squirrel, and chipmunk when chased by a dog. The bee has a concept of a flower, the eagle a concept of a sheer-faced rocky

⁷ Max Müller, *The Science of Thought* (London: Longmans Green, 1887), 78-79. Eugenio Rignano in his *The Psychology of Reasoning* (New York: Harcourt, Brace, 1923), p. 108f, makes a similar criticism to mine.

ledge, as a nesting thrush has a concept of a crotch of upper branch awninged with green leaves. Concepts are simply classes of behaviorally equivalent things. Root concepts are prior to experience. They are fundamental to the aptic structures that allow behavior to occur at all.⁸ Indeed what Müller should have said was, no one has ever been *conscious* of *a* tree. For consciousness, indeed, not only is *not* the repository of concepts; it does not usually work with them at all! When we consciously think of *a* tree, we are indeed conscious of a particular tree, of the fir or the oak or the elm that grew beside our house, and let it stand for the concept, just as we can let a concept word stand for it as well. In fact, one of the great functions of language is to let the word stand for a concept, which is exactly what we do in writing or speaking about conceptual material. And we must do this because concepts are usually not in consciousness at all.

Consciousness Not Necessary for Learning

A third important misconception of consciousness is that it is the basis for learning. Particularly for the long and illustrious series of Associationist psychologists through the eighteenth and nineteenth centuries, learning was a matter of ideas in consciousness being grouped by similarity, contiguity, or occasionally some other relationship. Nor did it matter whether we were speaking of a man or an animal; all learning was "profiting from experience" or ideas coming together in consciousness — as I said in the Introduction. And so contemporary common knowledge, without realizing quite why, has culturally inherited the notion that consciousness is necessary for learning.

The matter is somewhat complex. It is also unfortunately

⁸ *Aptic structures* are the neurological basis of aptitudes that are composed of an innate evolved aptic paradigm plus the results of experience in development. The term is the heart of an unpublished essay of mine and is meant to replace such problematic words as *instincts*. They are organizations of the brain, always partially innate, that make the organism apt to behave in a certain way under certain conditions.

dishfigured in psychology by a sometimes forbidding jargon, which is really an overgeneralization of the spinal-reflex terminology of the nineteenth century. But, for our purposes, we may consider the laboratory study of learning to have been of three central kinds, the learning of signals, skills, and solutions. Let us take up each in turn, asking the question, is consciousness necessary?

Signal learning (or classical or Pavlovian conditioning) is the simplest example. If a light signal immediately followed by a puff of air through a rubber tube is directed at a person's eye about ten times, the eyelid, which previously blinked only to the puff of air, will begin to blink to the light signal alone, and this becomes more and more frequent as trials proceed.⁹ Subjects who have undergone this well-known procedure of signal learning report that it has no conscious component whatever. Indeed, consciousness, in this example the intrusion of voluntary eye blinks to try to assist the signal learning, blocks it from occurring.

In more everyday situations, the same simple associative learning can be shown to go on without any consciousness that it has occurred. If a distinct kind of music is played while you are eating a particularly delicious lunch, the next time you hear the music you will like its sounds slightly more and even have a little more saliva in your mouth. The music has become a signal for pleasure which mixes with your judgment. And the same is true for paintings.¹⁰ Subjects who have gone through this kind of test in the laboratory, when asked why they liked the music or paintings better after lunch, could not say. They were not conscious they had learned anything. But the really interesting thing here is that if you know about the phenomenon beforehand and

⁹ G. A. Kimble, "Conditioning as a function of the time between conditioned and unconditioned stimuli," *Journal of Experimental Psychology*, 1947, 37: 1-15.

¹⁰ These studies are those of Gregory Razran and are discussed on page 232 of his *Mind in Evolution* (Boston: Houghton Mifflin, 1971). They are discussed critically in relation to the whole problem of unintentional learning by T. A. Ryan, *Intentional Behavior* (New York: Ronald Press, 1970), pp. 235-236.

are conscious of the contingency between food and the music or painting, the learning does not occur. Again, consciousness actually *reduces* our learning abilities of this type, let alone not being necessary for them.

As we saw earlier in the performance of skills, so in the learning of skills, consciousness is indeed like a helpless spectator, having little to do. A simple experiment will demonstrate this fact. Take a coin in each hand and toss them both, crossing them in the air in such a way that each coin is caught by the opposite hand. This you can learn in a dozen trials. As you do, ask, are you conscious of everything you do? Is consciousness necessary at all? I think you will find that learning is much better described as being 'organic' rather than conscious. Consciousness takes you into the task, giving you the goal to be reached. But from then on, apart perhaps from fleeting neurotic concerns about your abilities at such tasks, it is as if the learning is done for you. Yet the nineteenth century, taking consciousness to be the whole architect of behavior, would have tried to explain such a task as consciously recognizing the good and bad motions, and by free choice repeating the former and dropping out the latter!

The learning of complex skills is no different in this respect. Typewriting has been extensively studied, it generally being agreed in the words of one experimenter "that all adaptations and short cuts in methods were unconsciously made, that is, fallen into by the learners quite unintentionally. The learners suddenly noticed that they were doing certain parts of the work in a new and better way."¹¹

In the coin-tossing experiment, you may have even discovered that consciousness if present impeded your learning. This is a very common finding in the learning of skills, just as we saw it was in their performance. Let the learning go on without your being too conscious of it, and it is all done more smoothly and

¹¹ W. F. Book, *The Psychology of Skill* (New York: Gregg, 1925).

efficiently. Sometimes too much so, for, in complex skills like typing, one may learn to consistently type 'hte' for 'the'. The remedy is to reverse the process by consciously practicing the mistake 'hte', whereupon contrary to the usual idea of 'practice makes perfect', the mistake drops away—a phenomenon called negative practice.

In the common motor skills studied in the laboratory as well, such as complex pursuit-rotor systems or mirror-tracing, the subjects who are asked to be very conscious of their movements do worse.¹² And athletic trainers whom I have interviewed are unwittingly following such laboratory-proven principles when they urge their trainees not to think so much about what they are doing. The Zen exercise of learning archery is extremely explicit on this, advising the archer not to think of himself as drawing the bow and releasing the arrow, but releasing himself from the consciousness of what he is doing by letting the bow stretch itself and the arrow release itself from the fingers at the proper time.

Solution learning (or instrumental learning or operant conditioning) is a more complex case. Usually when one is acquiring some solution to a problem or some path to a goal, consciousness plays a very considerable role in setting up the problem in a certain way. But consciousness is not necessary. Instances can be shown in which a person has no consciousness whatever of either the goal he is seeking or the solution he is finding to achieve that goal.

Another simple experiment can demonstrate this. Ask someone to sit opposite you and to say words, as many words as he can think of, pausing two or three seconds after each of them for you to write them down. If after every plural noun (or adjective, or abstract word, or whatever you choose) you say "good" or "right" as you write it down, or simply "mmm-hmm" or smile, or repeat the plural word pleasantly, the frequency of plural nouns (or

¹² H. L. Waskom, "An experimental analysis of incentive and forced application and their effect upon learning," *Journal of Psychology*, 1936, 2: 393-408.

whatever) will increase significantly as he goes on saying words. The important thing here is that the subject is not aware that he is learning anything at all.¹³ He is not conscious that he is trying to find a way to make you increase your encouraging remarks, or even of his solution to that problem. Every day, in all our conversations, we are constantly training and being trained by each other in this manner, and yet we are never conscious of it.

Such unconscious learning is not confined to verbal behavior. Members of a psychology class were asked to compliment any girl at the college wearing red. Within a week the cafeteria was a blaze of red (and friendliness), and none of the girls was aware of being influenced. Another class, a week after being told about unconscious learning and training, tried it on the professor. Every time he moved toward the right side of the lecture hall, they paid rapt attention and roared at his jokes. It is reported that they were almost able to train him right out the door, he remaining unaware of anything unusual.¹⁴

The critical problem with most of these studies is that if the subject decided beforehand to look for such contingencies, he would of course be conscious of what he was learning to do. One way to get around this is to use a behavioral response which is imperceptible to the subject. And this has been done, using a very small muscle in the thumb whose movements are imperceptible to us and can only be detected by an electrical recording apparatus. The subjects were told that the experiments were concerned with the effect of intermittent unpleasant noise com-

¹³ J. Greenspoon, "The reinforcing effect of two spoken sounds on the frequency of two responses," *American Journal of Psychology*, 1955, 68: 409-416. But there is considerable controversy here, particularly in the order and wording of postexperimental questions. There may even be a kind of tacit contract between subject and experimenter. See Robert Rosenthal, *Experimenter Effects in Behavioral Research* (New York: Appleton-Century-Crofts, 1966). In this controversy, I presently agree with Postman that the learning occurs *before* the subject becomes conscious of the reinforcement contingency, and indeed that consciousness would not occur unless this had been so. L. Postman and L. Sassenrath, "The automatic action of verbal rewards and punishment," *Journal of General Psychology*, 1961, 65: 109-136.

¹⁴ W. Lambert Gardiner, *Psychology: A Story of a Search* (Belmont, California: Brooks/Cole, 1970), p. 76.

bined with music upon muscle tension. Four electrodes were placed on their bodies, the only real one being the one over the small thumb muscle, the other three being dummy electrodes. The apparatus was so arranged that whenever the imperceptible thumb-muscle twitch was electrically detected, the unpleasant noise was stopped for 15 seconds if it was already sounding, or delayed for 15 seconds if was not turned on at the time of the twitch. In all subjects, the imperceptible thumb twitch that turned off the distressing noise increased in rate without the subjects' being the slightest bit conscious that they were learning to turn off the unpleasant noise.¹⁵

Thus, consciousness is not a necessary part of the learning process, and this is true whether it be the learning of signals, skills, or solutions. There is, of course, much more to say on this fascinating subject, for the whole thrust of contemporary research in behavior modification is along these lines. But, for the present, we have simply established that the older doctrine that conscious experience is the substrate of all learning is clearly and absolutely false. At this point, we can at least conclude that it is possible — possible I say — to conceive of human beings who are not conscious and yet can learn and solve problems.

Consciousness Not Necessary for Thinking

As we go from simple to more complicated aspects of mentality, we enter vaguer and vaguer territory, where the terms we use become more difficult to travel with. Thinking is certainly one of these. And to say that consciousness is not necessary for thinking makes us immediately bristle with protest. Surely thinking is the very heart and bone of consciousness! But let us go slowly

¹⁵ R. F. Hefterline, B. Keenan, R. A. Harford, "Escape and avoidance conditioning in human subjects without their observation of the response," *Science*, 1959, 130: 1338-1339. Another study which shows unconscious solution learning very clearly is that of J. D. Keahn: "Experimental Studies of the Unconscious: operant conditioning of unconscious eye blinking," *Behavior Research and Therapy*, 1967, 5: 95-102.

here. What we would be referring to would be that type of free associating which might be called thinking-about or thinking-of, which, indeed, always seems to be fully surrounded and immersed in the image-peopled province of consciousness. But the matter is really not that clear at all.

Let us begin with the type of thinking that ends in a result to which may be predicated the terms right or wrong. This is what is commonly referred to as making judgments, and is very similar to one extreme of solution learning that we have just discussed.

A simple experiment, so simple as to seem trivial, will bring us directly to the heart of the matter. Take any two unequal objects, such as a pen and pencil or two unequally filled glasses of water, and place them on the desk in front of you. Then, partly closing your eyes to increase your attention to the task, pick up each one with the thumb and forefinger and judge which is heavier. Now introspect on everything you are doing. You will find yourself conscious of the feel of the objects against the skin of your fingers, conscious of the slight downward pressure as you feel the weight of each, conscious of any protuberances on the sides of the objects, and so forth. And now the actual judging of which is heavier. Where is that? Lo! the very act of judgment that one object is heavier than the other is not conscious. It is somehow just given to you by your nervous system. If we call that process of judgment thinking, we are finding that such thinking is not conscious at all. A simple experiment, yes, but extremely important. It demolishes at once the entire tradition that such thought processes are the structure of the conscious mind.

This type of experiment came to be studied extensively back at the beginning of this century in what came to be known as the Würzburg School. It all began with a study by Karl Marbe in 1901, which was very similar to the above, except that small weights were used.¹⁶ The subject was asked to lift two weights

¹⁶ K. Marbe, *Experimentell-Psychologische Untersuchungen über das Urteil, eine Einleitung in die Logik* (Leipzig: Engelmann, 1901).

in front of him, and place the one that was heavier in front of the experimenter, who was facing him. And it came as a startling discovery both to the experimenter himself and to his highly trained subjects, all of them introspective psychologists, that the process of judgment itself was never conscious. Physics and psychology always show interesting contrasts, and it is one of the ironies of science that the Marbe experiment, so simple as to seem silly, was to psychology what the so-difficult-to-set-up Michelson-Morley experiment was to physics. Just as the latter proved that the ether, that substance supposed to exist throughout space, did not exist, so the weight-judgment experiment showed that judging, that supposed hallmark of consciousness, did not exist in consciousness at all.

But a complaint can be lodged here. Maybe in lifting the objects the judging was all happening so fast that we forgot it. After all, in introspecting we always have hundreds of words to describe what happens in a few seconds. (What an astonishing fact that is!) And our memory fades as to what just happened even as we are trying to express it. Perhaps this was what was occurring in Marbe's experiment, and that type of thinking called judging could be found in consciousness, after all, if we could only remember.

This was the problem as Watt faced it a few years after Marbe.¹⁷ To solve it, he used a different method, word associations. Nouns printed on cards were shown to the subject, who was to reply by uttering an associate word as quickly as he could. It was not free association, but what is technically called partially constrained: in different series the subject was required to associate to the visual word a superordinate (e.g., oak-tree), coordinate (oak-elm), or subordinate (oak-beam); or a whole (oak-forest), a part (oak-acorn), or another part of a common whole

¹⁷ H. J. Watt, "Experimentelle Beiträge zur einer Theorie des Denkens," *Archiv für Geschichte der Psychologie*, 1905, 4: 289-436.

(oak-path). The nature of this task of constrained associations made it possible to divide the consciousness of it into four periods: the instructions as to which of the constraints it was to be (e.g., superordinate), the presentation of the stimulus noun (e.g., oak), the search for an appropriate association, and the spoken reply (e.g., tree). The introspecting observers were asked to confine themselves first to one period and then to another, and thus get a more accurate account of consciousness in each.

It was expected that the precision of this fractionation method would prove Marbe's conclusions wrong, and that the consciousness of thinking would be found in Watt's third period, the period of the search for the word that would suit the particular constrained association. But nothing of the sort happened. It was the third period that was introspectively blank. What seemed to be happening was that thinking was automatic and not really conscious once a stimulus word had been given, and, previous to that, the particular type of association demanded had been adequately understood by the observer. This was a remarkable result. Another way of saying it is that *one does one's thinking before one knows what one is to think about*. The important part of the matter is the instruction, which allows the whole business to go off automatically. This I shall shorten to the term *struction*, by which I mean it to have the connotation of both instruction and construction.¹⁸

Thinking, then, is not conscious. Rather, it is an automatic process following a *struction* and the materials on which the *struction* is to operate.

But we do not have to stay with verbal associations; any type of problem will do, even those closer to voluntary actions. If I say to

¹⁸ The terms *set*, *determining tendency*, and *struction* need to be distinguished. A set is the more inclusive term, being an engaged apic structure which in mammals can be ordered from a general limbic component of readiness to a specific cortical component of a determining tendency, the final part of which in humans is often a *struction*.

myself, I shall think about an oak in summer, that is a struction, and what I call thinking about is really a file of associated images cast up on the shores of my consciousness out of an unknown sea, just like the constrained associations in Watt's experiment.

If we have the figures 6 and 2, divided by a vertical line, 6|2, the ideas produced by such a stimulus will be eight, four, or three, according to whether the struction prescribed is addition, subtraction, or division. The important thing is that the struction itself, the process of addition, subtraction, or division, disappears into the nervous system once it is given. But it is obviously there 'in the mind' since the same stimulus can result in any of three different responses. And that is something we are not in the least aware of, once it is put in motion.

Suppose we have a series of figures such as the following:



What is the next figure in this series? How did you arrive at your answer? Once I have given you the struction, you automatically 'see' that it is to be another triangle. I submit that if you try to introspect on the process by which you came up with the answer you are not truly retrieving the processes involved, but inventing what you think they must have been by giving yourself another struction to that effect. In the task itself, all you were really conscious of was the struction, the figures before you on the page, and then the solution.

Nor is this different from the case of speech which I mentioned earlier. When we speak, we are not really conscious either of the search for words, or of putting the words together into phrases, or of putting the phrases into sentences. We are only conscious of the ongoing series of structions that we give ourselves, which then, automatically, without any consciousness whatever, result in speech. The speech itself we can be conscious of as it is

produced if we wish, thus giving some feedback to result in further structions.

So we arrive at the position that the actual process of thinking, so usually thought to be the very life of consciousness, is not conscious at all and that only its preparation, its materials, and its end result are consciously perceived.

Consciousness Not Necessary for Reason

The long tradition of man as the rational animal, the tradition that enthroned him as *Homo sapiens*, rests in all its pontifical generality on the gracile assumption that consciousness is the seat of reason. Any discussion of such an assumption is embarrassed by the vagueness of the term reason itself. This vagueness is the legacy we have from an older 'faculty' psychology that spoke of a 'faculty' of reason, which was of course situated 'in' consciousness. And this forced deposition of reason and consciousness was further confused with ideas of truth, of how we ought to reason, or logic — all quite different things. And hence logic was supposed to be the structure of conscious reason confounding generations of poor scholars who knew perfectly well that syllogisms were not what was on their side of introspection.

Reasoning and logic are to each other as health is to medicine, or — better — as conduct is to morality. Reasoning refers to a gamut of natural thought processes in the everyday world. Logic is how we ought to think if objective truth is our goal — and the everyday world is very little concerned with objective truth. Logic is the science of the justification of conclusions we have reached by natural reasoning. My point here is that, for such natural reasoning to occur, consciousness is not necessary. The very reason we need logic at all is because most reasoning is not conscious at all.

Consider to begin with the many phenomena we have already established as going on without consciousness which can be

called elementary kinds of reasoning. Choosing paths, words, notes, motions, the perceptual corrections in size and color conditions — all are primitive kinds of reasoning that go on without any prod, nudge, or even glance of consciousness.

Even the more standard types of reasoning can occur without consciousness. A boy, having observed on one or more past occasions that a particular piece of wood floats on a particular pond, will conclude directly in a new instance that another piece of wood will float on another pond. There is no collecting together of past instances in consciousness, and no necessary conscious process whatever when the new piece of wood is seen directly as floating on the new pond. This is sometimes called reasoning from particulars, and is simply expectation based on generalization. Nothing particularly extraordinary. It is an ability common to all the higher vertebrates. Such reasoning is the structure of the nervous system, not the structure of consciousness.

But more complex reasoning without consciousness is continually going on. Our minds work much faster than consciousness can keep up with. We commonly make general assertions based on our past experiences in an automatic way, and only as an afterthought are we sometimes able to retrieve any of the past experiences on which an assertion is based. How often we reach sound conclusions and are quite unable to justify them! Because reasoning is not conscious. And consider the kind of reasoning that we do about others' feelings and character, or in reasoning out the motives of others from their actions. These are clearly the result of automatic inferences by our nervous systems in which consciousness is not only unnecessary, but, as we have seen in the performance of motor skills, would probably hinder the process.¹⁹

Surely, we exclaim, this cannot be true of the highest processes of intellectual thought! Surely there at last we will come to

¹⁹ Such instances were early recognized as not conscious and were called "automatic inference" or "common sense." Discussions can be found in Sully, Mill, and other nineteenth-century psychologists.

the very empire of consciousness, where all is spread out in a golden clarity and all the orderly processes of reason go on in a full publicity of awareness. But the truth has no such grandeur. The picture of a scientist sitting down with his problems and using conscious induction and deduction is as mythical as a unicorn. The greatest insights of mankind have come more mysteriously. Helmholtz had his happy thoughts which "often enough crept quietly into my thinking without my suspecting their importance . . . in other cases they arrived suddenly, without any effort on my part . . . they liked especially to make their appearance while I was taking an easy walk over wooded hills in sunny weather!"²⁰

And Gauss, referring to an arithmetical theorem which he had unsuccessfully tried to prove for years, wrote how "like a sudden flash of lightning, the riddle happened to be solved. I myself cannot say what was the conducting thread which connected what I previously knew with what made my success possible."²¹

And the brilliant mathematician Poincaré was particularly interested in the manner in which he came upon his own discoveries. In a celebrated lecture at the Société de Psychologie in Paris, he described how he set out on a geologic excursion: "The incidents of the journey made me forget my mathematical work. Having reached Coutances, we entered an omnibus to go some place or other. At the moment when I put my foot on the step, the idea came to me, without anything in my former thoughts seeming to have paved the way for it, the transformation I had used to define the Fuchsian functions were identical with those of non-Euclidian geometry!"²²

It does seem that it is in the more abstract sciences, where the materials of scrutiny are less and less interfered with by everyday

²⁰ As quoted by Robert S. Woodworth, *Experimental Psychology* (New York: Holt, 1938), p. 818.

²¹ As quoted by Jacques Hadamard, *The Psychology of Invention in the Mathematical Field* (Princeton: Princeton University Press, 1945), p. 15.

²² Henri Poincaré, "Mathematical creation," in his *The Foundations of Science*, G. Bruce Halsted, trans. (New York: The Science Press, 1913), p. 387.

experience, that this business of sudden flooding insights is most obvious. A close friend of Einstein's has told me that many of the physicist's greatest ideas came to him so suddenly while he was shaving that he had to move the blade of the straight razor very carefully each morning, lest he cut himself with surprise. And a well-known physicist in Britain once told Wolfgang Köhler, "We often talk about the three B's, the Bus, the Bath, and the Bed. That is where the great discoveries are made in our science."

The essential point here is that there are several stages of creative thought: first, a stage of preparation in which the problem is consciously worked over; then a period of incubation without any conscious concentration upon the problem; and then the illumination which is later justified by logic. The parallel between these important and complex problems and the simple problems of judging weights or the circle-triangle series is obvious. The period of preparation is essentially the setting up of a complex structure together with conscious attention to the materials on which the structure is to work. But then the actual process of reasoning, the dark leap into huge discovery, just as in the simple trivial judgment of weights, has no representation in consciousness. Indeed, it is sometimes almost as if the problem had to be forgotten to be solved.

The Location of Consciousness

The final fallacy which I wish to discuss is both important and interesting, and I have left it for the last because I think it deals the coup de grâce to the everyman theory of consciousness. Where does consciousness take place?

Everyone, or almost everyone, immediately replies, in my head. This is because when we introspect, we seem to look inward on an inner space somewhere behind our eyes. But what on earth do we mean by 'look'? We even close our eyes sometimes to introspect even more clearly. Upon what? Its spatial

character seems unquestionable. Moreover we seem to move or at least 'look' in different directions. And if we press ourselves too strongly to further characterize this space (apart from its imagined contents), we feel a vague irritation, as if there were something that did not want to be known, some quality which to question was somehow ungrateful, like rudeness in a friendly place.

We not only locate this space of consciousness inside our own heads. We also assume it is there in others'. In talking with a friend, maintaining periodic eye-to-eye contact (that remnant of our primate past when eye-to-eye contact was concerned in establishing tribal hierarchies), we are always assuming a space behind our companion's eyes into which we are talking, similar to the space we imagine inside our own heads where we are talking from.

And this is the very heartbeat of the matter. For we know perfectly well that there is no such space in anyone's head at all! There is nothing inside my head or yours except physiological tissue of one sort or another. And the fact that it is predominantly neurological tissue is irrelevant.

Now this thought takes a little thinking to get used to. It means that we are continually inventing these spaces in our own and other people's heads, knowing perfectly well that they don't exist anatomically; and the location of these 'spaces' is indeed quite arbitrary. The Aristotelian writings,²³ for example, located consciousness or the abode of thought in and just above the heart, believing the brain to be a mere cooling organ since it was insensitive to touch or injury. And some readers will not have found this discussion valid since they locate their thinking selves somewhere in the upper chest. For most of us, however, the habit of locating consciousness in the head is so ingrained that it

²³ It is so obvious that the writings ascribed to Aristotle were not written by the same hand that I prefer this designation.