

We can only expect, with any degree of predictional value, events which later on will obtain a higher predictional value. In this form, however, the lack of cogency is obvious.

The probability theory of meaning cannot be reduced to the truth theory of meaning; on the contrary, the latter must be conceived as a schematized form of the former, valid only in the sense of an approximation.

If, from this point of view, we take up the question of the positivistic construction of the world, we find that the introduction of the impression basis does not free us from probability statements, not even at the very basis itself. It is not only the inferences from the basis to external things which have a probability character; the same is valid for every statement concerning basic facts. This is the last blow against the positivistic theory, shaking even the last remnant of absolutism still left to it after the rejection of its wider pretensions. The psychological origin of this theory was the tendency to restore absolute certainty to all statements about the world; if statements about impressions were absolutely certain, and if statements about physical things were nothing but equivalent transformations of impression statements, this aim would be reached. We found in the preceding chapter that the second part of this theory is not tenable, that the relations between impressions and physical facts are probability relations, and that the certainty of the basis cannot be transferred to our knowledge of external objects. In the present chapter we found that a similar fate attends the basis itself in the light of a precise examination. There is no certainty at all remaining—all that we know can be maintained with probability only. There is no Archimedean point of absolute certainty left to which to attach our knowledge of the world; all we have is an elastic net of probability connections floating in open space.

CHAPTER IV

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§ 23. The grammar of the word "existence"

Our inquiry into the nature of impressions led us to the conclusion that impressions are not observed but only inferred. We said that the things directly observed are the concrete things of daily life and that it is an inference which leads us from them to the existence of impressions. The basis of the epistemological construction, therefore, is the world of concrete objects; from this sphere inferences lead to more complex physical objects, on the one hand, and to impressions, on the other.

It will be our task to analyze this process, to develop the whole construction of the world on the concreta basis—the result forms what is usually called our picture of the world. The analysis of this construction will furnish us a theory of existence which relates our results concerning the probability character of the combining relations to the discovery that it is the sphere of concrete objects, not of impressions, which should be taken as a basis for the rational reconstruction of the world.

Before entering into this analysis, however, we must make a preliminary remark concerning the term "existence." Language expresses this concept by the term "there is." If we ask for the meaning of this term, we must begin with an inquiry into the rules according to which the words "there is" are used. That is to say, we want to learn the grammar of the term; without knowing this grammar

we should not be able to employ the term in an understandable way.

Entering into this inquiry, we must note first that the words "there is" do not always have the meaning of existence. If we ask "Where is William?" and receive the answer, "There is William," this "there is" expresses a spatial determination; we do not want to emphasize that William "exists" but that he is at the place denoted by "there." The meaning of existence is expressed in another kind of phrase. We say, for example, "There is a bird as tall as a horse"; the "there is" here does not indicate a spatial determination but that such a bird exists. This is obvious if we compare the last phrase with the phrase, "There is an ostrich," spoken, say, before the cage in a zoo; in this phrase "there" is a spatial determination, as in the first example. Let us consider the construction of a phrase containing the existential "there is."

The essential feature of such phrases is that they contain the term "there is" or "there exists" not as applied to an individual but in the context of a description. A description is a combination of words, the sense of each of which is already determined, but which defines, in combination, a new term. We can ask then whether there exists a corresponding thing. This is a reasonable question because we cannot infer from the description that such a thing exists; this is not possible even in case the existence of things corresponding to the constituents of the definition is guaranteed. If we know that there exist a mammal and also an animal with a trunk instead of a nose, we do not yet know that there exists also a mammal with a trunk. This is why language applies here the concept of existence and formulates the sentence: "There is a mammal with a trunk." This proposition informs us of something new; its truth is confirmed when we see an elephant. What is

stated, however, is not the existence of this single elephant but of a thing corresponding to the given description. An existential proposition always concerns the existence of the specified, not of an individual.

Logistic expresses this idea by the prescription that an existence sentence is always to contain an operator together with a bound variable:

$$(\exists x)f(x) \quad (1)$$

which formula reads, "There exists an x such that $f(x)$ is true." We never write $(\exists a)$, where a is an individual; i.e., we do not say, "This elephant exists." Such a statement would be meaningless. If we have the feeling that perhaps this statement means something, this is because we take the word "elephant" not in the sense of an individual sign but in the sense of a description. A manual of zoölogy contains a description of an elephant; if we point to an elephant and say, "This elephant exists," this may mean "This thing exists as an elephant," or more briefly, "This thing is an elephant." It is obvious that the word "elephant" in all these phrases is a description. If we were to point to the elephant and say, "This lion exists," our assertion would be false not because the elephant does not exist but because it is not a lion. If the phrase "This elephant exists" is accepted as meaningful, the word "elephant" must therefore be a description, and our phrase must be interpreted as meaning "There exists an elephant in the direction in which I point," or simply: "This thing is an elephant."

The last phrase does not contain the concept "existence," for the word "is" in this case is the copula and not the existential "is." So the form of the last phrase is $f(a)$, that is, a certain predicate f (being an elephant) is predicated of the argument a . We see that a statement of such

a kind may be used as a substantiation of an existence proposition. If the thing a is an elephant, we are correct in saying "There is an elephant." In the last form, the "is" is the existential sign, and "elephant" is a description. Logistic expresses this relation by the formula

$$f(a) \supset (\exists x)f(x) \quad (2)$$

We may say: The thing a confers existence on a corresponding descriptum. This is the correct way of expressing the relation between things and the term "existence."

§ 24. The different kinds of existence

This point in grammar having been determined, we shall now proceed to a further analysis of the concept of existence. The next thing to be noted is that the concept of existence divides into different subconcepts which must now be explained.

Imagine we are taking a walk at dusk through a lonely moor; we see before us at some distance a man in the road. He is a strange little man, wearing a caftan, and carrying a bag on his shoulder. In spite of a certain feeling of uneasiness we do not doubt the man's reality. Coming nearer, we see that he does not walk; he stands and waves his hand. We advance farther and discover that it is not a man that we see there but a juniper bush, a branch of which is moved by the wind.

What has happened in this case, logically speaking? First, there was a man and, afterward, a juniper bush. We know, now, that the juniper bush is the "real" thing and that the man was an "apparent" thing only; but this man had an existence in a certain sense. We may even go back several steps and "produce" the man once more, in spite of knowing about the illusion. The juniper bush then does not cease to exist—that we know—but we do not see the

bush; we see the thing like a man and not like a bush. We shall say that both the man and the bush have *immediate existence* at the moments we see them. In spite of this common quality there is a difference as to their existence: the immediate existence of the man is a *subjective existence* only, whereas that of the bush is an *objective existence*. We must add that the objective existence of the bush may even persist when its immediate existence has ceased whereas the subjective existence of the man is bound to the duration of the immediate existence.

It follows that the three new terms introduced denote partially overlapping subclasses of the existence concept.

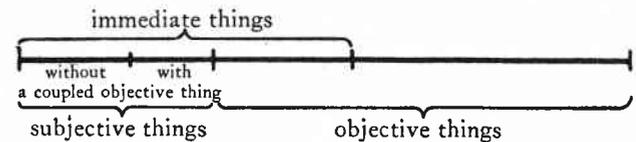


FIG. 4.—The different kinds of existence

Existence is divided into subjective and objective existence; the domain of immediate existence, however, includes all subjective existence and, in addition, a part of the domain of objective existence. It is this domain of immediate existence to which our epistemological interest will be particularly directed.

According to our new notation, we shall also apply the terms introduced to things directly. We shall speak of subjective and objective things and of immediate things. This mode of speech will facilitate our investigations. Figure 4 may illustrate our classification.

The subjective things involve a further subdivision. The subjective thing of our example, the man with the caftan, stands in a certain relation to the objective thing, the bush; we should not see the man if there were no bush, and we see

that the man is altered if the bush is altered. If the branch of the bush is moved, the man waves his hand. We shall say in such a case that the subjective thing is *coupled* to a certain objective thing. Our observation of the subjective thing, in this case, is bound to an observation of an objective thing in the physical sense, i.e., in the sense that light rays coming from the bush enter our eyes; we do not observe, however, the bush as a bush, but as a man. There is then no immediate bush; what exists instead is a subjective man.

A very instructive case of this type is that of the cinema. The immediate things we see there are of a very suggestive character; though we know they are subjective things only, we cannot withstand their intuitiveness, their persuasiveness, and are seized by them in such a way that emotions of pain, affliction, joy, tenseness, and sympathy are aroused as though the subjective things were objective. The co-ordinated objective thing is here the screen as a sheet of cloth, or a whitened wall covered with dark and bright patches. The objective and subjective things are coupled; a movement of the patches on the screen produces a movement of the subjective things. In this case, however, the subjective and objective things do not always occupy the same place in space. The subjective things have a certain spatial depth and therefore cannot be localized on the two-dimensional screen. They may even be very far off; such is the case in a view of distant mountains which by the perspective of the picture may subjectively appear at a distance of some miles.

There are, however, cases in which there is no objective thing co-ordinated with the subjective thing. Such is the case of dreams. The subjective things here are also very suggestive and are not associated (as in the cinema) with a knowledge about their merely subjective character. In this

case, however, there is no coupled objective thing at all. That is to say, when I dream that my friend stands before me, there may be objective things standing just at the place where my friend is localized; but they are not coupled with my friend in the sense defined (certain movements of these other things do not produce corresponding movements of my friend).

One might be tempted to construe another difference between the cinema and the dream by pointing to the fact that the subjective things in the cinema correspond to some objective things actualized at an earlier time, namely, to the movements of the actors during the taking of the film, whereas there is no such correspondence for the dream. This difference, however, is not relevant for our considerations. We do not call the correspondence between the cinema pictures and the actors a coupling; if we speak of an *existential coupling*, this coupling is to concern states of things existing at the same time. It is this concept of existential coupling on which our subdivision of subjective things is based.

The subjective things both of the cinema and of the dream are immediate things; in this respect they do not differ from such objective immediate things as the physical things of our daily environment. The separation of immediate things into subjective and objective cannot be performed on the basis of immediate intuition; their intuitiveness is their common feature, and we must apply other methods to separate them, methods of which we shall speak later. What is meant by immediate intuitiveness is not to be defined; we may regard immediate existence as a concept known to everybody. If someone does not understand us, we put him into a certain situation and pronounce the term, thus accustoming him to the association of the term and the situation seen by him. We make use

here of the same method as employed for the definition of special empirical concepts. If a child asks us, "What is a knife?" we take a knife and show it to the child. It was in this manner that we first learned the sense of words, that is, the correspondence of words to things. We previously presented this idea (§ 5) by imagining a collection of specimens in which everything bears a label with its name on it. We pointed out also that qualities such as "possession" or "being larger than" are to be demonstrated in the collection of specimens; there may be two poles of different size, marked as "pole *a*" and "pole *b*," and a label inscribed, "Pole *a* is larger than pole *b*." In the same way, the concept of immediate existence could be presented. After our visitor has passed before many cages, each with a label bearing the name of the animal, he is led to a large cage in which many different animals are moving about. "There is an elephant among these animals" may be written on a label before this cage. The term "there is" occurring here stands for our concept of immediate existence. If it is introduced in the form described, it is simultaneously shown that, as we remarked in our grammatical excursion, existence always concerns a description, that the words "there is" denote the existence of the specified among other things. That this term is not limited to objective things but applies to subjective things as well may be pointed out by the fact that a dreamed collection of specimens of the arrangement described would suffice for the explanation of the intuitive "there is" as well as the real one.

After the determination of the concept of immediate existence we must turn to the concept of objective existence. This concept is of a type entirely different from the first. Objective existence is not an intuitive quality; it must be determined by relations which are attached to the concept of immediate existence. That is to say, objective

existence is a determinate logical function of subjective existence.

To carry through this determination, we have to reconstruct the methods by which the distinction of immediate and objective existence is performed in practice. In the pursuit of this plan, we turn next to the task of expounding the logical construction of the system of knowledge.

§ 25. The projective construction of the world

The original world is the world of immediately existing things. It is the world of concrete objects around us, entering into our knowledge without any intellectual operations being performed by us. It is a world where there is no difference between waking and dreaming; in which everything exists exactly in the form in which it is observed.

The word "original," with which we characterize this world, has three significations. First, it means that this is the world which *historically* is first, standing at the beginning of the long road which has been traveled by mankind from its primitive stages to the complicated state of intellectual culture of our day. Second, it means that this is the world at the beginning of the *individual* mental development of any human being; i.e., the world of early childhood. Third, it means that this is the *psychologically* first world; by this term we mean that this is the world which presents itself immediately, which is actually not constructed by inferences but is the basis of all inferences actually performed by us.

There is a theory that there remains a question as to the *logically* first basis, i.e., a basis which must be chosen for logical reasons as the ground of all inference if we want to give the rational reconstruction of the world. This idea seems to me untenable. Logic does not distinguish one basis as the necessary one; logical inferences may be attached

to any basis, and what is a basis for one logical system may become a deduced result for another. This logical arbitrariness of the epistemological basis has been justly pointed out by Carnap.¹ If we want to mark one basis as the "original" one, this question may only concern that basis which corresponds best to the actual performance of knowledge; we may ask for the best adapted form of the rational reconstruction. This leads to the three senses of the word "original" as distinguished, according as we want to adapt the rational reconstruction to the historical course of knowledge, or to the course of the individual acquisition of knowledge in the development from childhood to manhood, or to the course of operations in which knowledge is actually performed at every moment in which we want to know something new. These three kinds of basis are perhaps not identical but they are similar and surely rather remote from the "simplest" basis such as logicians would like to assume. Seen from the viewpoint of a neatly ordered system, in the logical sense, the actual basis is on a rather complicated middle level. This is especially obvious if we consider the basis in the third sense. The act of acquiring knowledge reveals its implicit basis whenever doubts of the physical world occur, as, for instance, at the moment of awakening, or at times of high nervous tension. We go back then to the immediately existing objects, to the concreta, as the most reliable facts. This *return to the basis of immediate existence* points out that it is the world of the concreta which forms the actual psychological basis.

Let us consider this original world and the ways in which we emancipate ourselves from it. Primitive people make no distinction between subjective and objective existence; they take as real what they observe, and they know no difference between dreams and wakefulness. Explorers re-

¹ R. Carnap, *Der logische Aufbau der Welt* (Berlin and Leipzig, 1928), p. 83.

late strange stories about the interconnection of dreamed and real facts among primitive races. A man who dreams that a certain woman makes a declaration of love to him may take this as a real offer; a man who dreams that another man wounded him, or some member of his family, may try to kill this man.² Observations of children in the days of early childhood furnish analogous results; we know that there are children who relate, without any consciousness of lying, things which never happened, as if they were observed by them—thus revealing that they do not always differentiate between subjective and objective existence. We see that it is not only the difference between dreaming and being awake which is in question here. There are many things seen while awake which afterward turn out to be of merely subjective existence. To this class belong optical illusions like the image seen in a mirror, taken originally as a material thing behind the mirror, or the appearance of the bent stick produced by a straight one put into clear water. Originally the world is full of illusions of this kind. Historically speaking, it was a long time before mankind learned to distinguish between subjective and objective existence, a distinction obtained by means of intellectual processes but not directly furnished by observation.

The logical way in which this distinction is made is as follows. We begin with the presupposition that all things which we observe exist; that is, with the presupposition that immediate existence is equivalent to objective existence. We contrive then to construct a net of combining relations between the things; we call these physical laws. They are relations of the type, "If there is one thing, there is another thing also." If the other thing is not observed, it is easy—in this primitive state—to alter certain conditions and thus observe it. The primitive man sees that

² Cf. Lévy-Brühl, *La Mentalité primitive* (Paris, 1922), p. 102.

there are certain traces in the sand and infers that there is a bear; he then goes into the woods and sees the bear. Thus we succeed in constructing inferences on the basis of observed relations which lead to foreseeing future events.

In performing inferences of such a kind, however, we discover that we are not always successful. The analysis of this fact leads to the discovery of the dream world. The primitive man may have "seen" a bear before his cave, but afterward he finds neither traces in the sand nor the animal itself in the wood. Analogous inferences show the unreality of our own dream world, which is occupied with subjects other than those which concern the primitive man. But it is not only the difference between dreaming and being awake which is established in this way; it is the totality of all other corrections of our immediate world as well. When we try to touch a thing seen in a mirror, at the place where it is seen, we touch nothing; this is the way in which we discover the "virtual" character of the image in the mirror, a method actually performed by children, and even monkeys, when we put a mirror before their eyes. The laws of nature involve contradictions if we consider the whole immediate world as real—this is the reason that the distinction between the objective and the subjective world is introduced.

The method described is a typical statistical method. It starts with the presupposition that all things are real, and arrives at the result that some of them are not real. There is no contradiction in this method, though it cannot be replaced by another which needs no presupposition to be refuted later on. The presupposition is the identification of immediate and objective existence; the result is the division of the domain of immediate existence into a subjective and an objective part. We may say that the character of immediate existence entitles us to assume a thing

as having the character of objective existence so long as no contradiction arises.

The statistical character of the method is expressed in the acknowledgment of the superiority of the greater number. The objects of the waking-world are more numerous than those of the dream world; therefore the waking-world is conceived as the "normal" world, the dream world, on the contrary, as the exception. There is a kind of democracy in our subjective world, and the dream world is outvoted. However, this is not the essential point; there is another quality of the waking-world which distinguishes it from the dream world.

This second point is a statistical matter also but of another type. We said that we construct predictions by making use of the laws of nature. If we now count the success ratio of the predictions, we find that we have arrived at a much better success ratio if we have put the things of the dream apart and do not use them as basis for predictions. This is illustrated in the case of the man who dreams of a bear in his cave but does not observe afterward the traces in the sand, or the bear in the wood. Even if the world of dreams were quantitatively superior to that of wakefulness, the latter would be denoted as superior by this quality of admitting predictions. We cannot construct laws dealing with the things dreamed and furnishing predictions which are confirmed within the dream, or within another dream.

There is a third point of a statistical character which is in favor of the waking-world. It is possible to combine both worlds into a single one if we leave the things of waking as they are but interpret the things of the dream in a way quite different from their immediate appearance. That is to say, if we interpret the things we dream as merely subjective, but as due to internal processes in our body which

have objective existence, we arrive at a single world in which prediction is possible, even when the dream world is included. We can, on the one hand, foresee the dream world to a certain degree; we know that after a certain exciting experience we shall dream of it, we know that after taking a soporific the dream world is suppressed, etc. We can, on the other hand, use the contents of dreams for predictions concerning the world of waking; this is a rather modern discovery owing to Freud's psychoanalysis and applied in psychical cures. This is the epistemological significance of psychoanalysis; it showed for the first time how to construct a causal connection between the two worlds of waking and dreaming. The objects of the dream in this context are not considered as physical objects but as pseudo-objects indicating certain states of the nervous system of the human body. This third point is statistical, like the second, because it cannot furnish an absolute decision in favor of the world of waking; it furnishes only a statistical decision because the laws obtained are probability laws only, i.e., valid in the greater ratio of events.

From the statistical character of the inferences occurring here it is obvious that we never obtain an absolute certainty about objective existence. This corresponds to the result of the preceding chapters. A statement that a certain thing objectively exists is never absolutely certain, be it even one of the simple and concrete things of daily life. But the degree of weight obtained in such a case is, of course, rather high.

It is not always necessary to carry through the whole statistical method in order to discover the merely subjective character of certain objects. Basing our inference on many former experiences, we learn to discern subjective and objective things immediately. As for the dream, we perform this distinction immediately after awaking, with-

out needing further experience; in other cases, the appearance of the object is accompanied by a knowledge of its merely subjective character. This is the case of so-called images which we produce intentionally, or which are raised in the context of other experiences, by association, etc. To explain this, we might speak of a *scale of gradation* of the immediate existence character; representations have a rather feeble existence character if they are produced intentionally but may acquire a stronger existence character if they arise spontaneously. Objects appearing with a feeble existence character are not regarded as real, i.e., we know immediately that chains of inferences attached to these objects would lead to contradictions, and we need not carry through the statistical method. This renunciation of control is perhaps, psychologically speaking, a result of former experiences in early childhood; in any case, it can be logically conceived as such. This means that in the rational reconstruction of knowledge we might start with the presupposition that all objects, the representations included, are real, and prove then by our statistical methods that the representations are not real. Certainly this procedure is used by us every time we are in doubt as to the reality of an observed object. There are sensations with a very feeble degree of existence character, such as sensations outside the field of concentration, as in the case of optical sensations within the peripheral optical field; to clarify their reality, we control them by inferences leading to sensations of a stronger existence character. Thus we turn our eyes in such a way that the supposed thing enters into the central optical field; if it is observed, then we infer that the object formerly seen was real. This is an example of what we called the return to the basis of immediate existence; in a case when we are uncertain about objective existence, we go back to the presupposition that what has immediate

existence also has objective existence, and control this presupposition by the statistical method.

Although we may, in cases such as those described, interpret a low degree of existence character as indicating the subjective character of the object, we must not invert this relation: a high degree of existence character does not necessarily involve the objective character of the thing. There are things of a high degree of existence character which are only subjective; their subjectivity may even be known to us without any enfeebling of the existence character being involved. Of this kind are the things seen in a cinema. We know from the whole situation, from the surrounding interior of the theater, etc., that these things have no objective existence; but their immediate existence is of so high a degree that we submit to the suggestion of their reality and forget, for a while, their merely subjective existence. In this case the knowledge of the unreality of the seen objects is certainly psychologically acquired by former experiences. Small children when taken into a cinema take the pictures for real beings and may be afraid of the terrible beasts and men they see there.

However, the great majority of the things of daily life, the *concreta*, are, for us, real beyond any doubt. This is because they have stood up to every test ever applied. We are entitled to identify their immediate existence, being of so high a degree, with objective existence. This is the reason that these things are so concrete, so indubitable, so solid in their intuitive reality. It is the combination of immediate and objective existence character which is the essential feature of *concreta*.

The *concreta* form the basis of inferences which lead to the existence of other things. That is to say, the inferences leading from immediate to objective existence are for *concreta* skipped in practice; once the existence of *concreta* has

been ascertained, inferences from them lead to other things of a less immediate character.

There are, first, inferences to other *concreta*. The domain of *concreta* accessible to direct observation is restricted, on practical grounds, and for every person in a different way; our personal situation in life allows us to enter into direct contact with only a restricted number of things. There are other continents, foreign people, unseen machines, which we infer from our surrounding *concreta*, without the possibility of observing them directly. But this is only a technical impossibility, and we call these things *concreta* also. Though they never had immediate existence for us, they might obtain it; we provide a substitute by looking at pictures, i.e., by bringing similar things into immediate existence. The inferences leading to these things are probability inferences; we are never absolutely sure whether these other *concreta* actually exist. But this uncertainty is not relevant; it does not render our situation appreciably less secure, as even the existence of accessible *concreta* is not absolutely certain.

Second, there are inferences to *abstracta*. These inferences are, as we pointed out in § 11, equivalences, not probability inferences. Consequently, the existence of *abstracta* is reducible to the existence of *concreta*. There is, therefore, no problem of their objective existence; their status depends on a convention. As for immediate existence, it may be taken as a definition of *abstracta* that they have no immediate existence. Actually the determination of *abstracta* is somewhat arbitrary, so that the term "abstract" itself is rather vague. There are many cases in which we are undecided whether a term is an *abstractum* or a *concretum* (cf. § 11). The process of forming *abstracta* may be continued to the formation of *abstracta* of higher levels, the elements of which are already *abstracta*. Thus

abstraction involves a direction; on the higher levels the decision as to the abstract character of the terms becomes more determinate.

Third, there are inferences to other things which are not abstracta, but which cannot become concreta either, since, for physical reasons, their becoming immediately existent is precluded. Of this kind are things such as electricity, radio waves, atoms, or many invisible gases. The existence of these things is not reducible to the existence of concreta because they are inferred by probability inferences from concreta. Let us introduce the term *illata* for these things, i.e., "inferred things."³ We see that the old disjunction of concreta and abstracta is incomplete; a third term is needed to denote things which are neither concrete—capable of immediate existence—nor abstract—reducible to concreta. The relation of the *illata* to the concreta is a projection in the sense indicated in § 13. The *illata* have, therefore, an existence of their own, as the birds for the people of the cubical world, although they are not accessible to direct observation, that is, to immediate existence.

If it is questioned whether the *illata* are logically different from the abstracta, i.e., if it is maintained that the *illata* are reducible to the concreta, we must answer with the arguments developed in the discussion of the cubical world (§ 14). Our observations of concrete things confer a certain probability on the existence of the *illata*—nothing more. It is not possible to enlarge the class of the considered concreta in such a way that statements about this class are equivalent to a statement about the *illatum*. The equivalence maintained by positivists is due to the neglect of the probability character of the inferences. The atoms

³ We use the participle *illatum* of the Latin *infero*, to denote this kind of thing.

have been discovered by the physicists in a way analogous to the discovery of the birds in the cubical world. Certain observed relations between macroscopic bodies—such as expressed in Dalton's law of multiple proportions—made it very probable that all bodies are built up of very small particles, though these particles could not be directly observed; this was the first substantiation given by the physicists to the theory of atoms. Mach, from his positivistic standpoint, declared that the concept "atom" was nothing but an abbreviation for the relations observed between macroscopic bodies; in our language: Mach declared that the atom is a reducible complex of concreta as internal elements. Boltzmann, one of the leading investigators in the domain of atomism, opposed Mach's "dogmatism" and defended the independent existence of atoms; he compared the hypothesis of atoms to the hypothesis of the stars as being enormous bodies at enormous distances—a hypothesis, he said, inferred only from "scanty optical sensations."⁴ To this hypothesis, he continued, it could also be objected that it constructs "a whole world of imagined things in addition to the world of our sensations"; but in this case nobody doubts their reality. Boltzmann's argument in our terminology would read that there are probability inferences to the existence of atoms, that the atoms are a projective complex of concreta, and that it is no objection against the independent reality of the atoms if a "direct verification," i.e., the determination of a higher weight is physically impossible. Later developments have decided in favor of Boltzmann's opinion; effects have been discovered experimentally which are comparable to a penetration of the walls of the cubical world as described by us. These are the famous discoveries which show individual

⁴ "Von spärlichen Gesichtswahrnehmungen" (L. Boltzmann, *Vorlesungen über Gastheorie* [Leipzig, 1895], p. 6).

effects of a single atom, or electron, like the Wilson tracks of alpha and beta particles. It is true that they do not show the individual atom in the same way that we see a tennis ball; but they increase the weight of the hypothesis to such a degree that no practical doubt remains.

It may be answered that it is unavoidable that our direct observations concern macroscopic objects, that the objects seen in the verification of the atomic hypothesis, such as the Wilson tracks, are macroscopic objects also, and that therefore the meaning of the concept "atom" can never be more than a statement about *concreta*. To this we have the two answers developed in the example of the cubical world. The first answer is that such an epistemological theory presupposes physical truth meaning, and that with such a meaning the existence even of the *concreta* cannot be maintained as meaningful; that physical probability meaning, however, allows us to speak meaningfully of atoms as independent entities. The second answer is that with logical meaning the existence of the atoms is directly verifiable if we confine ourselves to practical verifiability. It is, physically speaking, an accidental matter that we cannot see atoms, owing to our being of larger dimensions. It is not logically impossible that some day we shall learn to diminish our size to submicroscopic dimensions and to observe atoms directly. We refer for these reflections to §§ 6 and 14.

The latter argument, to give it a less abstruse form, may be interpreted in the following way. The human body so far as its size is concerned happens to be situated in a certain range of medium physical sizes; it possesses sense organs reacting to certain physical processes only, yielding impressions only of things of medium size and medium intensity. By this physical place of our bodies in the world, the class of our *concreta* is determined. Smaller beings or

beings of other sense organs would directly observe what we must infer; men with eyes structurally different from ours would see radio waves as we see those of light and would not need to infer them from sounds or pictures. Larger beings would see directly as a whole what we must construe as abstracta; they might see our planetary system as a whole, as a celestial merry-go-round. The division into *concreta*, *abstracta*, and *illata*, is therefore not a matter of principle, but due only to our personal situation in the physical world. Consequently we should not make any distinction as to the existence of objects corresponding to these terms.

This is to say that the world of *concreta* is only the first step in our construction of the world. From this step, we construct the *abstracta* as reducible complexes, the *illata* as projective complexes. *Abstracta* and *illata* have as a common feature their inaccessibility to immediate existence; but, in respect to objective existence, their logical character is entirely different. The objective existence of *abstracta* is reducible to *concreta*, so that these are internal elements of *abstracta*. The objective existence of *illata*, however, is not reducible to *concreta*; these are external elements of *illata* as projective complexes.

It might be asked whether it is possible to introduce, instead of *concreta*, other basic elements which would be elements internal to all objects. This is the question of the atomic theory of physics. Modern physics has shown that electrons, positrons, protons, neutrons, and photons, are the basic elements out of which all things are built up in the form of reducible complexes. For this basis, however, not only *abstracta* and *illata* but *concreta* as well are reducible complexes. The logical character of this basis, as a basis of internal elements, provides a good illustration of the logically different character of the *concreta* basis (and

of the impression basis as well). The latter is a basis of external elements, upon which the world is constructed by projection.

These reflections necessitate an additional remark. We called the atom a projective complex of concreta but, on the other hand, said that the atoms are internal elements of concreta, as reducible complexes. This seems to be a contradiction, but the paradox is resolved when we distinguish the physical relations between things from the way in which we discover them.

The relation of reducibility is an objective relation, but there are different ways of establishing it. The ways differ according to what is given as a starting-point. If the elements are given, together with the relations between them, the complex is constructed by definition; this is the way we construct the abstracta. In the case of the atoms, however, the complex is given, and the elements must be inferred. Since all observable qualities of the macroscopic bodies are only averages of qualities of the atoms, there are no strict inferences from the macroscopic bodies to the atom but only probability inferences; we have, therefore, no equivalence between statements about the macroscopic body and statements about the atoms but only a probability connection. The relation is consequently of the logical type of a projection. However, it is a projection somewhat different from that analyzed in the example of the birds and their shadows, as it leads to things which are the internal elements of the things from which the inference started. Let us speak here of an *internal projection*. It is a projection because it establishes a probability connection between propositions; but the propositions obtained maintain that there is a reducibility relation. Thus the occurrence of a reduction is in this case ascertained by probability inferences, not by definition. Consequently it

is not absolutely certain that the maintained reducibility holds; in this case, the reducibility is an empirical result. The internal projection, has, in common with the external one, a probability character, but it differs with respect to the existential relations. As it leads to internal elements, the existential relations here correspond to those of reduction (cf. § 13), with the sole difference that the validity of these relations cannot be maintained with certainty.⁵

We said that abstracta and illata are not accessible to immediate existence; the limits, however, are not sharply demarcated and may even be shifted by psychological processes. We do not observe air in the sense that we observe water; we do not see the state as a political body in the sense in which we see a marching regiment of soldiers. We cannot "realize" them in the sense of representing them with the character of immediate existence. We try to fill up the concepts as much as possible with "intuitive sense," i.e., we imagine some of their characteristic features which have the character of immediate existence. We imagine the feeling of wind and the resistance felt in pumping a tire, to realize the meaning of "air"; we think of public buildings, of marching soldiers, of a trial, with the intention of attaching the feeling of existence to the word "state." The word "realize" characterizes this process by its linguistic origin; it means originally, "making real," and we understand the metamorphosis of the word when we interpret its secondary sense as "transferring immediate existence to a thing." In this linguistic transformation, the concept "real" and the concept "immediately existent" have been assumed to be identical.

⁵ There are other examples of an internal projection in which both sides of the co-ordination are directly observable; e.g., the case of a leaf and its cells which are visible under the microscope. The fact that there is a reduction of the leaf to the cells is, as in the example of the atoms, an empirical result and not maintained with certainty.

The process described may be denoted as the acquisition of an intuitive character by abstracta and illata; it cannot be arbitrarily extended but is governed by psychological laws. Only to a certain degree may this process be extended. It may happen, on the other hand, that we lose a distinct knowledge about that which may be called "immediately existent." Familiarity as to the use of a concept may be taken as intuition. If the electrician believes that he has an intuition of electricity, in the sense he has of running water, his usage of words seems scarcely permissible. In such a case some sensible effects of electricity are taken as representing the intended thing; the concreteness of the representatives is confounded with that of the original. But such psychological processes happen frequently and may acquire a great deal of practical value; they show in any case that the boundary between immediate existence and objective existence is indeterminate. They show at the same time that the "feeling of existence" is not an essential quality of objective existence but only an associated attitude.

It may be added that the character of concreteness is not restricted to things of material existence but may be attached to things which, physically speaking, are only "processes." We see the waves of the sea move as concrete things, but we know that there is no material thing moving with them, that they are to be explained as phase relations between vertical motions of water particles. A musical melody for us is a very concrete object, although it consists, physically speaking, of relations between individual tones. The pressure of a heavy load on our back is felt as a concrete power. Even the spiritual power of a great personality may be felt by us as a concrete entity; the illustration in ancient pictures of spiritual power by a halo shows the material conception of this power in all its

concreteness in archaic minds. The domain of concrete things is not restricted to things of a spatial character; it is not at all determined by the place of the things in the physical arrangement of the world, but by psychological conditions.

These considerations, detailing the difference between the subjective and the objective arrangement of the world, show us the one-sided character of the perspective in which we see the world from the standpoint of our middle-scale dimensions. We walk through the world as the spectator walks through a great factory: he does not see the details of machines and working operations, or the comprehensive connections between the different departments which determine the working processes on a large scale. He sees only the features which are of a scale commensurable with his observational capacities: machines, workmen, motor trucks, offices. In the same way, we see the world in the scale of our sense capacities: we see houses, trees, men, tools, tables, solids, liquids, waves, fields, woods, and the whole covered by the vault of the heavens. This perspective, however, is not only one-sided; it is false, in a certain sense. Even the concreta, the things which we believe we see as they are, are objectively of shapes other than we see them. We see the polished surface of our table as a smooth plane; but we know that it is a network of atoms with interstices much larger than the mass particles, and the microscope already shows not the atoms but the fact that the apparent smoothness is not better than the "smoothness" of the peel of a shriveled apple. We see the iron stove before us as a model of rigidity, solidity, immovability; but we know that its particles perform a violent dance, and that it resembles a swarm of dancing gnats more than the picture of solidity we attribute to it. We see the moon as a silvery disk in the celestial

vault, but we know it is an enormous ball suspended in open space. We hear the voice coming from the mouth of a singing girl as a soft and continuous tone, but we know that this sound is composed of hundreds of impacts a second bombarding our ears like a machine gun. The concreta as we see them have as much similarity to the objects as they are as the little man with the caftan seen in the moor has to the juniper bush, or as the lion seen in the cinema has to the dark and bright spots on the screen. We do not see the things, not even the concreta, as they objectively are but in a distorted form; we see a *substitute world*—not the world as it is, objectively speaking.

Using the terminology developed above, we should say that even the concreta are only subjective things, of the type to which an objective thing of different form is co-ordinated. These things are coupled, but they are not strictly speaking identical. If we compare this co-ordination to that of our former examples, the juniper bush seen as a man or the cinema, we may say that, in the case of concreta, the correspondence of the subjective and the objective thing is closer than in those examples; but there always remains a deviation. This is the reason that the separation of objective and subjective things, within the realm of immediate things (§ 24), involves an element of arbitrariness; it depends upon what degree of deviation is to be tolerated for an immediate thing which is to be called objective. There is only a difference of degree between immediate things such as those seen in a cinema and immediate things such as the concreta: our immediate world is, strictly speaking, subjective throughout; it is a substitute world in which we live.

This fact is due to a psychological phenomenon which is connected with the logical structure of the existence concept. We showed (§ 23) that existence is a quality not

of individual things but of *descripta*; only if a thing is given by description can we ask whether it exists. The mechanism of sensation is organized in such a way that it cannot produce a sensation without superimposing upon it a certain description. We do not see things as amorphous but always as framed within a certain description. It is as though we looked at a Persian carpet: its pattern consists of colored designs arranged in a strange and complex regularity; we may conceive its forms in different ways, grouping different forms as a whole—but we cannot visualize it without some structure. In the same sense the objects of our sensations always have a “*Gestalt* character.” They appear as if pressed into a certain conceptual frame; it is their being seen within this frame which we call immediate existence.

The description in whose frame we see things corresponds to the objective thing only to a certain extent. This fact finds its expression in the predictational qualities of the co-ordinated description. To every description belongs a domain of included predictions; the degree of correspondence is measured by the ratio of true predictions within this domain. We see once more that between the subjective things of the kind occurring in the cinema, and the immediate concreta there is only a difference of degree: the ratio of true predictions is greater in the case of the immediate concreta—this is the only difference. Neither is the ratio of true predictions equal to *one* in the case of the concreta, nor is it equal to *zero* in the case of the cinema; in this case, also, there are a number of true predictions—those restricted to changes in the optical sphere—included in the description. The descriptive frame in which we see the world is never more than a substitute for a completely true description and will express only certain more or less essential features of the physical object.

The psychological origin of this frame must be supposed to lie in certain simple intellectual operations belonging to the primitive state of mankind or even to higher animals. Primitive man adapted his way of seeing to the simple cases of physical objects around him and to what he knew about these objects. He knew, for instance, that the tree he saw might be touched, that another tree partially hidden by the first could be reached after a greater number of steps (i.e., was more distant), and that the same tree would be seen by him on the following day, in the same place. Although this was not consciously formulated knowledge, it was knowledge instinctively acquired and expressed in his actions; in our rational reconstruction we have to express this fact by saying that he learned to attach to every observed object a group of inferences leading to other objects to be observed in the future. This acquired knowledge influenced his way of seeing; he came to see objects in the frame of a certain description. It is this primitive transition from immediate to objective existence which determines the form in which we see the world today—which creates the substitute world within which we wander throughout our whole life. Our immediate world is the objective world of primitive man; we see the world through the eyes of our ancestors, or, better stated, we see it as interpreted according to the knowledge of our ancestors. This primitive knowledge furnishes the frame of description into which we automatically press things in seeing them.

We need not refer to modern physics to show the discrepancy between the immediate and the objective world. There are simple and well-known phenomena indicating this difference. The object seen in a mirror is localized at a place corresponding to the place at which the material object usually stands when it emits light rays into our

eyes. The psychological phenomenon of localization is adapted to the simplest and most natural case of observation as is proved by this example. We cannot alter this optical localization, but we can learn at least to alter some motor associations, to perform some manual operations upon an object seen not directly but only in a mirror. We see the stick put into the water bent at the point of its entrance into the water—i.e., we see it corresponding to a description which would be objectively true if the same optical datum were to occur outside the water under ordinary conditions. We see the rails of the railway converging toward the horizon; this means that we see them in the form shorter rails would objectively have if they were to offer the same optical effect. The phenomenon of the convergence of parallels may be conceived as an undervaluation of distance in the dimension of depth; in cases of shorter depth the parallels are not seen as convergent, as when we regard the edges of a book placed before us on the table. Our optical mechanism for erecting the optical image in the spatial form is adapted to small distances only; for greater distances it furnishes a substitute which would fit for the case to which it is suitable, that is, in the case of shorter distances. When we go straight ahead by railway, we see the flat fields turning around a distant but indeterminate center. This phenomenon comes about because our eyes cannot otherwise account for the perspective displacements observed—a fixed point at a certain middle distance appears at rest because our eyes follow it, whereas the more distant points move with the train, and the nearer points toward it. When we move more slowly, in walking, this phenomenon does not occur; our eyes are then able to correct the displacement of perspectives which is qualitatively of the same type, and to interpret it as a movement of our own body. This is once more an ex-

ample of our optical apparatus being adapted only to the simpler case but furnishing a substitute in the more difficult case.

The substitute world around us is a product of the physical and historical conditions into which we are placed—a product of our situation in the middle of the physical world and at the end of a long historical development from primitive life to our present state. Analogous conditions are still at work and influence our vision. The social milieu into which we are caught adds pressure to the stronger influence of the physical and historical milieu. Our modern eyes, familiar with rectangular houses and steel constructions, see the richer forms of nature within the frame of our architectural style; modern drawings, in comparison with ancient drawings, betray this influence.⁶ Instead of freeing our immediate world from the influence of our milieu, we adapt it to another milieu.

Must we renounce the possibility of ever obtaining a true picture of the world? I think not. Intellectual operations have shown us the way to overcome the limitations of our subjective intuitional capacities. It is true that the latter are little influenced by this process; but instead of constructing one single intuitive picture of the world, we learn to combine different pictures of different levels. Every picture may, besides containing false traits, introduce some true features into the composition. Perhaps it would be demanding too much if we insisted on including all features within one picture. The perspective of the beetle in the meadow is better than ours in the sense that it allows a more precise observation of the individual

⁶ Cf. L. Fleck, *Entstehung und Entwicklung einer wissenschaftlichen Tatsache* (Basel, 1935), p. 147, Table III. Fleck shows antique and modern drawings of the human skeleton taken from medical textbooks; he makes clear that in ancient drawings the skeleton is always a symbol of death, whereas in the modern it is a symbol of mechanical-technical constructions.

blades; but the green evenness of the meadow which *we* see is an essential feature also, although unattainable for the beetle. When we see the polished table as a smooth surface, this is not simply false—this picture contains some qualities of the physical table which the picture of the swarm of gnats suppresses, namely, the relative smallness of the corpuscles and interstices compared with the two-dimensional extension. It is true that our substitute world is one-sided; but at least it shows us some essential features of the world. Scientific investigation adds many new features; we look through the microscope and the telescope, construct models of atoms and planetary systems, and penetrate by X-rays into the interior of living bodies. It is our task to organize all the different pictures obtained in this way into one superior whole. Though this whole is not, in itself, a picture in the sense of a direct perspective, it may be called intuitive in a more indirect sense. We wander through the world, from perspective to perspective, carrying our own subjective horizon with us; it is by a kind of intellectual integration of subjective views that we succeed in constructing a total view of the world, the consistent expansion of which entitles us to ever increasing claims of objectivity.

§ 26. Psychology

In the foregoing section we have shown how the external world is constructed on the concrete basis. It remains for us to show that the internal world also may be constructed on this basis. This means that we must show how so-called psychical experience is inferred from the basis of concrete objects.

In taking up this task, we depart from the traditional conceptions of psychology. It is the usual conception that so-called psychical phenomena are accessible to direct ob-

servation—that an internal sense shows us these phenomena in the same way that the external senses show us external phenomena. For a criticism of this conception we refer to our third chapter. We argued there that impressions are not observed but inferred; that we do not sense impressions but things; that there is no internal sense but

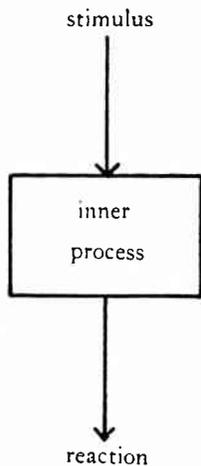
that this concept is due to the confusion of an inference with an observation. We shall maintain these results now and apply them to a construction of the whole psychical world on the analogy of our construction of the external world.

The human body is a system which is acted upon by external processes, and which itself initiates actions upon external processes. The external processes of the first kind are called *stimuli*, the external processes of the second kind are called *reactions*. Between them is intercalated the human body with its inner processes (cf. Fig. 5). The problem of psychology is to infer these inner processes. To illustrate this task, let us give an instructive example from physics which has been constructed, for this purpose, by Carnap⁷—an example which shows that the situation in question is not restricted to the case of the human body but occurs in a similar way for inanimate systems. A photoelectric cell is a device which is acted upon by light rays, as stimuli, and which produces an electric current, as reaction.

FIG. 5.—The human body as a system of inner processes intercalated between stimulus and reaction.

In the interior of the cell there are processes; these, however, are not accessible to observation. In spite of this fact, a description of these inner processes may be

⁷ *Erkenntnis*, III (1932–33), 127.



given in an indirect way. If there is a light ray of the intensity S falling on the cell, we may say that the cell is in the state corresponding to the stimulus S . Thus the cell is described by a description of the stimulus. A second way would be to describe the cell by a description of its reaction; if there is an electric current of the intensity R flowing from the cell, we may say that the cell is in the state corresponding to the reaction R . Both ways of description are equivalent, as there is a one-one correspondence between S and R .

What is important here is that we can give a very exact description of the internal state of the cell without being able to observe the interior. The best microscope directed to the interior of the cell would not show us any difference between two states S_1 and S_2 , or R_1 and R_2 ; the inner changes are much too small to be observable. But the indirect description replaces the direct one to a high degree.

The situation of the psychologist is of the same kind as the situation of the physicist in the case of the photoelectric cell. He does not see the psychical phenomena but describes them by describing the stimuli which produce these processes, or the reactions which are produced by them. The idea of introspection is an illusion if we understand by introspection an observation of "psychical" phenomena; what we observe are physical phenomena, and the inner processes corresponding to them are only inferred. They are *illata*; and the basis from which we infer them is the totality of the concrete objects of the physical world, which stand to the inner processes in the relation of stimuli or reactions.

It is a current opinion among philosophers that what we have said is valid only for our observation of other persons, as we cannot share their psychical life, but that for our own person there is another means of observation, a direct view

into our internal life. This distinction is one of the profound misunderstandings on which the traditional metaphysics is based. To clarify this question, let us enter into an analysis of the difference between our own personality and other personalities. There is, of course, a specific difference; but it is not of the type assumed by traditional philosophy.

We may begin this inquiry by a remark which a desultory survey of psychology already urges upon us: For the description of our own inner phenomena we generally start from the stimulus basis, whereas for the description of the inner phenomena of other persons we generally start from the reaction basis. I will illustrate this by an example.

The stereoscopic impression is a certain impression of spatiality which we may obtain from certain pairs of pictures if we observe them through a stereoscope. This impression demands, however, a certain training; untrained eyes have to make an effort before succeeding in obtaining the stereoscopic impression, and there are persons who never succeed in so doing. Looking through the stereoscope, we see two pictures at first; then these converge until they coalesce, and at this moment we see one, and only one, spatial picture in which the dimension of depth is seen in full strength, as in ordinary binocular vision of spatial things. The appearance of the spatial picture is rather sudden; the picture jumps suddenly into the spatial depth.

The description we have just given corresponds to what is called observation by introspection. If we analyze it, we discover however that it is built up entirely in terms of the stimulus sphere.⁶ A picture is a thing which we see, is a drawing on paper which we know to be an imitation of certain other physical things. The moving of the pictures is a physical phenomenon; so is the spatial depth—it is a quality observed in the visual perception of almost

everything. There are some terms, in addition, taken from other phenomena of quite a different character, applied here in the sense of an analogy, such as the terms "coalesce," "full strength," "jump." Using these terms, we want to express a similarity relation between the objects just seen and other objects; "coalesce" indicates a similarity to certain changes occurring in the mixture of liquids, "strength" means a comparison to certain features observed in touching resisting forces, etc. We perform the description by describing physical things which stand in similarity relations to the thing observed—that is what philosophers call description by introspection. Our internal process "stereoscopic impression" is not observed directly; it is determined only as the internal process belonging to the stimulus S , where S is described in terms of concepts which a physicist would use for the description of a physical phenomenon.

Now let us see how we control the statement that another person has the stereoscopic impression. That the person is looking through the stereoscope is not a sufficient reason to believe that he has the impression. We control it by his reactions. First of all, we listen to what he relates. Speech is a special case of reaction but not the only one; and, above all, not always a reliable one. If the person says that he sees only one picture, and that it has a spatial character, this is not a sufficient indication that he really has the stereoscopic impression. It may happen that he neglects one of the pictures, i.e., drops it out of the field of concentration and sees then the other picture alone, mistaking the feeble spatial qualities of each photograph as the stereoscopic effect. In observing many persons before the stereoscope, I found a good means of eliminating this mistake. When the stereoscopic effect occurs, almost every person, especially if untrained, shows a sudden expression

of joy and surprise, by an exclamation or a smile. This reaction, in combination with the other ones, is a very good indicator.

We see that here the presence of the stereoscopic impression is mainly inferred from observations of the reaction sphere. But not entirely; we observe also that the person has the stereoscope with the photographs before his eyes, i.e., we observe that a certain stimulus is acting upon him. But in this case—and this is the difference from the photoelectric cell—the occurrence of the physical stimulus S is not unambiguously combined with the inner process. This is the main difficulty of psychology. The same physical stimulus may start different impressions. We control the impression, therefore, by the reactions; only a rather complicated combination of stimuli and reactions allows a determinate inference as to the inner process. The decisive character here is always on the side of the reactions; they decide the choice between the different possibilities of impressions opened up by the stimulus. We may say, therefore, that the impression of another person is characterized by us as the internal process belonging to the reaction R .

The ambiguity between the physical object and the impression is the fact which led us, in the preceding sections, to the distinction of immediate and objective existence. The same objective thing may produce different immediate things. This was the case in our example of the juniper bush, which from a certain distance appeared as a man, from another distance as a bush. There are other examples in which the physical conditions do not change at all, whereas the immediate thing changes. A perspective drawing of a cube may be inverted, as psychologists show, so that the front and rear sides are exchanged. We know picture-puzzles in which suddenly the outlines of a man appear whom we did not observe before. All this means

that the objective physical thing does not fully determine the immediate thing. As the impression is characterized by the immediate thing only, and not by the objective thing, psychology is interested in the description of the immediate thing.

This is the main difficulty of psychology. If the human body were organized like a photoelectric cell, psychology would be a very easy science; it would have nothing to do but to name the stimulus S , and would in this way describe the impression. The task of description in psychology, on the contrary, is to describe the immediate thing, not the objective thing.

This description, however, can be performed entirely within the stimulus sphere. We may refer here to the results of our preceding chapter; we describe the immediate thing by denoting objective things to which it stands in similarity relations. The different immediate things seen in a picture-puzzle are described if we say whether the picture resembles a man or not. If the indication of the stimulus S is not sufficient to determine the inner process, we may overcome this ambiguity by adding statements concerning relations of the type $S = S'$. In this way, all psychology can be presented within a stimulus language, i.e., a language using concepts characterizing things and relations of the physical world in so far as these occur as stimuli. Psychology, then, describes physical objects as well as physics does, but there is a difference in the aim of the description: physics looks for all those relations of a certain thing to other things which are needed for an unambiguous determination of the objective thing; psychology on the contrary looks for all those relations which are needed for an unambiguous determination of the immediate thing, and with this of the impression. It is another class of relations which psychology constructs; this is be-

cause psychology is not interested in the things but in the internal processes the things start in our bodies. In any case, these internal processes are not observed but inferred; the basis of this inference is observed concrete things.

We may also write a psychology in reaction language. For this purpose we should denote the internal process by giving the class of reactions belonging to one internal process. Linguistic utterances stand in the first place here; but they are not sufficient. As we saw in the example of the stereoscopic impression, additional reactions of other types are required, such as exclamations, movements of eyes and face, etc. Reaction language is used in the psychological observation of other people and of animals; we shall inquire shortly for the reason.

The relating of both systems of description is one of the most important tasks of the psychologist. Which description of the reaction sphere belongs to a determinate description of the stimulus sphere? This is one of the main questions of psychological investigation. The relation of *S* to *R* is, for the human body, a very complicated matter; it can be answered only if we consider not isolated stimuli and reactions but rather comprehensive groups of them. We put a piece of sugar before a dog; will he eat it? Perhaps this reaction depends not only on the food stimulus but also on other stimuli given in the form of gestures by the dog's master. We tell a man that he is to be put into prison; will he run away? That depends on many other conditions, such as the crime he is charged with, his knowledge as to the conditions of life in prison, his chances of further life after escape. It is always the relation of *S* to *R* which is asked for in such questions.

Now, if we are to compare both languages, we have to note a decisive difference. A complete description of the inner process in stimulus language without the use of reac-

tion language can be given only by the person himself whose process is to be described. A complete description in reaction language, however, is obtainable for every other person. This difference is caused by the variability in the relation of the stimulus to the impression. The immediate thing is observable only by the man whose impression is asked for; only he can say whether he sees the juniper bush or the little man with the caftan, or whether he sees a man or not in the picture-puzzle. Other people depend upon his reactions, which may consist in his linguistic report or other indications.

This distinction is due to the special position of the self-observer. In the case of self-observation the man who observes is identical with the system the inner process of which is to be characterized. Now, *seeing* the immediate thing is identical with *having* the corresponding inner process; therefore the man who has the inner process observes the immediate thing—nobody else is in an analogous condition.

It is to be remembered here that *having* the inner process does not mean *observing* the inner process but means observing the immediate thing. This matter is the source of much confusion and, I think, of the false conception of the "psychical phenomena" of traditional philosophy. We do not see our interior process, but we have it; and, because we have it, we see a thing outside. By a confusion of these relations the idea has arisen that having an inner process means observing it, and "having" has acquired the sense of "being given in observation." But "having" is to denote here only that the internal process occurs within our bodies. If this is the case, we observe a thing outside. However, this is an immediate thing; without further determinations we cannot say whether it is jointly an objective thing, or whether there is only a coupled objective thing, or

whether there is no co-ordinated objective thing at all, such as in the case of dreams.

The special position of the self-observer has led to the concept of introspection. If this term is to denote nothing but that the self-observer is the only one who can give a complete description of the immediate thing, without making use of reactions, the term would be permissible. The term has been connected, however, with the idea of a direct observation of inner processes; so it has acquired a misleading metaphysical meaning. We shall therefore avoid this term and replace it by the term *self-observation*.

The idea of introspection has been developed, I think, in a misinterpretation of a fact which indeed offers the possibility of misunderstanding: it is the fact that the stimulus may be situated within our own body. We have already discussed this case in our criticism of impressions (§ 19); we held there that, as well as seeing our body, we may feel it by interior tactile sensations, and we added that this sensational character is revealed in the fact that such inner sensations are always spatially localized. We must extend this criticism now to the more general case of the so-called psychical phenomena of a higher level, such as thoughts, emotions, passions, etc.

It is one of the arguments in favor of "psychical experience" that these phenomena have no localization; Kant already took as a specific quality of psychical life the supposed fact that it passes within time only but is not localized in space. I feel, say, a certain joy at a definite time; but this joy has no place in space. I had the thought of going to the cinema last night at seven o'clock; but this thought had no position in space. Psychical phenomena such as love or hatred may last for a period of time, for hours or years; but they have no spatial extent. This non-spatiality of psychical life is considered as one of the most

cogent arguments for the duplicity of our experience which divides, it is said, into the two domains of physical and psychical experience; the former is ordered in space and time, the latter in time only.

This theory, it seems to me, is the result of a twofold confusion. First there is the confusion indicated concerning stimuli situated within our bodies; these stimuli are considered as entities of a nonphysical character. To this confusion is added a second which arises from the problem of abstracta.

Joy, grief, love, hatred, etc., are abstracta, complexes of elementary phenomena which are "bodily feelings." Our bodies feel light, without weight; we feel ourselves "walking on air," smiling—of such a kind are the elements of the complex called "joy." We feel a certain tension within our bodies, a constraint to move and see a certain person, we feel our body becoming more vivacious in the presence of this person, feel excitations in the sexual zones of our body—of such a kind are the elements of the complex love. These elements have spatial localization, either in special parts of our body or all over the body. The abstractum, the complex, may however be defined in such a way that it has no spatial qualities at all. We discussed this question in § 11 and gave examples of abstracts composed of physical elements but having no spatial qualities, such as the political state, a melody, or the elasticity of a spring. We said that this matter depends on a convention, that we may or may not ascribe a spatial position or extent to these abstracta, but that usually the nonspatial conception is preferred. This is valid as well for the complexes composed of stimuli situated within our body. The complex "love" is generally conceived as having no place or extent in space; but we might give another definition according to which this complex is spatially situated within our body and ex-

tended all over our body. The preference of time in these cases, the decision for a localization of the abstractum in time but not in space, has its origin in the fact that the temporal characterization enables us to construct an order among the abstracta, by ascribing different time positions to each of them; whereas a spatial characterization leads to the trivial result that they are all within our bodies and extended all over it—thus making it impossible to establish an order among them. If the same result occurs for a position in time, we arrive at a similar indetermination for the time qualities of the abstracta. Is the character of a person *in time*? If this is assumed, the character covers the entire span of the person's life, and therefore this definition is of no use for establishing an order. We cannot establish a time order between his character and, say, his father-complex, an abstractum which also covers all his lifetime. For these kinds of "psychical phenomena" the temporal characterization is usually dropped—an indication that temporal character is not at all serviceable for the definition of "psychical experience."

The fact that the stimuli may be situated within our body has a consequence of quite another type than is assumed by traditional psychology. What it implies is that in these cases the inner processes are for us *concreta*. We said previously that inner processes are *illata*; this is valid for the processes of optical and acoustical sensations, which are inferred from the observation of external things. The inner process "hunger," on the contrary, is a *concretum*; it is directly observed in the same sense that we observe, say, a movement of our legs with the tactile sense, or the pulsation of our heart. The interior of the body is partially accessible to direct observation, partially only inferred—as is the case with most external objects. The abstracta com-

posed of complexes of these internal *concreta* and *illata* constitute the so-called higher psychical life.

The internal processes are, to summarize, inferred from stimuli or reactions, or observed by the inner tactile sense. What then are these internal processes, if we are to ascribe to them a place in our physical world?

They are nothing but physiological processes. There is a direct way to observe all internal processes of the human body; this is the way of the physiologist. He discovers that an optical sensation consists in a picture on the retina, in determinate physiological changes in the *nervus opticus* and the brain; he finds that hunger consists in convulsions of the stomach, secretions of the salivary gland, etc. He is not bound to the stimulus language or to the reaction language; he observes the interior of the bodily system directly and expresses his results in a direct language, which we may call *inner-process language*.

There is an old question which has been opposed at all times to materialism: How is a nervous process in the brain transformed into an optical sensation? How is a convulsion of the stomach transformed into the feeling of hunger? This question, I think, is nothing but a profound misunderstanding of scientific concepts. Let us analyze the questions separately; they are of different types.

An optical sensation is not observed by a man who sees things outside his body; it is inferred. The man *sees* a thing before him and *has* a sensation; this sensation is for him an *illatum*. He does not know anything about its qualities, except that it has a certain correspondence to the immediate thing he observes. It is an unknown, *X*, determined as a function of the immediate thing observed. If now a physiologist asserts that this *X* is a nervous process, there is no difficulty in characterizing *X* as a process in the nervous system. There is no more difficulty in this than in a similar

case of the physical world, say in our photoelectric cell. The internal state of the cell has been first determined as the state X belonging to the intensity S of the light ray entering the cell; later the physicist discovers that the state X consists in a certain swarm of electrons passing through the spaces between the molecules of the photoelectric crystal. The physicist does not ask: Where is the light ray within the crystal? How is the swarm of electrons transformed into a picture of the light ray? These would be unreasonable questions issuing from a misunderstanding of the functional relation between the light ray, as stimulus, and the swarm of electrons, as the internal process released. The light rays coming from the external thing release the nervous process within us. It would be unreasonable to demand that this nervous process is to be transformed into a picture of the light ray, or of the external thing. Having the nervous process means seeing the external thing; from this we cannot infer that the nervous process is a picture of the external thing, or is transformed into such a picture.

In our second example, the sensation of hunger, the situation is a little different. In this case the internal process is in itself observed by us. We do not sense it as a movement of our stomach, as the physiologist describes it. But this is a difference we notice similarly in cases of external observation. We see a rectangular box as a geometrical body with planes, edges, and points. If we touch it, we feel it as a resistance, we feel the sliding, cutting effect of the edges and the stinging pressure of the corners on our fingers. This difference of qualities is due to the difference of the sense organs used in the observation. Correspondingly, hunger observed by the inner tactile sense has qualities different from hunger observed with the eyes, as a convulsion of the stomach. Similar differences occur within op-

tical sensations in the form of differences of perspective; the view I have of a certain room differs from the view another person has. In this case, an exchange of spatial positions is easily performed, and the other person may have my perspective also. In the case of the observation of internal processes of the body, however, an exchange of positions is physically impossible. If a physician who watches my hunger on the Roentgen screen should want to feel the hunger I do, he would be obliged to enter into the same tactile relations to my stomach as I have—this is physically impossible.

The difficulties of the problem of internal processes arise from the fact that there are three different ways of determining these processes: the way of observing the stimulus, that of observing the reaction, and that of direct observation of the interior of the body. The latter divides into the two ways of physiological observation and of self-observation by the inner tactile sense; the first of these is open to every person, the second only to the person who is identical with the body in question. The difference in the ways of determination has led to the idea of different objects concerned. This is the decisive fault; all methods in fact have the same objects.

Traditional psychology prefers throughout the stimulus method and is accordingly written in stimulus language. To this is added the method of self-observation of the body by the inner tactile sense; but the main role is played by the stimulus method. This is because most of the "higher psychological phenomena" are produced by external stimuli and therefore best described in the stimulus language. The immediate thing is described by comparisons to other physical things of a similar kind. We speak of the "stabbing pain" we had on hearing the message of the death of an intimate friend and describe the immediate thing "pain,"

furnished by the inner tactile sense, by a similarity relation to the immediate thing "needle" which we may feel stabbed into our finger. We say, "I felt bound to go to my friend," and compare the tension felt in our muscles with the sensation of a cord bound round our arms. We talk of a man who has "a clear insight into his task" and describe the subjective images he has of his future work by a comparison to optical qualities of bodies seen in bright light and a clear atmosphere. This method of description by comparison in the stimulus language is also the method of poets.

My heart aches, and a weary numbness pains my sense
As though of hemlock I had drunk
Or swallowed some dull opiate to the drains
One moment since, and Lethewards had sunk.

These verses of a romanticist—quoted from Keats's "Ode to a Nightingale"—give a description of a psychological state in the stimulus language. The feeling is described as that impression which occurs after drinking hemlock, or an opiate; the "aching heart" is a description of a feeling such as appears after our body has been injured from without, or such as is observable as released by internal stimuli. Only the term "Lethewards had sunk" belongs to reaction language, as it describes a reaction occurring in combination with feelings of the type indicated. Reaction language is generally used in poetry if the poet wants to describe a person in an objective way, i.e., if he wants to prevent us from identifying ourselves with the person. "You are fatal then when your eyes roll so," says Desdemona; the poet here wants us to see Othello through the eyes of his wife.

The behaviorist, in opposition to the traditional psychologist, considers the reaction language as the only language of psychology. That is to say, a behavioristic de-

scription includes the stimulus, but only in its objective physical existence, not in its immediate existence. As the inner state of the person is not determined by the objective stimulus, the determination of the inner state is entirely left to reactions; thus reactions are considered as the only indications permissible in psychology, and in this sense the language of behaviorism is reaction language. The relation from *S* to *R* is what the behaviorist studies; *S* characterizes the environment, *R* the person or animal with all his inner qualities. To this is added, in a certain degree, the inner-process language in the objective, i.e., physiological, form. The limits between the objective inner-process language and the reaction language are fluctuating; it is not always sharply demarcated where the inner process ceases and the external reaction begins. Some processes within the body are usually called reactions, such as palpitations, blushing, etc.; they might be considered as parts of the inner process as well. The behaviorist usually considers only those inner reactions or processes which are easily observable from without, such as those already mentioned; processes demanding, for observation, operative intervention, e.g., processes within the nervous system, are left to the physiologist. Here also the limits are indeterminate.⁸

It is the advantage of behaviorism that an objective language is obtained which can be controlled by everybody; reports of the person observed are not needed, and the method is applicable to animals as well as men. Restriction to this method, however, seems to be an overstrained requirement. This postulate arose from an antagonism to vague metaphysical concepts in traditional psychology and had, therefore, a methodological value in the sense of a strict purification of psychology. It seems to me, however,

⁸ The Pavlov experiment on the salivary gland demands, for animals, a simple operation but is used by behaviorists also.

that to lay aside the reports of the person observed is to eliminate the most privileged observer. We know that subjective reports are sometimes dubitable, and the elaboration of methods of control is very useful. But the unique position of the self-observer offers such great advantages that psychology will never, I think, renounce using it. It is the fact that the self-observer, and he alone, can describe his internal state in stimulus language, without the use of reactions, which makes this position unique. A man who sees a juniper bush, at nightfall, as a brigand, knows this and does not need to infer it from his palpitations or trembling knees. A man who has hunger knows this from direct sensation and does not need to count drops from his salivary gland. There are a great many psychological facts which never would have been discovered without the self-observer.

Take as an example the fact that we see parallels, such as rails, converge. It is a subjective fact, since the objective physical stimulus does not give any indication as to this psychological fact. It is, however, easily described in stimulus language: "I see these rails similar to such lines," and with this the person points to a drawing of convergent lines. I do not see any way in which this psychological fact might have been discovered without a report of a self-observer. I do not say that it is absolutely impossible to discover such a fact by behavioristic methods but only that this is out of the domain of the practically attainable. The report of the self-observer is in a great many cases a means far superior to the observation of reactions.

It is true that the report, as soon as it is uttered, is in itself a reaction. But the question is precisely whether the behaviorist is to include report reactions. That the knowledge of the person observed, if it is to be transmitted to another person, must be transformed into a reaction, is

obvious. But if the person observed wants to know what he himself observes, he need not wait for his own reaction. He may even suppress his reactions and keep his knowledge to himself. The cardplayer knows what he is hiding behind the poker face. If psychologists had none but persons of the poker-face type as subjects, they would have a very difficult task.

Behaviorists may answer that thinking is subvocal speaking, that a man who knows what he observes speaks to himself subvocally and therefore also knows it from his reaction as other persons do. This objection, however, would not correspond to thoroughgoing behaviorism and would not, I think, be shared by Watson. For behaviorism, subvocal speaking *is* knowing; so the man does not obtain his knowledge from subvocal speaking. He obtains it from seeing objects, i.e., in physiological language: the nervous process of seeing releases subvocal speaking. Other persons, however, remain one step behind: their knowledge, i.e., their subvocal speaking, is started by the vocal speech of the self-observer.

The method of self-observation is, I think, a necessary element of psychology; it is to be controlled but not to be dropped. The mischief of psychology does not arise from this method but from the false interpretation which has been given to it. It is the concept of introspection which marks this misinterpretation, as it is meant to indicate a direct view of psychical phenomena. The interpretation developed by us, in the sense of a stimulus language, is free from such misconception. The case of the converging parallels gives a good example of a psychological description in stimulus language. What is stated here is a comparison of two objects: the rails, which are physically parallel, and the lines drawn on the paper, which are physically convergent. By this comparison, the immediate thing "rails"

is described, and with this, indirectly, the inner process "impression." By this method we can describe our impression even to a man born blind. The method of self-observation, if it is conceived as the method of stimulus language, is not less objective than reaction language. However, it opens up possibilities for observation which do not exist for the reaction method.

Our solution of the problem of psychology is based on the distinction of the three categories of stimulus, inner process, and reaction; to this is to be added the fact that the self-observer is in a particular position which cannot be occupied by other persons. We must now add a remark concerning the relations between the three categories.

These relations are generally considered as implications; the stimulus implies the inner process, and the inner process implies the reaction. It is the same case as in other causal relations; the light ray implies the inner state of the photoelectric cell, and the inner state of the cell implies the current leaving the cell. But, just as in all these other cases, this is to be considered as an idealization; the relations are, strictly speaking, not logical implications but probability implications. That is to say, if there is a certain stimulus, then there is a determinate probability that a certain inner state will occur, and, if there is a certain inner state, there is a determinate probability that a certain reaction will occur. Even in the case of the photoelectric cell there are, strictly speaking, only probability implications; in the case of the human body this is more important because the degree of probability obtainable is not so high as in the case of the cell. The intervention of the probability concept in this context adds some relevant features to the problem of psychology.

The first consequence is that the inner state of the body cannot be conceived as a reducible complex of the stimuli

or of the reactions. It is, on the contrary, a projective complex of these elements. This distinction introduces into the problem of the psychology of other people a remarkable correction.

Behaviorists used to say that what we mean by speaking of the psychical state of other persons is just the class of their reactions. If we say that a man is angry, this means—so behaviorists argue—that the man speaks in a loud voice, springs from his chair, and, leaving the room, slams the door. This conception, however, is not tenable. A statement about the reactions as described is not equivalent to the statement about the anger but is in a probability connection only. This is important as to the bearing of behavioristic methods. Psychologists frequently show a deep-rooted aversion to behaviorism; they will not admit that speaking of a man's fury means speaking about his visible reactions, but maintain that what they mean is something else which they infer only from the reactions. This objection, I think, is right. It is confirmed by our probability theory of meaning.

What then is the meaning of our statement about anger? This is asking for those elements of which fury is composed as a reducible complex. The answer is that these elements are given by the internal physiological state.

Indeed, if we know all the visible reactions of a man, we may infer with probability only that he is in the internal state called anger; but if we knew his inner state exactly, including all processes in the nervous system, the question of whether he is angry would be decided. The definitions of psychological states are to be given in the form of descriptions of inner processes. If we replace them by descriptions of certain stimuli or reactions, this is to be conceived as a practical abbreviation which is valid only in the sense of an approximation.

This is the reason that psychology so frequently stands before questions unanswerable in practice. The probabilities of the implications from behavior to inner states are, in many cases, not very high; thus the psychologist cannot overcome a certain indeterminacy in all his laws. I do not mean to say that all progress is precluded; but a determinacy corresponding to physics will be reached only if the direct physiological consideration of inner processes is achieved in a much higher degree than it is today. This remark, however, is valid in principle only. In the present state, on the contrary, as physiology is not yet able to distinguish internal states in such a degree of precision as is furnished by the observation of stimuli and reactions, the description of the inner states by means of the stimulus and reaction language is much more exact than the physiological description. This is the reason that psychologists refuse physiological methods and keep to self-observation and observation of reactions. The psychoanalysis of Freud, for instance, which is formulated entirely in stimulus and reaction language and does not use physiological language at all, gives very deep insight into certain internal states, such as "complexes"; physiology is by no means able to give the corresponding physiological descriptions. This is why psychoanalysis is used as a special medical method in cases in which those of physiology fail.

If to our distinction of the three categories of stimulus, inner process, and reaction we now add the fact of the probability character of the relations between these categories, the task and method of psychology assume a rather complicated character, but one in its general structure of a type similar to that of physics. Psychology is a science which infers *illata* from concrete objects. The inferred objects are projective complexes of these concrete objects. Since some of the objects of psychology such as bodily

feelings are accessible to the inner tactile sense, the inferred *illata* in such cases are internal elements of the observed concrete objects; it is therefore the process of internal projection which plays a role here. The "higher" psychological objects, and just those most frequently occurring in practical psychology, i.e., psychology as needed for daily life, are *abstracta*, built up of *concreta* and *illata*.

This characterization of psychology needs no such thing as "psychical experience" and is therefore very different from the usual metaphysical conception of psychology. On the other hand, behaviorism appears as an oversimplified conception, which, it is true, avoids metaphysical misinterpretations, but which does not take into account two remarkable facts: the particular position of the self-observer and the probability character of the relations between the three categories.

If we compare the process of the construction of the internal world to that of the external world, there is no difference in principle. The basis in both cases is constituted by concrete objects, including in this class objects both outside and inside our body. The construction of the external world is performed by the addition of objects outside our bodies, obtained by projections. The construction of the internal world is performed by the addition of objects inside our bodies, obtained, for the greater part, by projections. The first case is conformable to common sense; the second may appear strange and circumstantial. This may be the reason why the idea of a direct view into an internal life was invented. This idea, however, is not tenable. Our knowledge of the internal world is obtained by inferences which are based to a great extent on phenomena outside our body. It is as though a motorist were to infer a rising temperature of his motor from the steepness of the road his car is mounting.

§ 27. The so-called incomparability of the psychological experiences of different persons

Let us apply our results concerning psychology to a problem arising within this domain and frequently discussed in philosophy.

There is something in our experience, so it is said, which is accessible only to ourselves, and which cannot be communicated to other persons. We see the color red, we feel the heat, we taste the sweet; but we cannot tell how we see or feel or taste it. Other people tell us that they also see the red and feel the heat and taste the sweet; but we never can compare these sensations with ours, and so we do not know whether they are the same. There is, therefore, an unutterable residue in our experience. This is one of the most frequently used arguments in favor of the existence of a particular psychical world within every person; this world is supposed to be known only to each person and not accessible to others.

Let us analyze this situation. It is in a certain sense true that impressions of different persons cannot be directly compared. Imagine a man who sees green when I see red, and red when I see green—would we ever know this? A mind untrained in philosophy might perhaps object that the man in question would be in permanent conflict with the traffic regulations when driving a motorcar, that he would cross the street at the red light and stop on the green light—but of course this is thoroughly false. This man has learned that the color he sees when the red light is on means to stop, that this color is called "red," etc.; so all his reactions will entirely correspond to those of a man of "normal" impressions. There is no possibility of detecting the abnormality of this man.

This fact, however, is just an indication that the comparison intended constitutes a pseudo-problem. Neither

for physical truth meaning, nor for probability meaning, nor for logical meaning can the comparison of the impressions of two persons be accepted as a meaningful question. This is not surprising, since even for the same person there is an analogous pseudo-problem; as we pointed out previously (§ 21), nobody can directly compare his impression of today with his impression of yesterday. The idea may still be generalized, and the case of psychological comparisons may be considered as a special case of a general physical theorem. We cannot compare the length of a meter bar, situated at one point, to the length of another meter bar, situated at another point; we cannot compare the second indicated by a watch to the following second indicated by the same watch. We need not enter here into a criticism of this problem, as it has been solved within the philosophy of space and time.⁹ The indetermination in question, as it is shown there, leads to the consequence that in such cases it is not a *cognition* which is to be demanded but a *definition*. The equal length of two meter bars at different points of space can only be defined; i.e., if these fulfil certain observable conditions of another kind, such as being equal when they are put side by side at the same place, being of the same temperature, etc., we call them equal when they are situated at different places. In the same sense, the comparison of the impressions of two persons is a matter of definition. Here also the definition will demand that some observable conditions be fulfilled if the equality is to be postulated. If all reactions of the two persons, including reports of self-observation in stimulus language, are the same, we may define their impressions as being the same. It is only when such a definition has been given that the question of the sameness has a meaning; without this definition, there is nothing asked at all when

⁹ Cf. the author's *Philosophie der Raum-Zeit-Lehre* (Berlin, 1928), §§ 3-8.

we say, "Are the impressions the same?" We must first co-ordinate with the term "same" a corresponding set of observable relations; only thus does the question become determinate. Definitions of this kind have been called, therefore, definitions of co-ordination.¹⁰

If such a definition is once given, the question of the sameness of impressions can be answered empirically. We may say that a color-blind man does not have the same impression of certain colors that other persons have but that normal persons have the same impressions. This "sameness," however, has only the meaning established by the definition, not an absolute sense.

It has been argued that an absolute comparison of impressions is not logically impossible, that it is only because of the limitation of our technical faculties that we cannot make such a comparison. Biologists¹¹ have succeeded in joining salamanders by an operation in such a way that they have a common circulation of the blood and even a common nervous system; the possibility cannot be excluded that some day the same operation will be successfully performed upon men. In such a case, one person could look through the eyes of another person. Let us analyze this idea.

Imagine two men combined in such a way that the nervous processes of one enter into the nervous system of the other. They stand back to back; before A there is a red light which A sees and calls red. B sees the light also, but by the eyes of A, as his eyes are not turned toward the light; B says, however, that the light is green. Now both persons turn, and the light stands in front of B; B now calls the light red, whereas A now calls it green. Would not this indicate an absolute difference of their impressions?

It would indicate a difference but not an absolute one.

¹⁰ Zuordnungsdefinitionen (cf. *ibid.*, § 4).

¹¹ Cf. I. Schaxel, "Das biologische Individuum," *Erkenntnis*, I (1930), 467.

The statements made by A and B here presuppose already a definition of comparison. It is not true that the impressions of A and B are directly compared. Each one compares his present impression with a present recollection image of a previously seen object. When, for example, in the second position, the person A says that his impression is different from the impression in the first position, he compares not these impressions directly but only the recollection image of the first impression to the second impression. But then does he know which of the two has changed? What if the recollection image has changed and is different from the first impression, whereas the direct impression is unchanged? Then the impressions of the two persons would not differ. We see that such a comparison has a meaning only after a preceding definition and is therefore relative in the same sense as before.

We may, however, include the case of the combined nervous systems in our definition and say: Two persons have the same impressions if, first, they always show the same reactions and, second, if in the case of combined nervous systems, it makes no difference to them whether they look through the eyes of the one or of the other. The addition means that the experiment as described should furnish the opposite result, that if A calls a color "red," B calls it "red" also. If we use this definition, the question whether different persons have the same impressions cannot be answered with certainty but is a meaningful problem. It can, however, be answered with probability; we may say, I think, that it is highly probable that normal persons have the same impressions. This means it is highly probable that if two persons always show the same reactions, they would, after a combination of their nervous systems, discover no difference if they look through the eyes of the one or of the other.

We see from this that the sameness of the impressions in the narrower sense of the second definition has not only logical meaning but also physical probability meaning. It may be, therefore, admitted for our world. This definition seems to underly the ideas of such philosophers as want to maintain that a comparison of impressions means more than a comparison of reactions. Such an idea, we see, can be admitted, even for our world, if we accept probability meaning. But it is, of course, no absolute comparison; it presupposes also a definition of co-ordination, as all physical comparisons of this type do.

After these considerations, the problem of the incomparability of the impressions of different persons assumes an aspect very different from the usual view of the problem. This incomparability is not due to the individual separation of different persons but to a logical indeterminateness of a more general character, occurring in the same way for comparisons of purely physical character: this is the indeterminateness of the comparison between things or states in different spatiotemporal points—as is well known in the philosophy of space and time. This highly general character of the problem has been disregarded, and the incomparability of impressions has been considered a proof for the monadic character of the human mind. However, if we call the impressions of two persons incomparable, we are obliged to call the impressions of one person at different times incomparable as well. The analysis of the general problem, in the theory of space and time, has shown the means for surmounting these difficulties: a comparison can be made if we overcome the indeterminateness by the introduction of definitions of co-ordination. This principle is applicable for the comparison of impressions as well. If we introduce such definitions, the comparison of the impressions of one person at different times becomes meaningful;

but then the comparison of the impressions of different persons becomes meaningful as well and cannot be called impossible. The isolation of the human monads is, logically speaking, not of another type than the isolation of the different events within the stream of experience of one person. The difference is that, within one person, the phenomenon of recollection images furnishes a simple mechanism upon which a definition of comparison can be based, whereas for two persons, if all our requirements for such a definition are to be satisfied, a crossing-over of the nervous systems ought to be accomplished. Such an operation is as yet not technically possible; but it is not logically excluded. Its result, however, can be foreseen with some probability. Thus probability opens a window between the monads even if there is no channel uniting their individual streams of experience.

There is an outcome of the usual erroneous conception of the problem of incomparability which we must now discuss: it is the idea that there is something inexpressible in our experience, known to us alone but not communicable to other persons. The structural relations between impressions have been distinguished from the specific *quale* of each of them; only the structural relations, it is said, are communicable; the *quale* is known only to ourselves. The fault of this conception, it seems to me, lies in the idea that we ourselves know more than structural relations. We see differences between red and green; but to say that we see, in addition, a specific *quale* of the red means nothing. Such a term is nothing but a misleading expression for the fact that we can recognize red colors, i.e., that we observe them as the same. The relation of sameness has been substantialized—turned into a certain substantial entity called the *quale*, a fallacy frequently occurring in logic. If we had no possibilities of observing similarities, i.e., if there were no

two similar impressions in the whole stream of experience, the idea of a specific quale would not have arisen. To realize this we must remember that, in this case, recollection images would be excluded; the capacity of memory to "preserve the quale" is nothing but the capacity for producing images which stand in the relation of sameness to observed things. That the quale is not permissible is shown also by another reflection. We talked previously of a man who has the quale of red and green exchanged, i.e., who sees red when we see green, and vice versa; we said that this exchange cannot be discovered, as the structural relations are the same for him and for us. Now imagine that the same exchange happens for us, that one day we see as usual, the next day with exchanged colors, the following day as the first day, etc. If this exchange affects our recollection images as well, we never should become aware of it. We should believe then in a constant quale of our impressions, whereas this quale in fact always changes. This shows that the quale is an untenable concept. Its tenable basis is nothing but the relation of sameness, and the term "quale" means as much as can be said about similarities.¹²

For an illustration we may refer once more to an example chosen from the theory of space and time. The idea of the quale may be compared to the idea of an absolute size in space, and is therefore exposed to the same criticism as this untenable concept. Our argument concerning an unobservable change of the quale from day to day would correspond to the well-known argument that nobody would be aware of the change of "absolute size" if, during one night, all things (including our own bodies) would be enlarged to ten times their size; just as these reflections

¹² It is no objection against our reasoning that we make use of the concept "quale" which we want to refute. Our method is the *reductio ad absurdum*: we presuppose there is a specific quale and show then that this presupposition leads to contradictions.

demonstrate that all we mean about spatial size reduces to relations between spatial things, the corresponding reflections as to an unobservable change of the quale demonstrate that it is only relations between observed things which we can "mean" and not an "absolute quale." Even for ourselves, the occurrence of a certain quale would not be verifiable.

What we know can be said, and what cannot be said cannot be known. The idea that we know more than we can say has its psychological origin, I think, in a certain psychological fact concerning the capacity of imagination. We can imagine things we have not previously observed, but there are certain limits set to this power. As to geometrical arrangements, there is, it seems, no limit for imagination; but there is a limit as to colors, tastes, and some other qualities. We can imagine an elephant with six legs, though we never saw one; but we cannot imagine a color outside the well-known domain of usual colors. This is the reason we cannot describe to a color-blind man the colors we see. Suppose we show him a set of differently colored objects, but all of the same intensity. He will see them all equally gray, whereas we see differences among them. We can say to him: this thing is, for us, equal to this, but this thing is different from both. He may believe us, but he cannot imagine that there is a difference. If he could, he might attach the imagined difference to the things; he would represent then, for himself, differences which he did not see. It would correspond to the case when we look at two elephants and imagine that one has six legs; though we do not see such a difference of the elephants, we could imagine it. Now suppose the same power of imagination for the color-blind man; though he sees no differences of colors, he might imagine them and in this way construct a colored world of his own. Would this be the same as our colored

world? This, we found, is an unreasonable question; if his world has the same structural differences as our own, it may be called equal to our world. We are right, therefore, in saying that in such a case we had described the colored world to a color-blind man—though he would continue to be unable to see, in given physical objects, the color differences we see and would not be able to drive a car according to the directions of the traffic lights. Only imagined things would show color differences for him; but, as to observed physical things, he would not know where to attach the differences he could imagine.

This expansion of the observed colors by imagination is, however, impossible. It is this limitation of the power of imagination which leads to the idea that there is something inexpressible in our experience. We say: Whoever wants to know what is red must look at a red thing. But we do not say: Whoever wants to know what is an elephant with six legs must look at such a thing. The red, therefore, is called an *inexpressible quale*; the six-leggedness is not. This is a rather incorrect mode of speech. We ought to say: There are certain differences which we cannot imagine without having seen them before. It is a certain indigence of fancy which we have to state here—no more. It is true that we cannot describe colors to a color-blind man; but this does not mean that what we know about colors is unutterable—it means only that the color-blind man cannot imagine certain differences which we see and which we describe to him. The existence of limits of imagination¹³ in certain domains, together with a false theory of the comparison of impressions, is the origin of the untenable idea of the inexpressible quale.

¹³ It would be an interesting task for psychologists to find out whether these limits are so rigid as is usually assumed. It may be that with training an expansion of color imagination is attainable, for color-blind people as well as for other people.

A third source of this conception may be indicated. Suppose a color-blind man who possesses—in opposition to usual experience—the capacity of imagining color differences in the example just cited. Suppose besides that some day physicians find an operation which gives to our color-blind man the capacities of normal vision. Will the colors he then sees correspond to those he had imagined?

This of course cannot be guaranteed; it may be that the new colors are entirely different from the imagined ones. Philosophers may accordingly argue that this proves the existence of the quale: we could not describe this quale to the man, and he had to learn it by his own experience, made possible in our supposed case by an operation.

We cannot however accept such an argument. What is to be said here can be said entirely by means of similarity relations. The new colors are not similar to the imagined ones—this is what the man observes. Such an experience, however, may always happen. We have no guaranty that the colors we shall see tomorrow will be the same as those seen today. It is the indeterminacy of future observations which enters here and which furnishes a new source for the idea of the inexpressible quale. But it is to be realized that nothing more is involved than the occurrence or nonoccurrence of similarity relations.

A word may be added. Similarity relations permit predictions; thus we may say: If you look at this body tomorrow, you will see a similar color. In the case of our color-blind man, we cannot make such a prediction; i.e., we cannot say: The color you will see after the operation will be similar to the color imagined before it. The difference is nevertheless only a difference in the weight of a prediction. The second prediction is meaningful but is likely to be false. There is a natural law which we previously called the constancy of the perceptual function; it enables

us to make accurate predictions, by means of the similarity relation, of future observations in comparison to past ones. There is no such law as to the comparison of imagined things and future observations. If the imagined thing can at least be put into some relation to formerly observed things of a different kind, there is a certain approximation possible. We can describe to a person the color of a flower he never saw by comparison with colors of a somewhat different kind; we say, for example, "A deeper violet than this, and tending more toward red." In this way, we may obtain a rather reliable prediction. In the case of our color-blind man, we cannot predict a similarity relation between his imagined colors and his future color observations because we cannot show him, before the operation, physical things which, for him, will be similar to his future observations after the operation. This expresses, however, nothing but a lack of determinacy between his observations in so far as they are separated by the operation.

What stands in the background here is the fact that an observation is always imposed upon us, that we do not produce it but receive it independently of our own wills. We shall speak of this passivity in observation later on (cf. §§ 30 and 31). It may suffice to say here that this idea is sometimes expressed by saying that observation furnishes the *quale* of the impression. Nevertheless, this is a rather misleading term. Observation furnishes the whole impression, and whether it is similar to a former one, and in what respect, cannot be foreseen with certainty. This is all that is involved; we need no such *quale* as metaphysicians have invented.

§ 28. What is the ego?

The question as to the difference of the impressions of various people leads us to another question concerning the

special position of ourselves in the world; this is the question, What is the ego?

Metaphysicians of all times have written much about the ego. They have insisted that it is the cardinal point to which to attach all knowledge about the world, that the ego is a metaphysical entity known directly to ourselves, that it is a "thing in itself" but known to us by way of exception—and many other doctrines which under the scalpel of exact analysis turn out to be nothing but metaphors camouflaging a lack of insight into the logical nature of psychological phenomena. Our analysis of psychology furnishes an answer of quite a different type: The ego is an abstractum, composed of *concreta* and *illata*, constructed to express a specific set of empirical phenomena.

Let us collect these phenomena. Our characterization of the specific position of the self-observer furnishes the way to point them out. First is the fact that among all human bodies there is one, our own body, which accompanies all phenomena. We see the table and the paper on which we write, and there is one hand, our hand, on this table. We can turn our heads in such a way that the hand is not seen—then we still feel the existence of this hand by the tactile sense. We cannot rid ourselves of this world of bodily feelings. We observe that they are connected with certain other phenomena; when we see a needle stabbed into our hand, we feel it, whereas we feel nothing when we see the same needle stabbed into the hand of another person. We desire to move our legs, and we do so immediately; but we cannot move the legs of other bodies in such an immediate way. Thus our own physical body appears to be in a unique relation to a set of observed phenomena.

There is, second, the fact that some physical phenomena are known to ourselves alone. We stand at the window and see a car in the street; another person, in the interior of

the room, tells us that he does not see it. We relate things seen in a dream and learn that other persons did not see them. We find in this way that our description of the physical world differs in some respects from the descriptions of other people. The set of facts we refer to here is the same as expressed by the idea that the immediate world is directly accessible to one person alone.

It is the whole of these facts which is comprehended by the abstractum "ego." We say, "I see the car on the street," and mean by this that the thing "car" is accompanied by other phenomena such as feeling joy in the elegant streamline of the car, or feeling hunger in our stomach; in saying "I" we wish to add that we know well that for other persons the car may be accompanied by rather different phenomena. It is the empirical discovery of the difference between the subjective and the objective world which is expressed by the use of "I." This distinction has entered into the grammar of language, and now language is so impregnated with it that we cannot free ourselves of it and indicate it in almost every phrase. Our preceding description is itself not free from it. We described, some lines previously, the facts leading to the discovery of the ego, and said "*We stand at the window and see a car another person tells us. . . .*" Thus in this description we already used the ego-language which we wanted to substantiate. This is, however, no contradiction or vicious circle. We used the usual ego-language only to be more easily understood. We could have given the same description by speaking in a neutral language. The original neutral language¹⁴ does not say "I see" but "There is"; only because we hear that another person answers "There is not" do we retire to the more modest statement "I see."

It is the epistemological transition to the impression

basis which is expressed in this grammatical habit. There is a long line of experience hidden behind this "I." The ego is by no means a directly observed entity; it is an abstractum constructed of concreta and illata as internal elements. Descartes's idea that the ego is the only thing directly known to us and of which we are absolutely sure, is one of the landmarks on the blind alleys of traditional philosophy. It involves mistaking an abstractum for a directly observed entity, mistaking an empirical fact for a priori knowledge, mistaking a product of experience and inferences for the metaphysical basis of the world. Empiricists of all times have rightly opposed it.¹⁴ Let us quote here Lichtenberg, who though he called himself an idealist found the most striking formulation for the empiricist answer to Descartes: "*It thinks*, we ought to say, as we say: *it lightens*. To say *cogito* is already too much, if it is translated by *I think*."¹⁵ The original language is neutral and does not know an ego—this ego is a logical construction.

As the abstractum "ego" is to express an empirical fact, we are free to imagine a world in which there would be no ego. Imagine that all people were connected, according to the salamander operation (§ 27), in such a way that everybody shared the impressions of everybody else. Nobody would then say, I see, or I feel; they would all say, There is. On the other hand, we may obtain the opposite case by dissolving the unity of one person into different egos at different times; if there were no memory, the states of one person at different times would be divided into different persons in the same way that spatially different bodies are

¹⁴ Cf. an interesting summary of the empiricist criticism of the ego-concept given by H. Löwy, *Erkenntnis*, III (1932/33), 324.

¹⁵ "*Es denkt*, sollte man sagen, so wie man sagt: *es blitzt*. Zu sagen *cogito*, ist schon zu viel, sobald man es durch *ich denke* übersetzt" (cf. Lichtenberg's *Vermischte Schriften* [Göttingen, 1844], I, 99).

divided into different persons. The concept of ego then would not have been developed. Voltaire, impressed by the ideas of Hume, knew this when he wrote in his *Dictionnaire philosophique*, in the article "Identité": "Vous n'êtes le même que par le sentiment continu de ce que vous avez été et de ce que vous êtes; vous n'avez le sentiment de votre être passé que par la mémoire: ce n'est donc que la mémoire qui établit l'identité, la même de votre personne."

We are glad that we may quote older empiricists in the defense of an idea which finds its natural place in modern empiricism as well. We know that our empiricism is not a product of our time alone but finds its place in a long historical development. This has been obscured by the traditional metaphysical way of writing the history of philosophy, which has distorted all objective historical aspects. The prevalence of metaphysicians in the field of history is due, I think, to the fact that they have a special liking for history, whereas empiricists prefer to engage in the analysis of problems. The history of empiricism will have to be rewritten some day by the empiricists themselves.

§ 29. The four bases of epistemological construction

In the foregoing sections we gave an epistemological construction of the world on the *concreta* basis. We showed first that starting from this basis we construct, by projections, the whole external or physical world; we proceeded then to construct on the same basis, and also by projections, the whole internal or psychical world. The term "psychical," we indicated, is misleading, as the objects constructed are not of a type different from physical objects; they are physiological processes within the human body. The false interpretation of these internal objects as objects of "another sphere," of the "psychical sphere,"

is a misunderstanding due to an insufficient logical analysis. It is the particular situation of the observer in this case, the necessity of observing or inferring processes within his own body, which causes this misunderstanding so current in traditional philosophy. A correct analysis shows the way to liberation from such misinterpretations.

There is, however, no logical necessity for choosing *concreta* as the basis for the logical construction of the world. We have already pointed this out several times; we shall proceed now to a systematic survey of the different possible bases of epistemological construction.

The particular position of man as that being who wants to perform the construction suggests a classification which is related to man as point of reference. This idea leads to the distinction of three kinds of bases according to the trichotomy of stimulus, internal process, and reaction:

a) The first is the *concreta basis*, used in the preceding account. It is the *stimulus basis*, i.e., the basis formed by those objects which may become direct stimuli.

b) The second is the *impression basis*. Impressions are internal processes within the human body; thus this positivistic basis is an *internal-process basis*.

c) The third is a *reaction basis*. Among all reactions propositions pronounced by men are the most important; it seems convenient, therefore, to restrict this basis to propositions, i.e., to establish a *proposition basis*.

These bases may be called *anthropocentric*, as they are chosen by reference to man. Before entering into a closer consideration of them, let us add a fourth basis which is not related to man:

d) This fourth is the *atom basis*. By "atom" we may comprehend all those elementary corpuscles such as electrons, protons, photons, which physics has discovered as elements of matter. This basis is not anthropocentric.

The number of possible bases is not restricted. It would be easy to establish other kinds; thus we might consider all physical effects produced on certain physical objects, such as photographic plates, as the basis for a construction of the world. The choice is determined by expediency; the four bases as mentioned constitute the most important types which have been used.

Let us now consider some general relations between these bases. We must first point out a remarkable difference. The bases *a*, *b*, and *d* are similar to one another in so far as they involve objects and may be called *object bases*; the basis *c*, on the contrary is of another logical level, as it is a *sentence basis*. Now the system of knowledge is in itself a human reaction and a sentence reaction; thus the sentence basis, seen in terms of the sentence system of knowledge, is the nearest basis. This leads to some important considerations which we shall develop later.

We shall first consider the object bases. The construction of the world erected upon them is effected by means of projections and reductions. If we use the *concreta* basis, the *illata* are constructed by projections and the *abstracta* by reducibility relations; among the *illata* are to be placed most of the internal processes of the human body, except those which are accessible to the inner tactile sense. If we use the *impression* basis, the number of the projections increases, as all concrete physical things are then to be constructed by projection; only certain internal processes are constructed in this case by reducibility relations. The *atom* basis has the advantage that projections disappear and that the construction is entirely performed in terms of reducibility relations. This may be regarded as the definition of this basis: it is this quality which induces the physicists to use it.

Using mathematical symbolism, we may consider the

basic elements of the epistemological construction as a set of independent variables $x_1 \dots x_m$, whereas an entity *e* constructed on this basis is a function

$$e = f(x_1 \dots x_n) \quad (1)$$

where *f* is a complicated logical function including, in general, projections and reductions, as just described. The introduction of another basis may be considered as the transition to another set of variables $y_1 \dots y_m$, by means of functions

$$\left. \begin{aligned} x_1 &= t_1(y_1 \dots y_m) \\ &\dots\dots\dots \\ &\dots\dots\dots \\ x_m &= t_n(y_1 \dots y_m) \end{aligned} \right\} (2)$$

The entity *e*, in reference to the new variables $y_1 \dots y_m$, is expressed then by another function, *f'*, obtained by the introduction of the transformation (2):

$$e = f'(y_1 \dots y_m) \quad (3)$$

The functions $t_1 \dots t_n$ consist of projections and reductions, as well as *f* and *f'*. The occurrence of probability connections within these functions is of great importance; the neglect of this fact constitutes the main fault of the positivistic conception.

The *concreta* basis has the great advantage of being intuitive; it is the original basis in a psychological and historical sense (cf. § 25). Its disadvantage is its necessitating the concept of subjective existence, introduced by the unavoidable expansion of the concept of immediate existence into a concept encompassing both real things and things seen in a dream, or in a cinema. The *impression* basis avoids this disadvantage, as there is an objectively

existent impression even in the case of a merely subjectively existent thing, such as in the case of a dream. This is why the impression basis is preferred by many epistemologists; it enables us to construct the world by means of the concept of objective existence alone. On the other hand, the disadvantage of the concept of subjective existence must not be overestimated. It is true that this concept may lead philosophers to metaphysical fancies; but this can be avoided if we keep to the fact that every statement concerning subjectively existent things is equivalent to a statement concerning objectively existent impressions. The subjective language, i.e., that part of the immediate language which concerns subjective things, can therefore be translated into an objective language. Subjective objects may thus be compared to the fictive objects of mathematics, such as the "infinitely distant point," or the "imaginary conic section." These words—and this is true for our subjective language also—can be avoided by another mode of speech; but they are very practical because they allow us to use a simple language in cases in which another language would become rather opaque. The impression language has the great disadvantage that it refers mainly to illata and is therefore unintuitive and unpsychological. It has turned out in many branches of modern science that an ideal language does not exist, that the best language for one section of science is not always the best for another. The construction of a universal language, it follows, cannot be freed from certain inconvenient conflicts with the desires of linguistic taste.

It is the advantage of the concept of immediate existence, because of its inclusion of the concept of subjective existence, that it allows us to obtain basic statements of a high degree of certainty; for it is much more certain that there is an immediate thing *A* than that there is an objective

thing *A*. The impression basis attains the same advantage by the introduction of the impression of *A*, instead of the thing *A*. But as we saw that the impression can be characterized by us in stimulus language only, the impression of *A* is defined by the immediately existent thing *A*. This is why both modes of speech turn out to be the same.

The atom basis, on the other hand, starts from basic statements of a low certainty, especially when it is not general physical laws which are to be described but individual processes. This is why physicists, for many purposes, cannot renounce an anthropocentric basis. They choose, then, usually the impression basis. This basis corresponds well with physical methods. Imagine a physical instrument which is used as an indicator for other processes; this instrument will record the effects caused in it by the arrival of causal chains started from other phenomena. The instrument thus indicates the last links of causal chains converging toward one physical system and "infers," making use of the causal chains, the more remote phenomena. Impressions may be conceived in a similar way as the last links in causal chains starting from objects throughout the world and converging toward the human body as indicator. Instead of regarding the effects in the interior of the indicator, we may also consider the effects produced on a certain closed surface surrounding the indicator; this comes to the same thing, as all causal chains must pass the surface. The surface may be identical with the surface of the indicator, i.e., with the surface of the human body. Under this conception, impressions are conceived as processes on the surface of the body only; the processes on the retina, the vibrations of the tympanic membrane, and the like are then the physical facts on which all the construction of the world is based. We are thus led once more to our example of the cubical world (§ 14) as an analogy for inferences on

the impression basis; the shadows of the birds are causal effects produced by converging causal chains on a surface surrounding the observer.

It must not be forgotten that the impression basis possesses a high degree of certainty only as long as the impression is defined in stimulus language, i.e., as the impression belonging to a certain physical object. If we pass to the internal-process language, the certainty decreases. That there is a two-dimensional optical image of a seen table on the retina is much less certain than that there is a table before me. This is because the direct characterization of the impression is obtained by scientific inferences which presuppose the existence of the concreta. The concreta basis is the original basis in the psychological sense—in the sense that actual thinking starts from it.

The proposition basis needs a discussion apart from the other bases because it is of another level.

It may be objected that sentences are physical entities as well as impressions or the things of the concreta basis; sentences consist of carbon patches, or waves of sound, and are concreta in the same sense as thermometers or manometers or other instruments observed by the physicist. This is true; but the physical things "sentences" are used in a way different from these other things. They are used as symbols, as a co-ordinated set of things, portraying in itself the world as a map portrays a country. The system of knowledge, being composed of sentences, is also a co-ordinated system, copying the world. The sentence basis is for this reason more closely related to knowledge than an object basis; it is of the same nature as the system of knowledge.

This has an advantage. Instead of considering the relations between things or facts, on the sentence basis we may consider relations between sentences. This is the reason

Carnap¹⁶ has insisted on choosing the sentence basis. He maintains that certain relations which are considered as relations between things or facts are originally relations between sentences. Take the relation of implication. We say that "It rains" implies that "the street becomes wet." This is, says Carnap, a relation between sentences. If we consider it as a relation between the corresponding facts, this is a "shifted language"—a language which has left its original basis and assumed another one.

I do not think that this is a question of principle. Whether we should consider implication as a relation between sentences or between facts seems to me a matter of convention. For many purposes it may be convenient to consider it as a relation between sentences—such as the definition of implication as a certain tautological connection between sentences. There is, on the other hand, no difficulty in considering implication as a relation between facts. This corresponds much better to the actual significance of the concepts. Returning to our example, in speaking of an implication we want to express that the fact "raining" is always accompanied by the fact "the becoming wet of the street." It is such a permanent association of facts which we want to express by the word "implication."

It may be objected that the character of necessity belonging to implication cannot be expressed if we define implication as a relation between objects; i.e., that we cannot then distinguish strict implication¹⁷ from general implication. This is true, and certainly an important result of Carnap's investigations. Idealized concepts like "strict necessity," "strict impossibility," "strict implication,"

¹⁶ *Logische Syntax der Sprache* (Vienna, 1934).

¹⁷ The term "strict implication" has been introduced by C. I. Lewis, whereas Carnap usually speaks of "deducibility relation."

concern propositions only and not facts. Empirical observation gives no means of distinguishing between the two propositions: "The fact A strictly implies the fact B" and "The fact A is always accompanied by the fact B"; if we insist, nevertheless, upon a surplus meaning for the first proposition, this is a matter which can only be formulated as a property of the propositions. This property would be, in our example, the tautological connection of the propositions about A and B. But we must bear in mind that the surplus meaning saved by this interpretation is of no relevance for the content of science. Science is to give verifiable information about empirical objects—this aim can be fully attained in object language and needs no addition expressible in proposition language only.

The idea that such relations as implication are relations between sentences has led Carnap to maintain that philosophy is analysis of scientific language. This is, I think, not false, and it may be useful to conceive philosophy under such a definition. We ourselves made use of this conception when we reduced the question of the existence of external things to a question of the meaning of sentences. I should say, nevertheless, that such a definition of philosophy is not in opposition to the view that philosophy is concerned with the analysis of the more general relations holding for the physical world. This second interpretation is valid because scientific language is not arbitrary but constructed in correspondence to facts. There are only some features of language which have no relevance for the object world; among these are the idealized concepts which have been mentioned. There are, however, other features of language which have their origin in certain features of the world. Thus an analysis of language is at the same time an analysis of the structure of the world.

If the second interpretation is forgotten, a danger arises

which may imperil the understanding of philosophical methods. It is the danger that questions of truth-character may be confounded with questions of arbitrary decision. Language contains many arbitrary elements, and analysis of language is synonymous for many people with an analysis of the arbitrary elements of knowledge. This view would involve, however, a profound misunderstanding of the task of philosophy. There are some essential features of language which are not arbitrary but which are due to the correspondence of language with facts; the task of philosophy is to point out these features and to show which features of language reveal structural features of the physical world.

We may give as an example the problem of geometry. Geometry indeed may be conceived as a part of the language of science. This becomes obvious in the recognized relativity of geometry; mathematicians have shown that, if a description of the world is possible in Euclidean geometry, it is possible also in a non-Euclidean geometry, and vice versa. Hence the decision for Euclidean or non-Euclidean geometry may be conceived as a decision for a certain scientific language. In spite of this conventional character of geometry, however, there are certain considerations of truth-character occurring within the problem. It can be shown that the choice of a certain geometry is free only as long as certain definitions, the definitions of co-ordination, have not yet been formulated. After the decision as to these definitions, the question of the geometry of the world becomes an empirical question; i.e., if in different worlds the definitions of co-ordination are settled in the same way, the resulting geometry may be different. Geometrical conventionalism is accordingly a misleading idea; we may regard geometry as conventional only so long

as the question of the geometry of the world is not yet put in a sufficiently determinate way. In spite of this, we may keep to the idea that geometry is a feature of scientific language; but it is a feature in which the structure of the physical reality finds its expression.¹⁸

I should say, therefore, that the sentence basis does not introduce methods different in principle from the methods used in respect to other bases. It is true that every physical observation must be expressed in a sentence if it is to become an element of knowledge, and so it is useful in many cases to start from the sentence and not from the fact. Such a method may also assume the function of furnishing a control in cases in which an object basis may be misleading. But there are other problems in which the sentence basis is misleading.

We juxtaposed the sentence basis to the three kinds of object bases; however, this needs a correction. We may co-ordinate with each of the three object bases a sentence basis, according as the sentence concerns concreta, or impressions, or atoms. Thus the sentence bases repeat the differences of the object bases at another level. Instead of speaking of a particular sentence basis, we had better speak therefore of the sentence form of the basis in question, considering an object basis and the corresponding sentence basis as different forms of the same basis.

The transition from the object basis to the sentence basis is not the transition to another basis and cannot be symbolized by the mathematical transformation (2). It is a transition only to another mode of speech. Which mode of speech is preferable is, however, a matter of expediency and scientific taste.

¹⁸ For the substantiation of these remarks about geometry we may refer to the author's *Philosophie der Raum-Zeit-Lehre*, § 8.

§ 30. The system of weights co-ordinated to the construction of the world

After having exhibited the construction of the world erected on the concreta basis, we proceed now to the question of the distribution of weights within this construction. It is only after adding the co-ordinated system of weights that our construction becomes complete; without this addition the logical construction would lack its internal order as established by the postulate of truth. This is, however, a problem which can be raised only within the probability theory of knowledge, i.e., a theory in which truth has been replaced by the wider concept of probability. For a two-valued system of knowledge, all propositions forming a part of the system of knowledge are equally true; thus there is no internal order among them from the viewpoint of truth. As this obviously contradicts the practice of science as well as of all knowledge of daily life, the possibility of constructing the co-ordinated system of weights may be regarded as a new proof for the superiority of the probability theory of knowledge.

The particular position of the concreta basis is due to the fact that it presents itself in combination with a very high rank of weights. Statements about the concrete things around us, such as houses, furniture, streets, other people, etc., are practically certain, i.e., possess a very high weight which can be considered as certainty for many purposes. The passage from concreta to illata is accompanied by a continuous diminution of weight. That there is a needle pointing to the number 3.4 of a white board is of a very high degree of certainty; that there is a galvanometer before me pointing to 3.4 amperes is less certain (because the term "galvanometer" includes statements concerning further conditions to be fulfilled) but still of a rather high

weight; that there is an electrical current of 3.4 amperes is of a lower weight (because this statement presupposes the "working" of the instrument); that the temperature in the electrical oven heated by this current is about 357° C. is of a still lower weight. This chain of inferences is of a type frequently occurring in physics; every physicist knows the order of certainty which we have indicated and will, in case of any failure of his experimental arrangement, start to question the "working" of its parts according to the inverse order of certainty, i.e., beginning with the least certain parts.

The chains of decreasing weight constructed in this way may lead to complicated interconnections. In our example, the chain may lead to a new concretum. It may be that mercury is put into the electric stove; as mercury is evaporated at the temperature of 357° C., this evaporation may be directly observed and so may furnish a control for the chain of inferences. The end of the chain then receives a rather high weight; this reflects upon the middle parts of the chain so that their weight also increases, although remaining a little lower than that of the ends of the chain. Thus a system of interconnections is constructed, and the calculation of the weights becomes a very complicated matter. We shall consider this concatenation of probabilities in the following chapter, where we shall analyze it in a more detailed manner.

The character of the concreta basis, as the point of issue for all these inferences, becomes visible in any case where there is a new and strange experience whose interpretation is not yet determined. Imagine an engineer who discovers a new effect in a vacuum tube, say, a sudden rise of the anodic current when a certain pressure of a specific gas is poured into the tube. At first he will not believe in this physical interpretation of his experience. He

will look over his wires, batteries, and screws to ascertain whether the concreta basis of his inferences is unchanged. He will then control his instruments and his set by replacing the tube in question by another tube of known effects; he thus determines whether his concreta basis leads to the usual concrete effects if it is used in a normal way. He connects in this way the observed fact with a wider concreta basis. Whoever takes part in practical work with abstracta or illata—and almost every branch of higher engineering is occupied with such things—will know that this return to the concreta basis is used as the only decisive method of control.

The concreta are the things best known to us; all other knowledge is derived from this primitive knowledge. The question as to the source of this primitive knowledge arises: How do we know the things of the concreta world?

To this we must answer that the concrete things immediately present themselves to us; they appear, they are there—there is no choice left as to whether or not we shall acknowledge them. There is a choice as to pronouncing the statement, and the difference between "truth" and "lie" marks this liberty of speech; but this difference just indicates that there is no liberty left as to knowing about the immediate thing—he who tells a lie knows that his words do not conform with his observations. This is what we call the *peremptory character of immediate things*; the immediate concreta obtrude upon us, whereas we remain passive, receiving information, ready to observe something.

It may be objected that the observed thing may depend on our will; if we want to see an open window, we perhaps turn our heads to the left and see it; if we want to see a closed window, we turn our heads to the right and see it. What is here amenable to our will, however, is not the ob-

served thing but certain conditions which may produce it. These conditions will lead to the desired thing only if there is no disturbance of the physical connections of the thing in question. Someone may have shut the window while I was looking aside; then, if I turn to the left, the open window will not appear, but a closed one will. The phenomenon then will appear contrary to my expectation and will demonstrate the peremptory character of immediate things.

There is, at this stage, no difference as to things which are only subjective and others which are both immediate and objective. The distinction of subjective and objective things is a later correction which we add in order to avoid contradictions. The peremptory character is a quality which is combined with being an immediate thing, independently of its being jointly an objective thing. On the other hand, things which are only objective, not immediate, do not possess this peremptory character.

We may describe our immediate observations in sentences and may imagine a list of report propositions which forms the sentence basis corresponding to our concreta basis. It must not be forgotten, however, that these report propositions must be immediately true, i.e., correspond to the immediately observed objects. We pointed out in our first chapter (§§ 4 and 5) how a proposition can be compared with a fact; we said that it is not a primitive similarity between sentences and facts which occurs here but a rather complicated co-ordination presupposing the rules of language. It is this correspondence with the immediate things which we demand for the report propositions if we insist that they are to be true.

It has been objected that a proposition is not compared to a fact but only to another proposition. If we want to control a certain given proposition a_1 concerning concreta,

so this theory argues, we look at the fact, pronounce a second proposition a_2 , called a report, and then compare a_1 with a_2 . This theory, it seems to me, does not advance our problem. Of course we may intercalate such a second proposition a_2 to which a_1 is to be compared; but then the problem of truth arises for the proposition a_2 . We must know that a_2 is true, if this proposition is to control a_1 ; if we know nothing about the truth of a_2 either, we have now two propositions a_1 and a_2 on an equal level, and, if they contradict each other, we do not know which to prefer.

The answer has been given that the question of preference cannot be decided for two propositions alone; the propositions are incorporated in the whole system of knowledge, and it is by statistical methods, based on the superiority of the greater number, that the choice between a_1 and a_2 is determined. This idea, I think, is only half-right. It is true that the whole system of knowledge intervenes in such a problem and that the truth of a_1 and a_2 is controlled by the weight which these sentences obtain in reference to the whole system of knowledge. But it is not true that the sentences a_1 and a_2 enter into this statistical consideration on equal terms; they have, on the contrary, *initial weights* which determine to a high degree the issue of the calculation. It is this initial weight which includes the problem of the immediate truth of the observation proposition. Whoever refuses to speak of the correspondence of the report proposition to the immediate thing is obliged to speak instead of the initial weight of a report proposition. Thus if a_1 is communicated to us by another person, whereas a_2 is observed by ourselves, the proposition a_2 receives a high initial weight and may defeat the proposition a_1 .

Let us consider this procedure by an example. A friend who visited yesterday the mosque of Sultan Ahmet utters

the sentence a_1 : "The mosque of Sultan Ahmet has four minarets." To control this sentence I walk to this mosque and, looking at it, form the report sentence a_2 : "The mosque of Sultan Ahmet has six minarets." Convinced of the truth of my own observation, I will now prefer a_2 and denote a_1 as false. Why do I prefer a_2 ? Is it because of general statistics concerning mosques? Such statistics on the contrary are against a_2 , as all other mosques have only four minarets or less. It is because I myself observe the six minarets that I believe in the sentence a_2 . It is the peremptory character of the immediate thing which distinguishes the corresponding proposition a_2 from a_1 .

This does not mean that general rules do not intervene in this determination. On the contrary, we make use of them also. In the first place, if we say that our friend made a false report, we presuppose that the two minarets he omitted could not have been constructed in a single day; without the presupposition of such a law about the abilities of architects it might have been true that the mosque had only four minarets yesterday. Second, we make use of general statistics in stating that our own report in such cases is highly reliable. There are other cases in which we prefer the report of another man to our own. Imagine that you stand on the bridge of a liner; the officer on duty points toward the horizon and says, "There is a lighthouse." You look there but do not see it; in spite of this you will prefer to believe that there is a lighthouse, knowing well that in such a case the eyes of an old sailor are more reliable than those of a philosopher. It is this general rule which intervenes here in favor of a proposition contradicting your own report.

This does not contradict, however, the principle of the peremptory character of immediate things. What is shown here is only that we must not infer from this character that

the thing is jointly an objective thing. This question is decided only by additional inferences—inferences however which presuppose once more, for other immediate things, their peremptory character. That we may apply, in our example, the empirical rule concerning the superiority of a sailor's eyes is rendered possible only by our acceptance of some other immediate facts: we know by our own observation that the man before us is a sailor, that we are on the sea; we remember that in similar cases when we used our glasses we discovered the lighthouse which the naked eye could not see; we remember also that the captain told us last night that we were to reach the shore next morning, and so forth. Thus it is a set of propositions concerning our own observations and recollections which leads, when combined with certain empirical rules, to the consequence that one of our own observation sentences is not objectively true. If there were no such set distinguished by a high initial weight of truth, the statistical calculation leading to the denial of the objective signification of one of my own observations could not be performed or, rather, its result would be indeterminate, as it would depend on the statistical basis arbitrarily chosen.

To avoid "initial weights" the proposal might be made to consider the whole mass of accessible propositions, all propositions entering on equal terms. Our initial weight, then, would be the result of a preceding statistical calculation carried through on the basis of equal weight of all propositions. Such an idea, however, would lead to a complete arbitrariness of knowledge. Given a certain class of basic propositions, leading to a certain system of knowledge, we may easily enlarge it by addition of arbitrary propositions in such a way that a contrary system of knowledge is determined by it. Thus to get rid of the six minarets of the mosque of Sultan Ahmet we might add a thousand

propositions stating that there are only four minarets and other propositions stating that our own eyes are unreliable; we should obtain then a system which led to the consequence that the mosque had only four minarets. If we do not admit such an arbitrary enlargement of the basis of propositions, if we should call this a playing with sentences and not knowledge, we then decide in favor of initial weights; for refusing such arbitrarily added sentences as untrue is to be expressed in our terminology by ascribing to them the initial weight zero. Of course, we do not forbid anyone such play with sentences; what we want to maintain is that such a procedure does not correspond with the actual practice of knowledge. What we call knowledge is based on sentences appearing from the very beginning with a high initial weight, or with the character of immediate truth.

To summarize: The highest initial weights concern the immediately observed concrete objects. They form the center with reference to which the system of weights is erected. Reports of other persons, transmitted orally or in written form, can be considered as true; but before this is done they receive certain weights with reference to what I see and know immediately. All weights so occurring are thus determined as functions of the initial weights; objective truth in the sense of a high probability is a logical function of immediate truth.

We must add, however, a determination concerning time. We observe concreta at any moment in which we are awake or dreaming; but the basis of our world at a determinate moment is only given by the class of immediate concreta we observe just at that moment. It is for that reason that we do not admit reports about formerly seen things as immediate reports but apply to them a control similar to the control of the reports of other persons, based

on the immediate concreta world observed at the moment in which the judgment is performed. I find a note that I took this photograph at one three-hundredths of a second and with diaphragm eight; shall I believe this? That depends on what I see now on the film; if there is a person on it, and his silhouette is doubled, the time of the exposure must have been longer. All reports of the past, transmitted by other persons or by myself, appear with an initial weight which is referred to what I know and observe just now. The world of the immediate present, itself bearing the highest weights, is the center of reference for all other weights co-ordinated to propositions about other things; the construction of the world is ordered in such a way that the co-ordinated system of weights has its center in the region of the present concreta. This is what we call the *superiority of the immediate present*.

When wandering through time, we carry the center of weights with us. What is an immediate report at one moment becomes a transmitted report at a later moment; the primary weight it had is changed then into a secondary one derived from other immediate weights. This change of the structure of the system of weights is inevitable. It would be a vain attempt to fix the immediate weights by noting them on paper, with the intention of preserving them for a later time. What we have then, at a later moment, is a note on paper; whether this may be considered as the original immediate weight of the event depends on what we know and observe at the later moment and demands a new determination of its weight derived from the later moment as basis. We can keep the note only but not the event. This is what we call the flowing of time; events emerge, stay one moment in the sphere of the immediate present, and glide along the stream of time into a farther and farther past. We cannot accompany the events, can-

not follow them or visit them at their place in time; we remain detained in our position in the immediate present from which, as from the center of the perspective, we see, on the one side, the past events arranged one behind the other and, on the other side, the future events in a corresponding arrangement. It is as if we see the landscape from a moving train, in continuously shifting perspectives, all referred to ourselves as the center. The system of weights on which we erect the world as on a logical trestle-work is arranged in the form of projection rays radiating from the immediate present.

§ 31. The transition from immediately observed things to reports

We have shown that the basis of our knowledge is the world of immediate things appearing at one moment, and we added that we may imagine this world's being expressed in a set of propositions, the so-called report propositions. We insisted that these propositions are not arbitrary but that they are bound by the condition of being true reports of what we see. We must inquire now as to the way in which we proceed from things to the sentences.

Let us begin this investigation with a physical example concerning an apparatus possessing abilities similar to those of a "reporter"—a television set. Such a device incorporates a photoelectric cell the entrance of which is directed successively to the different points of the object, following a certain regular zigzag course; the different impulses of light, composed in such a way to form a one-dimensional arrangement, produce within the cell a corresponding series of electric currents the intensity of which varies according to the intensity of the light rays coming from the different points of the object. The series of these electric impacts stands in a correspondence to the object

which is to be portrayed; it may be considered as a series of report propositions. It is a true report if the apparatus works correctly, that is, if there is a correspondence, according to the rules defined by the construction of the apparatus, between the two-dimensional object and the one-dimensional set of electric impulses. This example illustrates our physical theory of truth; it shows that a correspondence between objects and a one-dimensional series of symbols is possible. It shows at the same time that the correspondence in question is not a simple similarity; it is a correspondence presupposing complicated rules. We should not recognize the relation between the one-dimensional series of electric impacts, furnished by the transmitter of the television apparatus, and the original object, if we were to observe this series directly, say, heard through a wireless receiver as a series of sounds varying in intensity; we should need complicated intellectual operations to determine whether this linear set of sounds is "true," i.e., whether it corresponds to the original object according to the rules of co-ordination established by the apparatus.

The receiver, standing at the other end of the line of communication, furnishes the control automatically by transforming the one-dimensional series of electric currents into a two-dimensional picture; it transforms the one-dimensional "sentence" consisting of electric currents back into a thing similar to the original and easily compared with it. Thus there is, finally, a transformation of a thing into a picture similar to it; but there is intercalated in the path of transmission a one-dimensional series of "symbols," having no similarity to the object, but carrying in itself, by means of a complicated co-ordination, all the qualities of the object, so that at the end of the transmission process they reappear as features of the picture. We

may say that the two television sets, the transmitter and the receiver, must "think" the object before they can produce the picture at the other end of the line of transmission.

It is easy to describe a similar arrangement in which these two electromechanical sets are replaced by men, and in which a so-called genuine thinking occurs. Imagine a man who observes an object and telephones what he sees to another man; this man at the other end of the cable draws the object according to the description. The processes occurring within these two men are of the same type as those occurring in the television set. The first man is the transmitter, the second the receiver; their communication is rendered possible only because they "think" the object, i.e., describe it in language. The description of the object passing through the wire in the form of electric currents stands to the object in a physical correspondence relation of the same type as that occurring between the series of electric currents furnished by the television transmitter and the object copied by it.

In the case of man we do not know sufficiently the mechanism which produces the sentences co-ordinated with the objects; in spite of that fact we may handle this mechanism as satisfactorily as a person without any understanding of higher engineering may handle television apparatus. Such a "handling of an unknown mechanism" is always performed by us when we make reports of the objects observed by us. But the sentences furnished by a man as observer are not of another kind than the sentences furnished by a television transmitter as observer; they are both true because they stand in a correspondence relation to the physical thing they describe.

The television transmitter does not always "work correctly"; there may occur disturbances which result in producing "false" sentences. To control this, the appara-

tus may show a red lamp which burns as long as the apparatus "works correctly," going out when the apparatus is disturbed. The same thing may happen to the human body as transmitter; the sentences furnished by men may be false, that is, not in correspondence (as established by the rules of language) with the observed facts. This is the case when the observer is lying. The observer himself knows this difference well; he knows whether or not the red lamp of immediate truth is burning during his speech.

The adherents of the sentence language sometimes drop this difference and say, using behavioristic terms, that in the case of a lie there is the subvocally spoken sentence *a* and the vocally spoken sentence *not-a*. However, this is not an exhaustive description of the phenomenon; we must add that the subvocally spoken sentence appears with a high weight, the vocally spoken sentence with the weight zero. Immediate truth is marked by its *evidence*; although this word has been greatly abused in traditional philosophy, we may apply it in the knowledge that it is not to denote an absolute character, that an evident observation proposition may be objectively false, that even a moment later, in a second observation, the proposition may lose its evidence and may be replaced by a contrary proposition showing instead the red lamp of evidence.

In the case of a report given by another person, the difference between immediate truth and a lie is not so easily observed. But a good psychologist may judge, from the behavior of the person and the whole situation, whether he may trust the report. The red lamp of immediate truth is visible for the reporter only; but, if he shows a "normal behavior," other persons may infer that the red lamp is burning for him. The "normal behavior of the reporter" expresses in reaction language what we call the "evidence character" in stimulus language. Reports bear-

ing this reaction criterion may be accepted in the list of report propositions.

The red lamp of the television transmitter is not an absolutely reliable indicator of the proper functioning of the apparatus. The apparatus may be disturbed but only in such a way that the red lamp continues to burn. The same is valid for the red lamp of immediate truth: it may happen that we have the feeling of pronouncing true sentences but that they actually do not correspond to our observations. Of this kind are slips of the tongue and errors in writing a report. They are not lies because the sentence is uttered in good faith, but nonetheless they lead to report propositions lacking immediate truth.

This needs an additional remark. In the case of the television transmitter there are methods to control the breakdown of the apparatus even if the red lamp continues to burn. We must ask whether there are such methods also for the control of immediate truth. There are such methods, but they are not unambiguous. This is because all methods of control concern objective truth; we are not sure, therefore, whether the fault was committed in the utterance of the sentence or whether the immediate thing differed from the objective thing. We mentioned the example of a note about a photographic exposure, stating that it was taken at one three-hundredths of a second, a note which later on is discovered to be false; was the fault committed in writing only or did I subjectively see the number 300 on the shutter in spite of there being objectively indicated another number? There may be a control by the use of recollection images; we may remember that we worked with the number 50 on the shutter and thus shift the fault to the act of noting. This presupposes, however, a definition of co-ordination as to the use of recollection images (cf. § 27). Without such a definition, or an anal-

ogous definition for the application of other methods, the question would become a pseudo-problem; but it must not be forgotten that such a definition of co-ordination can be given and that with such a definition the question of the control of immediate truth becomes as reasonable as the analogous question of objective truth.

In general it is only the objective truth of the proposition which we want to control, and thus the question as to its immediate truth is not raised; only in psychological observations does the question of immediate truth arise. This not only occurs in observations of other people where we have to infer from reactions whether a given report is, for the observer, immediately true; we may also observe the phenomenon that our own reports lack immediate truth. This may happen in reports concerning experiences charged with emotion, such as occur in a psychoanalysis; in such cases a certain courage is needed to heed the red lamp of immediate truth.

The control of immediate truth, as well as that of objective truth, is based on the correspondence theory of truth. Just as the electric impacts of the television transmitter are to be in a certain correspondence to the optical object, so the sentences uttered by men are to correspond to the observed things; it does not matter for this comparison whether objective or subjective things are concerned. We have, therefore, in the correspondence postulate a second criterion of immediate truth; this correspondence criterion is to be put beside the evidence criterion, and we may raise the question as to the compatibility of both criteria.

As to the application of the correspondence theory, we refer to our exposition of this theory in § 5. We showed that the sentence *a* and the sentence "*a* is true" concern different facts: *a* concerns a primary fact, say, a steamer's entering the harbor; "*a* is true" concerns a secondary fact,

a relation between the steamer's entering the harbor and a set of words. Let us suppose that we consider the primary fact and that the sentence *a* appears as evident. If we want to control this, we have to consider the secondary fact; if then the sentence "*a* is true" appears as evident, it is proved that the evidence criterion and the correspondence criterion for *a* lead to the same result, i.e., do not contradict each other.

The method may be continued; the evident truth of the sentence "*a* is true" may be controlled by the correspondence method because this sentence once more maintains a correspondence between a sentence and a fact. We have to demand, then, that the sentence, "The sentence '*a* is true' is true," occurs as justified by the evidence criterion. If this is the case, the compatibility of both criteria is proved at a higher level.

We see from these considerations that the evidence criterion of truth cannot be dispensed with; it is only shifted to a higher level. The evidence criterion always remains our ultimate criterion; we must look at a fact with our own eyes if we want to control the truth of a sentence, and, if we apply the correspondence definition of truth, this means nothing but directing our eyes to another fact. This is the difference from the case of the television transmitter. To control the function of this apparatus, we need not use the apparatus itself but have other instruments at our disposal. In the case of controlling our own function of reporting, we are obliged to use just the apparatus we want to control; it is as if a television transmitter were to control its own operation by observing itself with its photoelectric cell and transmitting the resulting electric currents. This is why the evidence criterion is superior to the correspondence criterion; the proper functioning of the red lamp of the transmitter is to be controlled by a second transmission

process in which once more the red lamp occurs as a criterion of proper operation. However, such procedure is not a vicious circle but a valuable method of control. It might happen that it leads to contradictions; if it does not, this constitutes a confirmation. By confirmation we understand a unilateral control, that is, a control which might prove the falsehood of a method, though it cannot furnish a decisive control of its correctness.

Applying this control to the problem of immediate truth, we may state the fact that in general both criteria lead to the same result—that, if a sentence appears with the evidence criterion, in most cases the control by the correspondence criterion leads to a confirmation. Using the language of our electrotechnical example, we may say that the human body is a good transmitter; it furnishes automatically sentences which may stand control by the correspondence criterion. Thus, although the evidence criterion is indispensable, the correspondence criterion is permissible as well; as a matter of fact, the criteria coincide.

The superiority of the evidence criterion may raise certain doubts as to the interpretation of scientific methods. We found that the feeling of immediate truth is the decisive indication as to the choice of the foundations of the whole system of knowledge. Why do we ascribe such significance to immediate things? If not all of them are objective things, why do we make them the directive factors of scientific thinking, the test of scientific theories, the object of scientific prophecies? Why is it the world of immediate things, and not that of objective things, for which all the labor of scientific work is done?

Our answer to this question is this: It is just this world of immediate things which is relevant for our lives. What makes us gay and happy and unhappy and ill at ease are the immediate things around us—the houses we live in, the

food we eat, the books we read, the things our hands create, the friends we talk with; and all of them in the form in which we see them, and hear them, and feel them—in the form of the immediate things which they are for us. We cannot leave this immediate world; we are bound to live in it and must look for its structure and order to find our way through it. There is no question as to whether we should acknowledge it; we are placed in it, and to learn to foresee it and to handle it is the natural task of our life.

Is not this subjectivism? If we content ourselves with such an answer, does it not mean the failure of the attempt to construct knowledge as an objective system, independent of human feelings and subjective determinations?

I do not think that we have to admit this. To state such an interpretation contradicts the feelings with which we meet the world of immediate things. We do not feel immediate things as a creation of our own. We sense them as something imposed on us from outside; they are not dependent on our will; they obtrude upon us, even if it is against our expectations or desires. What we called the “peremptory character” of immediate things is interpreted by us, emotionally, as their objectivity, as their being a world of their own, or at least messengers of such an independent world. This is just the contrary of the emotions associated with the term “subjectivism”; and if the man of science has constantly the feeling of discovering something with an existence of its own, this is just because immediately observed things are not controlled by his will but appear with irrefutable positiveness and stubborn perseverance.

It is true that this statement concerns emotional associations only; we may, however, co-ordinate to it a logical interpretation. The distinction of subjective and objective things is introduced by inferences based on immediate things; if these inferences show, on the one hand, that the

immediate thing is not always identical with the objective thing, that those among the immediate things which are merely subjective things are to be considered as a product of both objective things and the human body, these inferences demonstrate, on the other hand, that this product has an objective character also: it denotes a process occurring in the human body. It is this transition to an objective conception of immediate things which is expressed in the transition from the immediate language to an objective language: to speak of impressions, instead of immediate things, means putting an objective thing in the place of an immediate thing. It does not matter in this context that impressions are only inferred and not observed. We know immediate things, and even merely subjective things, such as the objects of a dream, are not empty shades without any connection with the objective world; they indicate in any case internal processes within our own body, and, as our body constitutes a part of the objective world, we know at least something about some small portion of the world. This turn of subjective things into objective things is as justifiable as is the distinction between these two categories: if it is permissible even to speak of some things as merely subjective, it is also permissible to interpret subjective things as indicating objective things of another kind, constituted by processes within the human body.

This conception gives a decisive turn to the problem of the objectivity of knowledge. The idea that all things we observe at least indicate an inner state of our own body must be considered as one of the greatest discoveries which traditional epistemology presents to us; as our body is in a continuous physical connection with other physical things, this discovery unlocks the door of our private world with its individualistic seclusion. There is at least a small domain of the world known to us; we can make it a basis of

inferences leading into the remotest parts of the world. It is the idea of projection which opens these windows to the world; we consider the causal chains which project the world to our small observation-stand as indicators of a much wider environment, the structure of which can be retraced if we copy these causal chains by chains of inferences inversely directed.

However, this expansion of our knowledge presupposes the concept of probability. It is only because the methods of probability are at our command that we can construct these chains of inferences. If we had nothing but tautological transformations at our disposal, we could never leave our small platform and would do nothing but repeat in various forms what we there observe. Inferences of probability character, on the contrary, enable us to advance from place to place; they allow us to add to our observations of the personal platform a knowledge about more distant objects. They can do this because they make no pretense of certainty as do tautological transformations; if we advance farther and farther, the degree of certainty decreases—but only because we pay this turnpike toll can we advance.

We have pointed out this function of the concept of probability during all the stages of our inquiry. We showed that the meaningfulness of sentences about the physical world can be kept only if we introduce the probability concept in place of the concept of truth. We demonstrated that under this condition knowledge starting from a given sphere of observation is not bound to this sphere but may advance to things beyond. We applied the same principle to the investigation of the interior world of our own body and showed that it may be inferred with probability from the surrounding world of stimuli and reactions. We could explain the opposition to the physiolog-

ical interpretation of psychology in terms of a justified antagonism to the identification of statements about stimuli and reactions with statements about inner processes—an antagonism which disappears however if the probability character of these inferential connections is recognized. We showed, finally, that the whole construction of the world is carried by a trestle-work of probability connections which finds its basis in the world of the immediate concreta but leads outward in two opposite directions to the worlds of large and small dimensions. Placed in the middle of the world, we attach to our point of reference, by probability chains, the whole universe.

It is the concept of probability, therefore, which constitutes the nerve of the system of knowledge. As long as this was not recognized—and logicians were particularly blind in this respect—the logical structure of the world was misunderstood and misinterpreted; an error which led to distorted epistemological constructions neither suiting the actual procedure of science nor satisfying the desire to understand knowledge. The concept of probability frees us from these difficulties, being the very instrument of empirical knowledge.

We have used this concept, however, as yet in a naïve way; we have applied it without giving an analysis of its logical structure. It is this task to which we must now turn. It is only from such an analysis that we may expect a final clarification of the nature of knowledge. We may add that this analysis will lead to a surprising result—that it will show the nature of knowledge as being much different from what its usual interpretations claim. In renouncing pretension of the certainty of knowledge, we must be ready to admit a fundamental change in its logical interpretation. But we may leave the exposition of this idea to the following chapter.