ABSTRACTS

From *Dialectica*, Vol. 11, No. 1/2

"Evidence et preuve," CH. PERELMAN. Having given an account of the classical theory of the obvious, and brought out its philosophical implications, the author turns to the two presuppositions whose apparently indisputable nature obliged those who wished to avoid scepticism to base any proof upon an obviously intuitive assumption, namely that a conclusion is never more certain than the weakest of its premises, and that a definitely known fact must be supported, in the final reckoning, by what is obvious.

He shows that a theory of proof which repudiates the classical conception of the obvious can nevertheless be elaborated, thanks to the elements provided by the analysis of reasoning, the study of which, unlike the study of demonstration, has for centuries been neglected.

"Phänomen und physikalische Realität," W. PAULI. Without accepting or favouring a particular philosophical "isme," "phaenomenon" and "reality" are analysed from the standpoint of the professional every day life of the physicists. The logical structure of physical theories, including its characteristic connections with observation and experimentation, is briefly indicated, with classical mechanics, classical relativistic field theories and quantum mechanics as examples. It is emphasized that physicists consider their science as being in the course of a development. The problem is therefore never whether or not the present theories will remain as they are, but merely in which direction they will change.

"Caractéristiques, tendances et implications de la recherche atomique actuelle," J. ROSSEL. The present situation of scientific activity, especially in atomic physics, has led to an appreciable alteration of the traditional spirit in basic research. The main reason of this modification appears to be the increasing bond between science and technology. As a consequence of this deep and intricate relationship, the influence of the political state and of large financial organisations upon fundamental scientific work, has developed to a degree as yet unknown.

On the other hand, the result has been an industrialisation of basic research. From this state of affairs arises a limitation in the freedom of research and information, and often for the physicist a questionable propensity to megalomania.

From the sociological point of view the industrial applications of atomic energy imply a dramatic dilemma: the preservation of civilization from a total energy shortage by the use of a new fuel, appears at the same time, by its very consequences, to be a menace of degeneration to the human species.

Such fundamental and urgent questions, like those arising from the implications of atomic research, will probably find adequate answers only through an intensive dialogue between philosophy and science.

"Aspect dialectique de la notion de système physique," J.-L. DESTOUCHES. The notion of system plays an essential part in Physics. The actual difficulties of theoretical Physics consist in this very notion. On each staple of the development of Physics they must imagine a new process to attenuate the cut introduced in the description of the universe by the consideration of a system. We investigate here the last process of *functional theory of particles* which consist in using for the representation of a particle a more complete picture than those which were used till now, the picture of a function u of a functional separable space.

"Zur Analyse des Grössenbegriffs," H. KÖNIG. Many difficulties in discussions on quantities, especially on electromagnetic quantities, arise from the fact that people use or are forced to use the concept of quantity in different ways. On the one hand the quantity as product of unit measure (numerical value) is considered as something which is invariant towards the transformation of scale, on the other hand the quantity is theoretically the mirror of dimensional considerations and must generally change when passing from one describing system to another. The author shows that a lot of difficulties disappear when two entirely different axiomatic bases are accepted, from which derive two entirely different manners of calculating with quantities and thinking in quantities.

"Formalisations et théorèmes critiques," R. P. DUBARLE. The writer aims at disengaging the philosophical significance of various mathematical theorems dealing with formalisations. These theorems form the part of epistemology which may be expounded in the technical form proper to that branch of science and bring together the elements of a self-critical reflection of mathematical thought. They suggest besides that the act of mathematical thought should be understood as the unfurling of a thinking process implying simultaneously a deliberate initiative of thought, an

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intuitive field altogether indefinite and a logical normative requirement. In conclusion, they induce the philosophy of science to wonder whether or not mathematics as they stand are the only possible form of synthesis—in the strict sense of the term—between these three moments or factors of thought.

"L'activité mathématique et son dualisme," G. BOULIGAND. A comprehensive study of mathematical thought, taking the actual works for its basis, will examine *mathematical activity* first. Such activity has always set itself mutually dependent aims of two sorts:

The solving of *problems*, i.e., determining some unknown element under precise conditions;

and the achieving of a *synthesis* which, in the presence of new problems, simplifies and, if necessary, coordinates anew the known facts of whatever sort (methods, operational potentialities . . .).

This is what allows us to draw up a specific scheme regarding the historical evolution of deductive science, the dialectical aspect of that evolution has been stressed as far as possible. It brings in Logic in a natural way, and shows clearly how "mathematisation" operates in a wide field.

"Dialekische Synthese von Formalismus und Intuitionismus," H. GUGGENHEIMER. It is shown first that the cardinal and ordinal hierarchies of the theory of sets may be interpreted in a finitist, operationist manner, without renouncing any of its fundamental features. This point of view has remarkable advantages as compared with a strictly axiomatic-formalistic interpretation. A way is indicated to overcome the problem of unaccessible numbers.

"Quelques remarques sur le caractère provisoire de toute axiomatique," D. DUGUÉ. Axiomatisation is given in this paper as the definition of a mathematical system with reference to all possible extensions. The set of these extensions may be infinite and so it is not impossible that the basis of any mathematical system is an infinite set of axioms.

This point of view is brought forward by examples of geometry. The author gives a statement of topology which he considers as an axiom boundary between certain mathematics and stochastic mathematics.

"Principles of Human Communication," J. RUESCH. The principles laid down in this article express the idea that psychopathology and social pathology can be conceived of as disturbed communication and that the various methods of therapy, both physical and psychological, are geared to improving the organs and functions of communication of man.

Disturbed communication is considered as a special case of ordinary communication that is distorted through erroneous timing, deviations in intensity, and inappropriacy of messages.

"Plan d'organisation, continuité et stades du développement des activites électriques cérébrales," M. MONNIER. The analysis of the development of the electrical activity of the brain in children, with EEGs recorded in longitudinal series allows us to express certain general remarks on the organization, continuity and discontinuity (levels) of the brain development. The method is both objective and subjective: *objective* because it consists of an exact recording of the physiological activity of the brain (variations of the electrical potentials), *subjective* because the records must be analyzed empirically by a specialist. Even when automatic frequency analyzers, correlators or integrators are used, they can only detect certain elementary parameters, such as frequency, voltage, phase relationships. These objective methods remain unable to express the pattern of the electrical activity in its "essential" and "general" aspects. They cannot replace entirely the qualitative subjective analysis. Another difficulty comes from the fact that if the EEGs are not recorded at sufficiently short (four months) and equal intervals, a false impression of discontinuity of the development may result from a too long interval between two EEGs.

These difficulties being accounted for, the analysis of longitudinal series of EEGs shows that the electrical brain activity develops in a *continuous*, progressive way, according to an organization plan (Bauplan). This plan is partially expressed in each EEG, but completed only in the definitely organized pattern of the 15 years old adolescent. In this continuity of the development, however, there appear certain periods when the organization of the electrographic pattern seems to be intensified, accelerated, consolidated. These "epochs," which give the impression of a certain discontinuity, deserve to be called "stades" (levels). They appear at 6–7 years, 9–9, 6, 11, 13 and 15 years. The achieved electrographic pattern of the 15 years old adolescent shows a differenciation, systematization, stabilization and localization of the electrical brain activity. Moreover, we could detect a certain correspondence between this conception of the development and that of Piaget and Inhelder, obtained by psychological tests of the cognitive functions: succession of equilibrium levels of broader extension and greater mobility, together with increased stability. The chronology of the electro-physiological levels corresponds to that of the cognitive functions.

"Analytic and Integrative Nervous Func-

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tions," C. J. HERRICK. Analytic functions, typified by reflexes, use stable inherited structures which are organized for adjustments in behavioral space and time. Individually acquired integrative functions, typified by conditioning, symbolism, and reasoning, are wholly internal and may use any nervous tissue not differentiated for other specific activities. They must be defined relativistically. The highest members of both classes are in the cerebral cortex, the first in the relatively stable projection centers, the second in the more labile areas of elaboration where there is no inflexible localization of function. When consciousness emerges within the second class, the mechanism employed probably must be described in accordance with still unknown relativistic principles.

"About the Goal-Structure of Human Life," MRS. CH. BUHLER. The article will bring about some theoretical considerations to be applied to a study of the goal-structure of human life.

One of the theoretical questions in which this study is interested concerns the origin of the different goals and goal-changes during life. One of the central questions is how goal-setting and goal-changes are brought about, what factors are responsible, what mechanisms come into play.

The material of the planned research study will be selected individual and interview cases whose goal-development and goal-changes will be examined and interpreted.

The present study is to survey some of the concepts and theoretical considerations to be applied in the study of individual's goal-setting, toward a general theory of goal-setting in human life.

"Pédagogie mathématique ouverte," W. SERVAIS. As a philosophy, idoneism is most closely related to mathematics, of which the whole field was, without exception, the ground and only ground of the research and speculation from which it has arisen. It follows that its methods could and should exercise a deep influence over the teaching of mathematics, which is rather unsatisfactory, precisely when the knowledge of the subject and its practical application are more than ever necessary.

Teaching should be an active dialectic of what is intuition, empirical, and rational. It should rely on concrete instances and progressively organize deductive inference, seeing to it that the requisite mental structures are acquired. Such elements would then mutually integrate, since the mathematical model would be disengaged, inferred, from the intuitive model.

The science and methods of teaching would, obviously, have to be kept up to date by the joint action of mathematicians, technicians making use of applied mathematics, finally of both teachers and students. All of them would, of course, want to prove fit for the tasks ahead.

From *Dialectica*, Vol. 11, No. 3/4

"Von der Syntax der Sprache zur Philosophie der Wissenschaften," P. BERNAYS. Newer trends of development in the schools of logical empirism are considered. It is shown how, by the correction of the original too simplifying theses of the Vienna school, one becomes reduced to the study of the traditional problems of the philosophy of science.

"De l'emploi inadéquat du term 'primitif'. Considérations sur l'évolution et la systématique," A. C. BLANC. The inadequate use of the term "primitive" is due to a confusion between archaic primitivity proper, and secondary "primitivity" or pseudo-primitivity. In any kind of evolution, the transitions from simplicity to complexity and from indistinctness to distinctness follow strictly similar courses. Three phases are recognizable: a pre-apogean phase of slow enrichment, an apogean phase of original polymorphism, and a post-apogean phase of segregation and specialization. It is necessary to distinguish between:

1. the archaic simplicity of truly primitive forms and secondary simplicity of impoverished and specialized forms;

2. original polymorphism and secondary polymorphism due to hybridization.

"Science et philosphie," by A. MERCIER. Science and philosophy are distinct, but they rely upon each other. Both are precarious, in different degrees; both are open.

An ontological position cannot be escaped. There are two extreme ones: A kind of scientism consisting in a radical positivism (there are no beings but limited beings), and the transcendental ontological position (the notion of being in the singular is meaningful as infinite source of all existence and as guarantee of the fact that there always will remain work to be done).

It is true that a dilemma arises: Neither of these positions can be proved to be the right one. Yet without the dilemma, it is doubtful whether any philosophical problem would arise at all.

There are strong reasons to think that the radical positivistic position is nearer to a closure, whereas the transcendental one warrants the openness of science as well as of philosophy.

"L évolution de l'intelligence et les formes modernes de la dialectique," R. BAYER. There are

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two prospects of intellectual evolution in the notion of dialectics: intelligence can either be the ultimate point of biological adaptation or it can already be the expression of reason. Within this open characteristics of scientific dialectics are to be found the interpretations studied here: Baldwin's pancalism, Binet's "thought without image," Janet's and Piaget's interpretations which help to enrich the knowledge of the genesis of intelligence and its evolution.

"L évolution du concept de raison dans la pensee occidentale," L. ROUGIER. There is no subject more suitable to the open philosophy of *Dialectica* than the study of the development of the concept of reason in Western thought.

The word "reason" acquired a meaning with the creation of deductive geometry by the Greeks of the Vth century B.C. These geometers substituted for the sensible evidence, which only establishes the "what" of an observed fact, the intelligible evidence which explains the "why" of such an observed fact, by showing that it is the necessary result of a small number of statements, accepted as self-evident. Rising from the concrete to the abstract, the geometers isolated the intelligible essence from the sensible accident, and substituted for the real the possible. The empirical technics of the Orientals made place for the theoretical sciences of the Greeks: astronomy, mechanics, optics and musical theory. Instead, however, of seeing mathematical concepts as creations of the mind, the Greek geometers considered them as preexisting entities, discovered by the eyes of the soul. They furthermore disregarded the practical applications which alone can stimulate experimental sciences. These were the limitations and the causes of the eventual end of hellenic science.

The conquests of Alexander brought to the Western Mediterranean the religions of salvation of the East. The *gnose*, revelation of mysteries transcending reason, took the place of the disinterested search for truth. As Christian message became a philosophy and then a theology, the distinction came to be made between the "hellenic demonstration of the faith" by logic and dialectics, and the "Hebrew demonstration" by the prophecies and the miracles. The scholastics sought to reconcile reason with faith, by defining reason as the legacy of Greek science and philosophy, identified, after the XIIIth century, with the Aristotelian Encyclopedia. They failed in this endeavour. The doctrine of the "double truth" was the admission of this failure.

In order to progress beyond the scholastic outlook, it was necessary to reject the precepts of Aristotle in the study of natural phenomena, to become free of the tyranny of theology, to develop a correct theory of knowledge, especially as regards the role of abstract ideas and the distinction between formal and empirical truths. It was necessary to interpret as a creation of the mind what the Greeks considered the discovery of preexisting truths. The breakdown of the *synthetic apriori* of the Cartesians and the Kantians leads one to wonder what remains of the *a priori* requisites of reason. The last part of the article suggests an answer to this question.

"Programme et position historique d'un rationalisme humaniste," C. PARIS. The critical attitude actually taken towards the idea of reason supplies the starting point; it is considered possible to overcome the resulting crisis by positing this idea anew, in order to establish a new rationalism which might be termed "humanist." That rationalism should first of all duly record the fact that our knowledge is strictly human and differs as such from an absolutely intellectual knowledge, in a sense which contrasts with the present rationalist outlook. Following that line, the writer stresses the "compositive" and "divisive" aspects as well as the dynamic character of our rational activity, in the process of presenting the explicative possibilities of this dynamic understanding with reference to mathematics and natural science. The metaphysical fact into which the rational is bound to flow must be accounted for. Kantism is examined in its historical and programmatical position, stressing how deep the rationalist imprint is there, making it a blind alley as far as scientific dynamics are concerned; it is held that they could be overcome by present day realism, thanks to a dynamic and humanist noetic doctrine.

"Spekulation und Vernunft," K. REIDEMEISTER. A theory of knowledge (relating e.g. to the exact sciences) can only exist as an independent philosophical discipline if we can establish a concept of scientific thought independently of an inquiry into individual sciences. This is the problem, which Wittgenstein tried to solve in his tractatus logico philosophicus, not without touching on some very speculative and unknowable things. For that reason, we cannot understand the significance of the tractatus without the idea of speculation. It is an essential and reasonable problem for the theory of knowledge to determine the nature and the limits of speculation. It is a relevant problem also for the theory of science, since physics and speculation have points of contact and some distinguished physicists have introduced speculative ideas uncritically into scientific exposition.

"Consistance et valeurs," E. DUPRÉEL. The

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edegre of consistence of an object results from its possibilities of resisting external attacks.

There are: the consistency of *beings*, the consistency of *notions* and the consistency of values. A notion is not very consistent if its contents vary from one utterance to another. A very consistent value gives rise to behaviour independent of personal conveniency and conductive to the agreement of the minds.

The most fundamental problems are those concerned with *hierarchy* according to consistence, and above all those concerned with *promotion*, the passing to a higher grade (matter—life—knowledge—spirituality).

Complementary notion: the *degree of precariousness*.

"Probability Magic or Knowledge out of Ignorance, K. R. Popper. We express here the statement "The probability of a given b equals r" symbolically by "$p(a, b) = r$." A formal axiomatic calculus can be constructed comprising all the well-known laws of probability theory. This calculus can be interpreted in various ways. The present paper is *a criticism of the subjective interpretation*; that is to say, of any interpretation which assumes that probability expresses *degrees of incomplete knowledge: a* is the statement incompletely known, b is our total knowledge, and $p(a, b)$ is the degree to which a is (partially) entailed by b. The subjective interpretation has often been proposed as an explanation and even a sharpening of the various objective theories (e.g. the frequency theory). It is shown in the paper that this proposal cannot be realised because the subjective theory cannot lead to results which are compatible with the objective theory. This is due to various reasons, the most important of which is that the objective theory interprets "b" in "$p(a, b)$" as a statement of the *objective conditions* of an experiment and "a" as one of its possible results. The subjective theory on the other hand interprets "b" as our total relevant knowledge which will in general include some knowledge of previous results of the experiment. It is shown that this must lead to incompatibility owing to the fact that this knowledge of previous results must influence the value of the probability.

It is shown, in this way, that any probabilistic theory of the process of learning from experience—that is to say, any probabilistic theory of induction—must lead to contradictions.

"Réflexions sur les probabilités," F. Moch. Probability shows paradoxical characteristics in classical physics; although dependent upon a state of knowledge, and yielding information only as the total result of numerous trials, it seems nevertheless to be definable as an objective characteristic of the isolated event; it assumes that one must reply "perhaps" to certain questions, whilst classical logic would allow no answer but "yes" or "no." When used by micro-physics, it breaks the unity of the physico-mathematical foundations which became apparent in bivalent logic, in its conception as a theory of any object, any event or any theory.

Analysis of these paradoxical characteristics and of the concepts "object" and "event" shows physics and mathematics regain their fundamental unity if bivalent logic is replaced by the trivalent logic of synthesis (*Dialectica* 35/36) or the logic of attitudes, which generalises it (*Dialectica* 39). This revision of fundamental concepts which progressive science brings upon itself, is an example of the doctrine of suitability (idoneity) in action.

"Spieltheorie und Willensfreiheit," P. Nolfi. The theory of games bids also with regard to knowledge an excellent background for the judgment of important cues. In this theory essential appearances of the reality can be observed and investigated *in vitro*. The present composition shows how the most important problem of "freedom of will" can be interpreted and clarified.

"Structure et substructure de la géométrie," S. Gagnebin. In the foregoing article the author endeavours—especially for all who are teaching the Elements—to set forth the significance and importance of two books about geometry. Mr. G. Bouligand's short writing brings out the algebraic and logical structure of that science and presents an "axiomatic" introducing both the notions of "whole" and "group of transformation." A progressive classification of problems is thus elaborated according to the kinds of solutions that suit them. Mr. F. Gonseth, in his far more comprehensive work, analyzes the intuitive, experimental and theoretical aspects of what used to constitute the elementary in classical treatises, then states the researches raised up by Euclid's postulate and leading to the development of the axiomatic method. The triumph of atomism, discovering a world to which the elementary notions of geometry do no longer apply fully, makes it still more difficult to solve the problems of the basing of both geometrical truth and the nature of space. Thanks to his introducing such ideas as "schematic correspondence" and "model", geometry appears as a rational science in progress using the "axiomatic" as its criterion. But far from offering the characteristics of pure rationality, such an "axiomatic" retains some intuitive bases, even when applied to non-Euclidian geometries; it organizes a control of our most elementary intuitions by setting them against one another, and secures through their medium the experimental signifi-

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cance and coherence of geometry. Thus a real mutation of the elementary takes place; but it is not owing to mere chance. The method which has presided over that transformation, the historical changes and stages of which are described, is clearly shown, and it is made evident that it also determines the new forms of physics, the theoretical constitution of which does not differ essentially from geometry considered as the rational science of space. That method is the statute of an open science. So Mr. Bouligand's account is fully justified. By elucidating each other, both books open new horizons to the teaching—even elementary—of geometry. The philosophical significance of those books is of no less importance than the pedagogical one.

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"Problem Solving," MICHAEL POLYANI. Problem solving as taught to students of mathematics presents the main features of heuristics. It is defined as the crossing of a logical gap and the width of this gap is a measure of the ingenuity displayed in crossing it. Such a process is essentially informal, irreversible and self accrediting. Thus it appears rooted in the purposive tension of animals and their alertness which keeps their environment under mental control. On the other hand, a tacit component of this kind enters into all formal operations of the human mind and remains the ultimate arbiter of their rightness.

"Historical Explanation in the Social Sciences," J. W. N. WATKINS. "Methodological individualism" is advocated as an essential principle for social science. Secondly, to this principle there are no "holistic" sociological laws that are irreducible to laws about the situations, dispositions, aims etc., of individual persons. It is claimed that the principle can account for organic-like social behaviour. The ways in which explanation of social regularities and of unique historical events should be framed in accordance with the principle are described.

"What Makes a Subject Scientific?" W. B. GALLIE. There is no single criterion of scientific achievement; different criteria being used in different fields. Nor is any single criterion applicable to natural or formal—or to pure or to applied—science: different criteria of scientific achievement cut across these familiar distinctions. Further, no known criterion is sufficient, and at most two are necessary, to establish scientific achievement in any field. Conflicting criteria of 'the scientific' function like persuasive definitions; they direct attention to the importance of novel or neglected features of scientific work. To understand such criteria is to appreciate how they have helped to diversify and articulate the scientific tradition.

"Diathesis, the Self-winding Watch and Photosynthesis," H. A. C. DOBBS. This article supports the resolute extension of mechanistic thinking in the "sciences of life". The argument is in two parts. (1) Refutation of vitalistic thinking as exemplified in Professor Kapp's theory of Diathesis. The operations of a self-winding watch are shown to be instances of processes in an inorganic mechanism in which forces of random origin, acting in accordance with the laws of physics, can be caused to produce specific events at specified moments of time. Thus an inorganic mechanism is shown to exhibit a characteristic which vitalistic theory holds to be distinctive of 'living' entities: the capacity to produce selective controlled output in response to random input. (2) Demonstration of the close analogy between the mechanical operations of a self-winding watch and certain biochemical processes which occur naturally during the process of photosynthesis in living plant leaves.

From The British Journal for the Philosophy of Science

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"A Logical Analysis of 'Psychological Isomorphism'," EDWARD H. MADDEN. The concept of isomorphism plays a prominent role in psychology, where, however, it has received neither an adequate historical nor logical analysis. Historically, analysis is confined to one type of isomorphism or is interwoven with other material so it does not form a unit. Logically, analysis usually is preoccupied with doubtful *apriori* judgments, pro and con, about the usefulness of different isomorphism hypotheses.

After making preliminary statements about mathematical isomorphism, for the sake of subsequent comparison and contrast, I provide what I

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