while it can come to terms with Special Relativity, seems in
opposition to General Relativity.

There would seem desirable a fundamental clari-
fication in terms of cognitional theory. Not only would this
throw an independent light on issues of interest to theoretical
physicists, but it would serve to bring to cognitional theory
an integrated account both of Prof. Einstein's highly valuable
reflections on the nature of knowledge and of the resistance
met by Relativity as a general methodological program by the
majority of scientists who are devoted to Quantum Mechanics.
On these issues, the reader is referred to the volume, Albert
Einstein, Philosopher-Scientist, ed. P. A. Schlipp, New York,
1951, The Library of Living Philosophers.

1.   The Abstract Statement.
                           abstract
         Though this ~~aspect~~ statement may seem formidable
at first, it brings together in their relations the various
factors that in the rest of the section come up for more
detailed treatment and so supplies the meaning to the whole
exposition.

         Consider three sets of elements: 1) an explanatory
set, say, P, Q, R,...; 2) a descriptive set, A, B, C,... ; and
3) an ambiguous set, U, V, W,... that will later be resolved
into two sets, X, Y, Z,... and x, y, z,...

         Though knowledge of the explanatory set arises
only when a theoretical system has been established, it is
simpler to begin from it because it can be defined internally
and because attention is given other types of elements only
for the sake of arriving at the theoretical system.

1.1   The explanatory elements, P, Q, R,... lie outside
the field of direct observation. One feels ~~differences of~~
weight not mass. A slab of marble may feel colder than a block
of wood of the same temperature.

1.2   The explanatory elements, P, Q, R,... are defined
implicitly by empirically established correlations. Thus, masses
may be defined by the laws of force, gravity, impact; similarly,
the electric and magnetick field intensities may be defined by
the equations that relate them.

1.3   There may be established more general theorems
that bring the correlations of a department into a single system.
Thus, energy relates mechanxical, thermodynamic, and electro-
magnetic correlations.

1.4   The set, P, Q, R,... , is explanatorily complete,
if any variation in any term of the set can be accounted for
satisfactorily by ~~variations~~ appropriate variations in other
terms.
         It is to be noted that this explanatory completeness
is quite different from the notion of the complete explanation

of data. Later it will appear that this distinction serves to separate the intellectualist and the determinaist components in Einsteinian methodology.

1.5   The explanatory set, P, Q, R,... is provisionally complete if, in the event that it is found unsatisfactory, there will be erected another explanatory set, By say, P', Q', R',... which will be regarded as provisionally complete until it is found unsatisfactory.

          This statement is added to indicate that explanatory completeness is an intrinsic character of an explanatory set, and that a theory can be complete explanatorily without claiming to be definitive.

2.1   The descriptive set, A, B, C,... lies within the field of direct observation.

2.2   While explanatory elements are defined by their relations to one another, descriptive elements are defined by their relations to human experiences.

          Contrast "color as seen" with "color as a wavelength of light," "heat as felt" with "heat as defined by the first law of thermodynamics," "sound as heard" with "sound as defined by longitudinal waves in a medium."

          Hence instruments of observation and measuring apparatus are extensions of the field of observation, for what is so observed or measured remains related to human experience.

2.3   Descriptive sets are of two kinds: classical and statistical.

          If A, B, C,... is a da classical, descriptive set, then each element is related to some specifically determinate human experience.

          If A, B, C,... is a statistical, descriptive set, then each element consists of a sub-set of alternatives, and to each alternative there pertains some actual frequency of occurrence.

2.4   There is a correspondence between elements of the descriptive set and, on the other hand, elements or combinations of elements of the explanatory set.

          Such correspondence may be heuristic or explanatory, and in either case the explanatory elements may be referred to classical or statistical descriptive elements.

2.41   If the correspondence is classical and heuristic, then the explanatory elements, P, Q, R,... are not, as yet, defined by their internal relations. They simply represent the theory that is to be discovered. At the same time, the selection of the descriptive elements, A, B, C,... is not closely defined and rests in the initial stages of a science upon a shrewd guess but later upon well-informed presumptions as well.

          The classical, heuristic correspondence may be put as follows. A is the evidence for P and P is the explanation of A. Similarly, B is the evidence for Q, and Q is the explanation of B, and so forth. Thus, the observation of the occurrence or of the variation of A establishes the existence or variations of a corresponding P. Inversely, the supposition of a P explains why A is what it is, and the supposition of variations of P explains why A varies as it does.

2.42   In the classical, explanatory correspondence there remains the heuristic relationship. Whether or not P, Q, R,... occur or vary, is settled by appealing to A, B, C,... Why A, B, C,... occur or vary, is explained by appealing to P, Q, R,...
          However, the explanation is no longer empty.
One not only explains the variations of A by appealing to P, but one explains the variations of P by appealing to the correlations that define it, by arguing to variations, say, in Q, and by showing that these variations have occurred by appealing to B.
          Moreover, the definitions of the descriptive set now become much more precise by appealing to the explanatory set. Weight is conceived not only as correlative to a feeling of effort but also as a product of the coefficient of inertia and the acceleration of gravity; and since that acceleration differs at different points of the earth's surface, it follows that weight also differs. Further examples are endless.

2.43   In the statistical, heuristic correspondence, the set, P, Q, R,... again are unknowns. Again, they ~~are defined~~ correspond to descriptive elements in heuristic fashion, so that A is the evidence for P, and P is the explanation of A. However, since A, B, C,... belong to a statistical descriptive set, the explanatory elements, P, Q, R,... have to satisfy an axiomatic structure and, inversely, this axiomatic structure makes it ~~possible to deduce from P, Q, R,... sets of alternatives~~ possible to deduce from P, Q, R,... their respective sub-sets of alternatives to each of which belongs a probability. Finally, this axiomatic structure may be based upon an analysis of the notion of probability, as is the case in the development of Newton's formula, or it may itself be a hypothesis that enjoys a greater or less degree of verification.

2.44.   In the statistical, explanatory correspondence, the set, P, Q, R,... still satisfies the axiomatic structure and it still retains the heuristic relationship by which A is the evidence for P and P is the explanation of A. But there now is added a set of internal relationships between P, Q, R,... to bind these elements together into a single, explanatorily complete theory.
          In other words, the elements, P, Q, R,... are determined only ~~general~~ generically by the axiomatic structure, which relates them to one another only by the similarity of their relationships to the statistical, descriptive elements, A, B, C,... The advent of complete explanation accounts for the specific differences of P, Q, R,... by relating them to one another either directly or by appealing to some higher set of explanatory elements.
          Whether such explanatory completeness can be attained by a statistical theory is, of course, a further question. It is mentioned simply as intellectually desirable. Finally, it is to be noted that ~~such~~ the explanatory completeness that is envisaged is compatible with the indeterminism of the statistical, descriptive elements. In this fashion there has been effected the distinction, mentioned above (1.4), between the intellectualist and the determinist ~~elements~~ components in Einsteinian methodology.