THE INFLUENCE OF ARCHETYPAL IDEAS ON THE SCIENTIFIC THEORIES OF KEPLER[1]

Although the subject of this study is a historical one, its purpose is not merely to enumerate facts concerning scientific history or even primarily to present an appraisal of a great scientist but rather to illustrate particular views on the origin and development of concepts and theories of natural science in the light of one historic example.

In contrast to the purely empirical conception according to which natural laws can, with virtual certainty, be derived from the material of experience alone, many physicists have recently emphasized anew the fact that intuition and the direction of attention play a considerable role in the development of the concepts and ideas, generally far transcending mere experience, that are necessary for the erection of a system of natural laws (that is, a scientific theory). From the standpoint of this not purely empirical conception, which we also accept, there arises the question, what is the nature of the bridge between the sense perceptions and the concepts? It seems most satisfactory to introduce at this point the postulate of a cosmic order independent of our choice and distinct from the world of phenomena. Whether one speaks of the "participation of natural things in ideas" or of a behavior of metaphysical things-those, that is, which are in themselves real, the relation between sense perception and idea remains predicated upon the fact that both the soul of the perceiver and that which is recognized by perception are subject to an order thought to be objective. Every partial recognition of this order in nature leads to the formulation of statements that, on the one hand, concern the world of phenomena and, on the other transcend it by the "idealized" use of general logical concepts. The process of understanding nature as well as the happiness that man feels in understanding- that is, in the conscious realization or new knowledge- seems thus to be based on a correspondence, a "matching" of inner images pre-existent in the human psyche with external objects and their behavior. This interpretation of scientific knowledge, of course, goes back to Plato and is, as we shall see, advocated very clearly by Kepler. He speaks in fact of ideas that are preexisting in the mind of God and were

implanted in the soul, the image of God, at the time of creation. These primary images, which the soul can perceive with the aid of an innate "instinct," are called by Kepler archetypal. Their agreement with the "primordial images" or archetypes introduced into modern psychology by C. G. Jung and functioning as "instincts of imagination" is very extensive. When modern psychology brings proof to show that all understanding is a long-drawn-out process initiated by processes in the unconscious long before the content of consciousness can be rationally formulated, it has directed attention again to the preconscious, archaic level of cognition. On this level the place of clear concepts is taken by images with strong emotional content, not thought out but beheld, as it were, while being painted. Inasmuch as these images are an "expression of a dimly suspected but still unknown state of affairs", they can also be termed symbolic, in accordance with the definition of the symbol proposed by C. G. Jung. As ordering operators and image formers in this world of symbolic images, the archetypes thus function as the sought-for bridge between the sense perceptions and the ideas and are, accordingly, a necessary presupposition even for evolving a scientific theory of nature. However, one must guard against transferring this *a priori* of knowledge into the conscious mind and relating it to definite ideas capable of rational formulation.

For the purpose of illustrating the relationship between archetypal ideas and scientific theories of nature, Johannes Kepler (1571-1630) seemed to me especially suitable, since his ideas represent a remarkable intermediary stage between the earlier, magical-symbolical and the modern, quantitative- mathematical descriptions of nature. The chief writings of Kepler (hence- forth referred to by the number given) are:

1) *Mysterium cosmographicum*, 1st ed., 1596; 2d ed., 1621.
2) *Ad vitellionem paralipomena*, 1604.
3) *De stella nova in pede serpentarii*, 1606.
4) *De motibus stellae Martis*, 1609.
5) *Tertius interveniens*, 1610.
6) *Dioptrice*, 1611.

7) *Harmonices mundi* (5 vols.), 1619.
8) *Epitome astronomiae Copernicanae*, 1618-1621.

I should mention briefly at this point that Kepler's three famous laws of planetary motion, upon which Newton based his theory of gravitation (1687), were not what he was originally seeking. A true spiritual descendant of the Pythagoreans, he was fascinated by the old idea of the music of the spheres and was always trying to find harmonious proportions, in which for him all beauty lay. He attached the utmost importance to geometric claiming that its theorems "have been in the spirit of God since eternity". His basic principle was "*Geometria est archetypus pulchritudinis mundi*" (Geometry is the archetype of the beauty of the world).

The essay gives a brief biography of Kepler and goes on to discuss the hierarchical arrangement of his archetypal concepts. The highest place is occupied by the trinitarian Christian Godhead, which is incapable of visualization. For Kepler, the most beautiful image that represents God's own form of being is the three-dimensional sphere. He says already in his early work (1): "The image of the triune God is in the spherical surface, that is to say, the Father is in the center, the Son is in the outer surface, and the Holy Ghost is in the equality of the relation between point and circumferences. The movement or emanation passing from the center to the outer surface an image that frequently recurs with him and is closely connected to the Neoplatonists (especially Plotinus) is for him the symbol of creation, while the curved outer surface itself is supposed to represent the eternal Being of God. One naturally links the former with extroversion and the latter with introversion. In his later writings (2, 5, 7), Kepler takes us one step farther down in the hierarchical order of his universe, passing, that is, from the ideas in the mind of the Godhead to the corporeal world. Here the heavenly bodies, with the sun as the central point, are for him a realization of the ideal, spherical image of the Trinity, though less perfect than it. The sun in the center, as the source of light and warmth and accordingly of life, seems to him especially suited to represent God the Father. Kepler's view of this correspondence between the sun with its surrounding planets and his abstract spherical

picture of the Trinity is regarded as primary. Because he looks at the sun and the planets with this archetypal image in the background he believes with religious fervor in the heliocentric system. This heliocentric belief impels him to search for the true laws of the proportion of planetary motion as the true expression of the beauty of creation.

In view of Kepler's conflict with Fludd -the representative of traditional alchemy- it is important that Kepler's symbol -of a type designated by Jung as a mandala because of its spherical form- contain no hint of the number four or quaternary. Perhaps this is due to the lack of a symbolism of time in Kepler's spherical picture. Movement in a straight line, directed away from the center, is the only kind contained in Kepler's symbol, and insofar as this movement is caught up by the outer surface of the sphere, the symbol can be termed static. Since the Trinity had never been represented in this way before Kepler, and since he stands at the threshold of the scientific age, one is tempted to assume that Kepler's "mandala" symbolizes a way of thinking or a psychological attitude, far transcending Kepler's person in significance, produced that natural science which we today call classical. From within an inner center, the psyche seems to move outward, in the sense of extroversion, into the physical world in which, by definition everything that occurs is automatic, so that the mind, in itself in a state of rest, embraces this physical world, as it were, with its ideas.

The next step in Kepler's hierarchical arrangement of the cosmos involves the individual souls. What he understands by individual souls are not just human souls but, employing Paracelsus's concept of the "Archaeus" the souls of the planets as well. The earth having lost its special position for the Copernicans, Kepler feels bound to assign a soul to it, the *anima terrae*. This *anima terrae* is also a formative power (*facultas formatrix*) in the earth's interior and in Kepler's view is responsible for meteoric phenomena. For Kepler, the individual soul, as an image of God, is partly a point and partly a circle: *anima est punctum qualitativum*. In the original essay, which functions of the soul are attributed to the central point and which to the peripheral circle is explained in quotations from *Harmonices mundi*. Connected to this conception as both point and circle are Kepler's

special views on astrology. According to him, the justification for astrology lies in the ability of the individual soul to react -with the help of the *instinctus*- to certain harmonious proportions that correspond to specific rational divisions of the circle. As with the perception of euphony in music, the soul is said to have a similar specific ability to react to the harmonious proportions of the angles that the rays of starlight, striking the earth, form with each other. Kepler seeks to link astrology to optical resonance effects, along the lines of scientific causal thinking. This resonance is based on the fact that, according to him, the soul knows about the harmonious proportions, because, by virtue of its circular form, it is an image of God. In Kepler's view, astrological effects are caused not by the celestial bodies but rather by the individual souls with their specifically selective ability to react to certain proportions. Since this power of reacting, on the one hand, receives influences from the corporeal world and, on the other hand, is based on the image relation to God, these individual souls (the *anima terrae*, and the *anima hominis*) become for Kepler essential exponents of cosmic harmony (*harmonia mundi*).

Kepler's views on cosmic harmony were incompatible with the point of view of the respected physician and Rosicrucian Robert Fludd of Oxford who, as the representative of traditional alchemical philosophy, published a vehement polemic against Kepler's *Harmonia mundi*. The intellectual "counterworld" with which Kepler here clashed is an archaistic- magical description of nature culminating in a mystery of transmutation [*Wandlungsmysterium*]. Fludd starts off from two polar fundamental principles: form, as the light principle, coming from above, and matter, as the dark principle, dwelling in the earth. In accordance with exact symmetry, from above and below, the world is the reflection of the invisible Trinitarian God, who reveals himself in it. A constant struggle goes on between the opposites: From below, the material pyramid grows upward from the earth like a tree, the matter becoming finer toward the top; at the same time, the formal pyramid grows downward with its apex on the earth, exactly mirroring the material pyramid. In the middle, the sphere of the sun, where these opposing principles just counterbalance each other, there is engendered in the mystery of the chymical wedding the *infans solaris*, which is at the same time the liberated world soul. In agreement with

old Pythagorean ideas, Fludd evolves from the proportions of the parts of these pyramids the cosmic music, in which the following simple musical intervals play the chief part:

Disdiapason	Double octave	*Proportio quadrupla*	4:1
Diapason	Octave	*Proportio dupla*	2:1
Diapente	Fifth	*Proportio sesquialtera*	3:2
Diattessaron	Fourth	*Proportio sesquitertia*	4:3

This is illustrated by several figures.

Fludd seems to have attacked Kepler so fiercely because he felt that despite their common starting point of similar archetypal concepts, Kepler was the child of a spirit that represented a serious threat to Fludd's own archaistic mystery world. Whereas for Kepler only that which is capable of quantitative, mathematical proof belongs to objective science, for Fludd nothing can have objective meaning unless it is directly connected to alchemical or Rosicrucian mysteries. This is why he dismisses as "sedimentary substance" the quantities represented in Kepler's geometrical diagrams and acknowledges only his own hieroglyphic figures (*picturae aenigmata*) as the symbolical expressions of the "inner nature" of cosmic harmony. He also criticizes Kepler for having shifted cosmic harmony too much into the subject, thus taking it out of the physical world instead of leaving it in the *anima mundi*, dormant in the matter. Kepler, by way of contrast, represents the modern point of view that the soul is a part of nature.

Generally, one has the impression that Fludd was always in the wrong when he let himself be drawn into a discussion concerning astronomy or physics. Yet the polemic between Fludd and Kepler is still of significance to modern man. An important pointer is to be found in Fludd's criticism of Kepler that “you force me to defend the dignity of the quaternity”

(*cogis me ad defendam dignitatem quaternarii*). For modern man, this is a symbol of a completeness of experience, which is not possible within the scientific method of observation and which the archaic point of view, which also strives to express the emotions and feeling-toned values of the soul with its symbolic images, has over the scientific point of view.

At the end of the essay an attempt is made to bring this seventeenth- century problem into association with the generally felt wish today for a greater unification of our worldview. There is an initial proposal to recognize the significance of the scientific stage of knowledge for the development of scientific ideas by supplementing the investigation of this scientific knowledge [*Erkenntnis nach aussen*] with an investigation directed inward [*Erkenntnis nach innen*]. The former process is devoted to adapting our knowledge to external objects; the latter should bring to light the archetypal images used in the creation of our scientific concepts. Only by combining both these directions of research may complete understanding be obtained.

It is then pointed out that though we now have natural sciences, we no longer have a scientific picture of the world [*Weltbild*]. This very circumstance, however, should make it easier to move toward a unified concept of the entire cosmos [*Gesamtweltbild*], of which the natural sciences are only a part. Modern quantum physics has come closer to the quaternary point of view, which was so violently opposed to the natural science that was germinating in the 17th century, to the extent that it takes into greater consideration the role of the observer in physics than is the case in classical physics. Unlike the "released observer" of the latter, the former postulates an uncontrollable interaction between the observer or the means of observation and the system observed with every process of measurement, and invalidates the deterministic conception of the phenomena assumed in classical physics; the series of events taking place according to predetermined rules is interrupted by the selective observation, which -as an essentially nonautomatic occurrence, according to the point of view of modern physics- may be compared to a creation in the microcosm or even to a transmutation [*Wandlung*], albeit with unpredictable results.

Not only alchemy but also the heliocentric idea furnishes instructive examples of the problem as to how the process of knowing is connected with the religious experience of transmutation undergone by him who acquires knowledge [*Wandlungserlebnis dos Erkennenden*]; it transcends natural science and can be comprehended only through symbols, which both express the emotional, feeling aspect of the experience and stand in vital relationship to the sum total of contemporary knowledge and the actual process of cognition. Precisely because in our times the possibility of such symbolism has become an alien idea, it may be considered especially interesting to examine another age to which the concept of what is now called classical scientific mechanics were foreign, but which permits us to prove the existence of symbols that had simultaneously a religious and a scientific function.

[1] Two Lectures given by Professor W. E. Pauli, in 1948, at the Psychological Club of Zurich .