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FROM THE CRITIQUE OF SCHOLASTICISM TO THE CRITIQUE OF ANTIQUITY

Suppose we agree with George Sarton [1] and Marie Boas Hall [2] that the revival of natural sciences began in the middle of the 15th century, that is at a time when, according to Karl Marx, the *Manufakturperiode* [3] started or, in other words, in a period when feudalism in Europe was already doomed and its significance in the economy, politics and thinking gradually declined, and when first forms of capitalism were discernible due to the emergence of commercial and manufacturing capital. This, then, was the time of a rapid growth of production and with it an expansion of trade and handicraft. It is remarkable that the classes of the population that participated in this expansion repudiated the recent past as gloomy, "gothic", meaning barbaric, and turned in their thinking from life of the hereafter to earthly thoughts. This trend can be noticed in all countries experiencing this growth of production and trade, and this novel outlook on life found its expression in humanism and in the Renaissance, that is, in the rebirth and restoration of the philosophy, science, art and literature of antiquity.

A more involved cause was the reason for going back to antiquity. The philosophy prevailing in those times, that is the authoritative science of feudalism as established in the 13th century by Thomas Aquinas, presented a combination of Christian tenets and ancient philosophy, and served as a philosophical basis for Christian theological teachings. The (genuine or assumed) works of Aristotle and the works of his commentators were acknowledged as beyond question or doubt, just as the

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[1] George Sarton, *The appreciation of ancient and medieval science during the Renaissance (1450—1600)*, Philadelphia 1955, p. 1.

[2] Marie Boas, *Die Renaissance der Naturwissenschaften 1450—1630*, Gütersloh 1965.

[3] Karl Marx, *Das Kapital*, vol. I, ch. 12, in: Karl Marx, Friedrich Engels, *Werke*, vol. 23, Berlin 1962, p. 356.

Bible and the writings of the Fathers of the Church. Especially in secular problems, antique philosophy and science enjoyed great and even the greatest regard. Yet it was precisely in these worldly things that the limitations became apparently inherent in actual cognition and prevailing ideas, and that one became conscious in regard to the contrast between the newly discovered conception of life and the old traditional way of the world. It seems understandable that, as long as notions of eternal and not replaceable values were not only dominant but at the same time linked to the belief in an ultimate authority as origin of all knowledge, an urge grew up to look for better and more profound knowledge at those sources which hitherto had been exclusively supplying this knowledge. Deeply rooted and commonly accepted—augmented by the Christian doctrine of original sin and by antique concepts dated from Hesiod and Homer—was the belief, that the "golden era" should be looked for in the past. This explains, why even Simon Stevin (1548—1620) mentions in his writings the past era of wisdom in which man was supposed to have known all of nature's wonders,[4] and why Francis Bacon built up his theory asserting that prior to the original sin man ruled over nature, and that this rule could and should be recaptured by labour, industry, and the development of a new science surpassing that of the antique.[5]

However, it was palpably necessary first to investigate and master the antique science, in order to associate the belief in a golden era of the past with the endeavour and the confidence of eclipsing the antique. This intensified study of the antique brought, at the outset, two striking surprises. It came to light, in the first place, that the traditions from the antique that were at hand contained inaccuracies, distortions and outright errors and, at the same time, that in all its domains including philosophy and sciences, life in the antique was much more abundant and variated and not at all as monotonous and single-minded as was commonly thought. Thus it appeared from two different points of view, that the "restitution of the antique" was indeed apt to satisfy the new demands: on the one hand by releasing tradition from the fetters of distortions and errors and, on the other, by enriching it with newly discovered source material. Today we may freely admit that antique science had indeed possessed much more knowledge and deep thinking than was perceived at those times.

Both these discoveries contained, at the same time, seeds for a critique of antique philosophy and science. Wherever contradictions and omissions occurred, even in philosophically incontestable texts, short-

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[4] George Sarton, *On the history of Science,* Cambridge (Mass.) 1962, pp. 164—165.

[5] Cf., e.g., Francis Bacon, *Das neue Organon,* Berlin 1962, pp. 305—306.

comings of this kind were not chargeable against ignorant commentators of later periods. Indeed, there were instances when in matters of essential importance ambiguities were discovered between the opinions of two authors of the antique; but in their contemporaneous argumentations each was able to have recourse to authors from antiquity—and in this way the trustworthiness of antiquity suffered severe damage, so that here the intensified study of antiquity became the seed for its loss of credit.

Thus, as early as in the *Quattrocento* there can be seen, parallel with each other, admiration of antiquity manifested by the humanists in their copying antique images, which today is occasionally termed classicism, on the one hand, and on the other one sees the first steps towards overthrowing antiquity, expressed by giving equal rank to contemporaneous times and to antique eminence, and by refusing to admit a gradual decline of the world following what was called the "golden age." [6] In consistence with G. Sarton one can distinguish, from the very beginning, two groups among the representatives of the Renaissance: the imitators of the antique, belonging to the educated classes and pursuing philology and archeology, and the "rebels"—as they are called by Sarton—whose mind was set on actual performance, independent creators who were outdistancing the antique. [7] Both these groups were united in their struggle against scholasticism, and each contributed its share towards overcoming this philosophy.

In the 15th century, the humanists undoubtedly took first place as far as the evolution of new thinking and the new science was concerned; Sarton speaks bluntly of a predominance of philosophy over all other sciences. [8] However, while initially both groups were complementing each other, the 16th and 17th centuries—with their intensification of the class struggle between the followers of the declining old social order and the representatives of the newly emerging one—brought with increasing clarity to light the differences between the philologers and the rebels. The humanists, *vel* classicists, kept off the revolutionary tendencies and from the people at large. Even when opposing scholasticism, they lost themselves in a sophistry of literary insinuations understood only by a narrow circle of educated people; they failed to appreciate the value of practical experience and proved incapable of complying with the new demands imposed by science in connection with the further evolution of productive vigour. In this manner they lost

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[6] Leon Battista Alberti (1404—1472), a humanist and architect, dedicated his book on painting to Filippo Brunelleschi (1377—1446) because, in his opinion, the Florentine cathedral built by Brunelleschi surpassed the science of antiquity, and because this masterpiece had vanquished his own regret about nature having grown old tired and unable to produce again giants in body and spirit.

[7] George Sarton, *The appreciation...*, pp. 2—3.

[8] *Ibid.*, pp. 169, 171.

their leading role in science and in culture, and their place was taken by the rebels who were enjoying the support of merchants, bankers and manufacturers as well as of the new aristocracy; this group, consisting of *artefici*, *virtuosi* and *curiosi* who, in part, had evolved from the above supporters, went ahead with its own independent research.

Under these conditions the rebels, champions of the practical application of science, managed to attain gradually the upper hand in the more profound knowledge made accessible by the humanists: part of the humanist school changed over from studying antique literature to investigation of nature, and this activity increased the amount of scientific literature published in a variety of languages.

Within the various domains of science, this change-over from humanistic studies to the study of nature proceeded at a different rate, alternately in league and in conflict with the humanists and artificers, depending on the significance of a given domain in world outlook and in practical life, and on the attainment previously reached in antique science. At any rate, this transition constituted not only the release from the despotic rule of philology as claimed by Sarton, [9] but, at the same time, the full liberation from the autocracy of theology—a fact overlooked by Sarton—and from reliance upon the authority of bygone time.

Here, on the one hand, it was the question of reconciling with the tendencies held thus far, which the new knowledge derived from antique sources or gained from practical experience; this was a step ahead which in botany, anatomy, geography, mining and metallurgy, that is, in the whole of natural science and in technical attainments went beyond a mere increase and enrichment of knowledge and a defeat of antique science. On the other hand, it was important to comprehend the failure of natural science and natural philosophy of those times in clarifying or, even, appraising practical problems and in discovering new solutions—a failure which, taking astronomy, mechanics and the atomistic theory as example, brought about revolutionary transformations in fundamental beliefs and thus developed into an entirely new natural science.

The resuscitation of antiquity was significant in a twofold sense. It supplemented and enriched extant knowledge and, at the same time, it supplied footholds for the critical examination of existing doctrines by referring back to those ancient writers or publications that had been unknown to, or overlooked by, routine philosophy, or which so far had been deliberately disavowed in conformity with acknowledged authorities of antique times.

In consideration of these interrelations, historiographers of philosophy and science have pointed out the significance of Platonism and Neo-

[9] *Ibid.*, p. 169.

platonism as a countercurrent to the Thomistic philosophy, and they have investigated the effect of this development upon Copernicus, Kepler and other scientists of the 16th and 17th centuries. [10] However, let us not confine ourselves to philosophical reflexions, but rather illustrate these events by indicating a most important change in the history of science: the history of astronomy or, to be exact, of the astronomic world systems.

During the 15th century, astronomy was very backward. It was unable or, rather, not able any more to satisfy practical demands, neither in the construction of the calendar nor the computation of the position of the sun, the moon and the planets—thus neither for astrological purposes nor for establishing the position of ships on the high seas. Under these conditions two prominent astronomers, Georg Feuerbach (1423—1461) and Johannes Regiomontanus (1436—1476), living in humanistic surroundings at Vienna, tried first to ascribe the difficulties encountered by astronomy to erroneous translations and to outright falsehood in Ptolemy's chief works. Aided by the bibliophile and collector of books, Cardinal Bessarion (1395—1472), they managed by their many years' strenuous work to prepare from a Greek copy of the *Almagest* a carefully executed summary in Latin. [11] The result however, was, that even the genuine Ptolemy failed to throw light on the existing difficulties.

The next chapter in the acquisition of antique astronomical knowledge was written by Copernicus. This scientist, an ardent admirer of Ptolemy, had studied the *Almagest* as given in Regiomontanus' epitome and arranged his principal book in the same order as Ptolemy had done. However, taking into account the shortcommings of astronomy of those times, he made bold to criticize Ptolemy from a Platonist's point of view and, being a humanist, he attempted to find more profound knowledge in earlier antiquity. As Copernicus himself stresses in the well-known Preface to his principal book, he had taken pain to study the works of all the philosophers: *omnium philosophorum*—obviously this could only mean all philosophers of past times—"to seek out whether any of them had ever supposed that the motions of the spheres were other than those demanded by the mathematical schools", and in this way Copernicus discovered the ancient opinion on the heliocentric system. [12] The commonly held concept of the universe was, therefore, radically criticized by him on the basis of a resuscitation of antique tradition and, at the same time, this critical attitude was in turn supported by this

[10] A. Koyré, *From the closed world to the infinite Universe,* Baltimore 1957, and the same author: *La révolution astronomique,* Paris 1961.

[11] *Epitome in Cl. Ptolemaei magnam compositionem,* Venice 1496. This work appeared after Regiomontanus' death. The Greek manuscript in Regiomontanus' possession was printed in Basel in 1538. Cf. G. Sarton, *The appreciation...,* pp. 146—147.

[12] Nicolaus Copernicus, *Die Kreisbewegungen der Himmelskörper,* 1. Buch, zweisprächige Ausgabe, Berlin 1959, pp. 10—11.

reference to antiquity. Copernicus developed his new concepts during the first decade of the 16th century. Only half a century after the beginning of the Renaissance, all relevant antique works had been translated anew by humanists. Copernicus wrote his own Preface in 1542 or 1543.

When, barely forty years later, Tycho Brahe (1546—1601) divulged his own system of the universe, he concealed the fact, that in antiquity there had been precursors of this system also. Like Copernicus, in disproving Ptolemy he made reference only to astronomical, physical and theological arguments; he may even not have looked for a confirmation of his theory in ancient writings. Astronomy had become self-reliant, undertaking research of its own.

Afterwards it was Galilei, who made the next momentous step forward by his declaring war on antique science. In his famous *Dialogue Concerning the Two Chief World Systems*, Galilei bluntly emphasized many times, that now more valuable knowledge could be attained than antiquity had known and that even Aristotle himself, were he then living, would change his opinions. The pedantic bookworms who considered Aristotle's authoritative reputation indispensable, were dismissed by Galilei with the advice: everyone should use his own eyes.[13] In this manner, the critique of the scholastic philosophy by the use of diverse antique teachings had turned into a critique of antique science on the basis of Galilei's own new discoveries and reflexions.

In the above I have presented in some detail the evolution of astronomy, because I consider it remarkably typical. The same pattern was repeated in the 17th century in the theory of the structure of matter, by the resumption of antique atomistics and of the works of Lucretius and Epicurus. Modified, we again meet this pattern in statics and hydrostatics in consequence of the revival of Archimedes' scriptures; in dynamics this process presents a different aspect, because Aristotle's doctrine on motion—a doctrine upon which the "impetus theory" of the Paris terminists was founded—was never followed in antique science by a second theory on motion. In the evolution of the new dynamics the antique science was, therefore, unable to serve as means of criticizing the peripatetic doctrine of motion; yet, it fulfilled its task inasmuch as Galilei's known allegation, that the Book of Nature was written in mathematical language,[14] also contained contemporaneous Neoplatonic reasoning.

In this context we note the historical and logical vindication, why the new mechanics developed not in the initial stage, when judgment was being pronounced upon the philosophy of the feudal schools, that is,

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[13] *Le opere di Galileo Galilei.* Edizione nazionale, VII, Firenze 1897, p. 138.
[14] *Ibid.*, VI, p. 232.

in the Renaissance, but only after this critique had resulted in the defeat of the peripatetic doctrines and of the belief in authority in other domains also.

While in 1609 Pierre Camus, bishop of Bellay, still asserted in his *Diversités*: "Thus, in any dissertation, authority is the same as foundations to a building or roots to a tree; lacking authority no dissertation can abide", [15] there dates back from the same time to Francis Bacon the dictum: "Plato harmed natural philosophy by his theology as much as did Aristotle by his logic." [16]

Thus initiated, the radical break with the belief in authority and the supremacy of philosophy was ultimately accomplished by René Descartes (1596—1650) in his work *Discours de la Méthode*, which he addressed, in French language, to all those who—as he put it—"profit solely by their natural pure intellect" and refuse to "have faith merely in the ancient books" [17] (unfortunately without contrasting authority with experience and experiment). An anecdote reports Descartes to have said to Queen Christine of Sweden: "I am surprised to see Your Majesty engaged in such nonentities," when she was given lessons in Greek by the famous Dutch humanist Vossius (1577—1649). [18]

Towards the end of the 17th century (1687—8), the feud between humanists and philologers as champions of the authority and the importance of antiquity, on the one hand, and the followers of the new science and of Descartes' philosophical teachings on the other, occasioned in the literary-philological domain of France a dramatic finale in the famous "Querelle des anciens et des modernes." Released by a controversy, whether the inscriptions on the "Arc de Triomphe" in Paris, intended to glorify the achievements of Louis XIV, should be given in Latin or French, there developed a discussion on the argument whether or not the age of Louis XIV excelled that of Rome's Augustus. The decision in favour of modern times, of France and the French language, constituted not merely the victory of a national state and absolutism but, at the same time, a declaration in favour of progress, based to a high degree also on the achievements of the new sciences and upon the hopes maintained for a more auspicious future. [19] While in France discourses continued throughout the 18th century on the ambiguous question of the superiority of one or the other language, literature and literary style, matters took an altogether different turn

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[15] Hubert Gillot, *La querelle des anciens et des modernes en France*, Nancy 1914, p. 282.

[16] Francis Bacon, *The Works*, ed. by J. Speeding *et al.*, VIII, p. 569.

[17] René Descartes, *Abhandlung über die Methode*, Leipzig 1948, p. 64.

[18] Hubert Gillot, *op. cit.*, p. 289.

[19] In his writings, Fontenelle proclaimed the law of continuous and necessary progress in science and attempted to prove the validity of this law in the domain of language and literature as vell. Cf. *ibid.*, pp. 494—496.

in England: here, interested in the new sciences, the emerging bourgeoisie, that in 1662 had established what was to be called the Royal Society, adopted a much more realistic attitude. In 1667, i.e. 20 years prior to the rise of the "Querelles des anciens et des modernes," Thomas Sprat (1634—1713) in his *History of the Royal Society* concluded his dissertation on the merits of antiquity and philologers by a comparison which shall also be the final accent of my recital: "It seems to me, that the wisdom they (the philologers) recovered from the ashes of the dead, is of about the same nature as ashes are. When concentrated in heaps, it is useless; when spread out over living soil, however, it renders it fertile so as to yield the most variegated kinds of fruit." [20]

[20] Thomas Sprat, *The history of the Royal Society of London for the improving of natural knowledge*, London 1667, pp. 24—25.