

PROFR. E. MOUTSOPOULOS

PSYCHO-AND BIO-CYBERNETICS IN PLATO'S
ACOUSTICS AND THEORY OF EDUCATION

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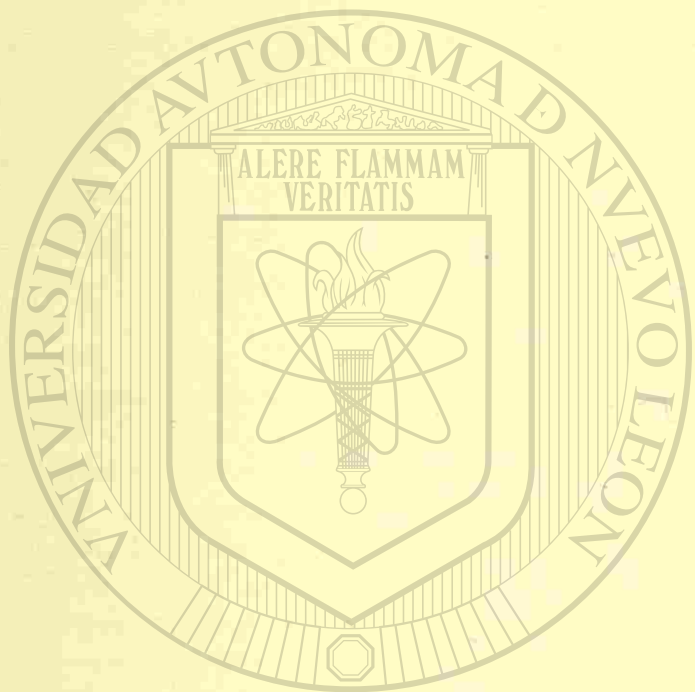
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PSYCHO-AND BIO-CYBERNETICS IN PLATO'S ACOUSTICS AND THEORY OF EDUCATION

PROF. E. MOUTSOPOULOS
Rector de la Universidad de Atenas

IN PLATO'S WORK, Physiology and Physics are closely connected both in his Theory of Psychology and in his Theory of Education.¹ According to Plato, man is a unified whole being subject to external influences, and responding to them accordingly. Under those circumstances the human psychosomatic factor of connections is understood to be autoregulated reacting against external influences. On the other hand, the above mentioned structure of man permits his external educative regulation. Knowing, thus, the rhythmic reactions of the human constitution as well as those of his psychism, it is possible to react educatively on the latter. In which case the rôle of Cybernetics² consists of the right formation of shapes through which the external influence on the human element will be achieved according to the best possible way, but depending on the circumstances. To make this clear we shall mention a couple of examples, taken from the regions of Acoustics and Physiology, as Plato understands them.

The principle hiding under those considerations is that of motion³ through which both the connection between the physiological and the physical level, and that of those previously mentionem to the educational is achieved, Referring to the subject in his *Timaeus* Plato starts off from his definition of sound

¹ Vd. A. VIRIEUX-REYMOND, *Platon ou la géométrisation de l'Univers*, Paris, Seghers, 1970, p. 23, f. 96 f. E. MOUTSOPOULOS, *La musique dans l'oeuvre de Platon*, Paris, P.U.F., 1959, pp. 39, f. 203 f.

² The term appears for the first time in PLATO, *Gorg.*, 511d.

³ Vd. E. MOUTSOPOULOS, *Musical Movement and Psychology in Plato's Later Dialogues* (in Greek), *Athena*, vol. 64, 1960, pp. 194-208.



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which he understands to be a stroke transmitted by a sound source, moving through the air, ear, brain and blood to those parts of the body, in which the soul resides *par excellence*.⁴ Hearing too is defined the same way, viz: as motion continuing or accompanying the motion of sound in the body, and which, starting from the ear, reaches the liver through the brain and heart in such a way as to invade the whole psyche, having had invaded *grosso modo* the seats of its three essential parts, viz: intellect, emotivity and desire. The transmission of sound, however, is not achieved through vibrations, which is something Plato ignores, just as he ignores the way of transmission of the acoustic irritation through the body. A. E. Taylor, having studied that description asserts that Plato means a reaction relevant to that caused by creaking.⁵ In this case, however, it is not noises that are understood but pure sounds, which are called by Plato in the *Philebus* smooth and bright,⁶ which means that they are musical sounds.

The height of the sound is in proportion to its speed. But, as soon as the sound goes through the ear (the rôle of the tympanum is not known by Plato), a regulative mechanism is set into motion, to the effect that the movement of sound shall decrease in reverse proportion to its initial speed: the quicker the sound was moving in the air, the longer it would need for it to reach from the ear to the liver during its course in the body. The coefficient of decrease in speed is in its turn in proportion to the initial speed.⁷ It is to be remarked that the decrease of the speed of the sound during its course in the body, does not in the least any longer affect its pitch. This of course is a simple postulate, necessary as it is, otherwise that Platonic theory falls to the ground. If then, the above mentioned things are to be taken into consideration, we shall have to suppose that two different sounds transmitted simultaneously from the same sound source (e.g. a musical instrument) will cross the distance between it and the ear in different times, according to their pitch. If V and v are respectively the speeds of two sounds having harmonic relation (1:2, 1:3, 1:4 etc.), P and p their relative pitches, then we have the following relation:

$$(a) \quad \frac{V}{P} = \frac{v}{p}$$

⁴ Vd. *Tim.*, 67 a.

⁵ Vd. A. E. TAYLOR, *A Commentary of Plato's "Timaeus"*, Oxford, 1928, pp. 476-477.

⁶ Vd. *Phil.*, 51 c.

⁷ Vd. *Musical Movement...*, *ibid.*, p. 119.

The speed of the sound higher in pitch S is greater than the speed of the other, as a result of which the higher pitched sound will reach the ear before the lower, and in time equalling the difference

$$(b) \quad t_p - t_P^8$$

In the simplest of all cases, that of the octave, there is proportionality between the pitches (1:2) and speeds, expressed thus:

$$(c) \quad \frac{P}{p} = \frac{V}{v} = 2.$$

In that case, and considering that, during its course in the air the speed of sound is not altered, the sound pitched P will reach ear in time t_P , corresponding to half of the time t_p which the sound pitched p needs in order to cross that distance.

The graphic accompanying the present text, does not unfortunately allow us to determine with exactitude the point to which the speed of the higher in pitch sound has been decreased, during the moment in which the lower sound strikes the ear.

We may follow the course of the sounds in the body. Right from the start of the intrusion of the sound through the body, the speed (but not its pitch) is altered according to a rigorous law, as we have already mentioned, viz: in reverse proportion to its original value. Thus, at a given time t_j , the speeds of those two sounds will have equalled each other; the one that moved slower through the air joining the first. Both of them, then united, continue their course till they reach the liver, when at a given time t_l , their speed is annihilated. Although they die that way,⁹ they just have the time to impose their harmony on the psyche, reflecting an immortal harmony.¹⁰ The results of the harmony on the body as much as on the soul become

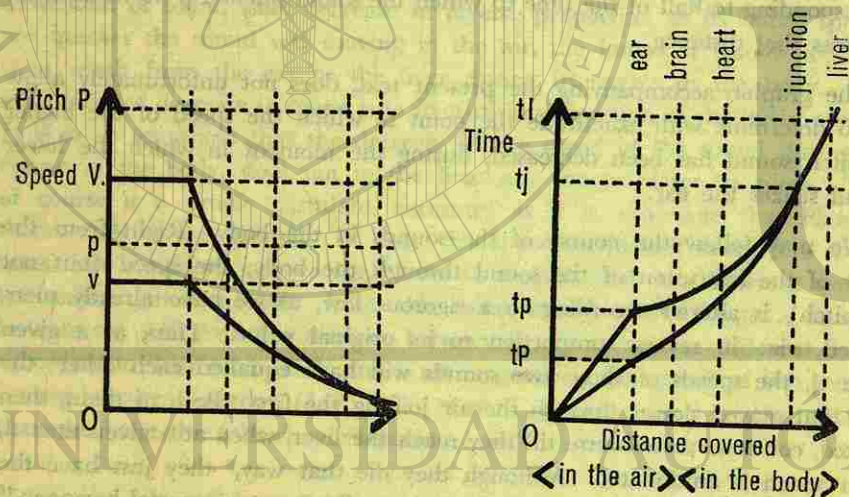
⁸ Vd. *La musique...*, p. 40.

⁹ Vd. *Tim.*, 80 b.

¹⁰ The old conception of Th.—H. MARITAIN, *Notices sur le "Timée"*, Paris, 1841, *ad loc.*, on the Pythagorean provenance of this idea has been accepted by A. E. TAYLOR, *op. cit.*, *ad loc.*

beneficient. Not only does it offer pleasure,¹¹ but, which is more important, it imposes prudence and justice.¹²

The above mentioned data extend according to Plato to the level of bodily movements, so as to impose on it a hermonious way of living, owing to dance, which is a disciplined manifestation of human vitality.¹³ The rhythmic as well as the harmonic exercise requires in order to be effective, a method of habit through which either anticipated immunity from disease or cure of states of psychic abnormality is obtained. The rôle of Cybernetics in its original meaning consists of the right specifications and the right selection of sounds or movements of the body, which are able (considering the psychosomatic mechanism of physiological reactions subjected to the reactions caused by it) to give exemplary forms of beauty and goodness to the soul, according to the need of each individual. To a lesser extend analytically Damon¹⁴ has supported this theory. Plato's contribution consists of the systematization of the subject, and of his recognition in it of a certain educational technique, technically taking resource even in Art.¹⁵ Cybernetics and Education are closely related in that domain.



¹¹ Vd. *Phil.*, 51 d.

¹² Vd. *Tim.*, 46 d; *Republic*, IV, 340 d; cf. E. Moutsopoulos, *Of the Fourfold Root of Practical Reason according to Plato* (in Greek), *Athena*, vol. 68, 1965, pp 12-16.

¹³ Vd. *La musique...*, pp. 96-156. *Musical Movement...*, p. 203 f.

¹⁴ *La musique...*, pp. 73-77.

¹⁵ Vd. *ibid.*, p. 309 f.

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