

Committee 6
Science and Music: A Unifying Concept

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Anthropologic Basis of the Search for Harmony in the Structure of the Universe

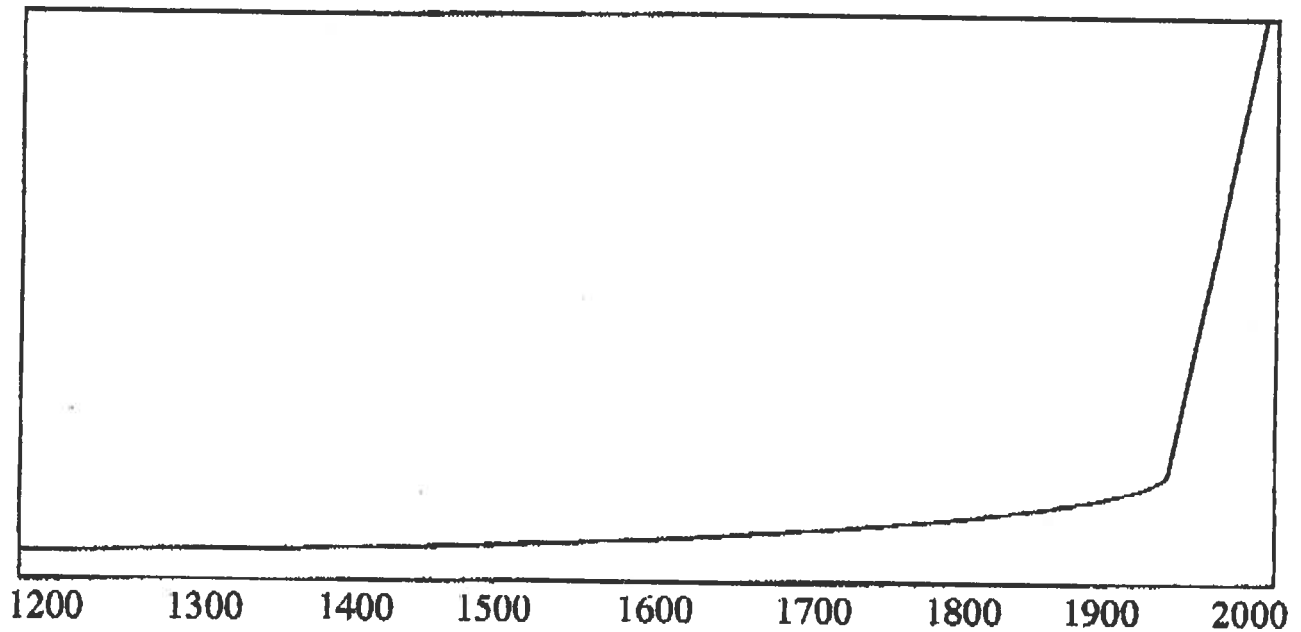
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“ANTHROPOLOGIC BASIS OF THE SEARCH FOR THE HARMONY IN THE STRUCTURE OF THE UNIVERSE”

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INTRODUCTION



The progress of the last century and specially of the second part, is going up almost vertically in this graph. 5000 years of history, history of constructions, constructions of cultures and civilisations, with several high-lights like for instance the melting of metals or the wheel. Since renaissance, human being is submerged by the new discovering and application.

Fletcher's graph is showing the progress line of scientific and technical applications since 1940. Everybody agree with this point of view.

I would like to present a deeper question which doesn't appear in this graph, an anthropological question. After the second world war, agriculture lost about 80% of its workforce. That means that most of the people are not concerned by the earth. In the sixties we have photos showing our earth from the sky like an object. Earth, is not any more the ³mother-earth², but just an object of study for science. Human's eye, can forget its roots, able now to have an ³external² look of the Earth.

What about the scientific mind before this breathtaking rapid scientific expansion ?

My point of view, is that this is not a question of progress, but a problem of reality.

I will try to present an anthropological evolution of the science and the music.

The absolute determinism has been considered for a long time like the main condition of science. The new scientific reality overtakes ideas based exclusively in this sense. **My next question will be the relation between the new scientific mind and the harmonical evolution in music.**

Musical examples and comments

Let's start from the beginning. Here are some facts :

- A man, whose name is Aristarkos of Samos, born in 310 before J.C. is pretending that the Sun and the planets are fixed, and the Earth is turning around the Sun in a circle. He is known to us by Archimede and Plutarkos ridiculising his ideas. We must wait 15 centuries, until Copernicus. He is using this idea, to prove his heliocentrique conception of the universe.

- Jordano Bruno was pretending that the world is infinite in the space and the time. He's been judged and burned in 1600. This idea is completely admitted to day.

- About 500 years ago, marins of Christophorus Colombus they've been revolted themself on the boat in the middle of the atlantic ocean. They were afraid to continue the voyage beleiving that the earth was flat and they were going to fall down suddenly. This idea was true a long time ago, but for some people is still true even nowndays.

- In 1530 Nicola Copernicus is writting to the Pope Paul III : ³I can presume, Very Saint Father, that certain people, when they will read in my ³De revolutionibus orbium caelestium² that I assign certain mouvements to the Earth, they will think that I sould be banished from the scene..² near the end of his life he is writting : ³Is correct to observe the methode of anciens and respect their remarks which have been transmitted to us like a testament. If someone is thinking that they are not entierely correct, the doors of our science are closed for ever.² (Charon 1980)

In spite of his conservatism and a extreme fear of the general opinion, his cosmology is very near of the reality. Planets are turning around the fixed sun in cercle almost in the same level. (Cercle has for him an absolute value.) The order of the planets mooving from the Sun is : Mercury, Venus, Earth, Mars, Jupiter and Saturn.

- Newton himself is writting to his friend Bentley : ³Suppose that a body far away from another can have an influence on it, through the emptiness. This appears to me so absurd, that I can imagine somone thinking philosophicaly, can approve that as a matter of fact.²

- Philolaos, a disciple of Pythagore, was the first to ask if Earth was realy fixed in the middle of the world. In his imagination there

was a central fire and the Earth the Moon, the Sun and the five planets turning around it. The fixed stars were only some small holes in the most external sphere; through them we can see the external fire.

- Is very important to remind here the arabe's contribution on astronomy and also mathematics. ³ Flat and spheric trigonometry aloud to calculate precisly the situation and the orbit of the planets, helps also the navigation. Al Birouni (937-1048) was pretending 500 years before Copernic that the Earth was moving round the axis and the Sun. All those who tried to move the sacred center of the universe, in every age have been considered like isolated case which no body could understand.² (Sigrid Hunke 1963)

First anthropological report : Scientific truth wasn't always received succesfully.

It is not scientifically true or not to assert that the Sun is turning around the Earth or the Earth is turning around the Sun. For a long periode this was only a beleif. What science is asking for is to know the law justifying this mouvement and which fondamental principle this law is deriving from.

Second anthropological report : Classical anthropology (ethnocentric) was interrested only by normal or higher cultures. Modern anthropology is investigating in larger applications.

Third anthropological report : The evolution of scientific thaught is swinging between a knowledge well-founded in an *a-priori* and a fact founded on observation.

To Pythagore observer succeded Plato and his symbole of the cercle basis of his axiomatic. Aristote preached the observation, but he did'nt observed him-self that the distance of the planets was changing, which eliminate the plausibility of the spheres. Ptolemeus tried to bring the world the nearness to the observed sky. A long periode of *a priori* thaught follow (IInd to IXth century)

which is the parallel of the science and the religion. The investigation turns into an inner world. Saint Augustin is writing in the book X of his Confessions :²...I'm not dreaming anymore to study the course of the stars.² He was a great astrologue and astronome till then. He wrote also a treaty on music...

- The monk Cosmas is writing a book which title is :²Against those who wish to teach about christianism, but they beleive like pagans that the sky is a sphere.² His wold is rectangular twice longer than large.

- Saint Augustin¹s world, without any worry to know if nature confirms or not his vew, is like a dream : the firmament is surrounded by water, the Earth is flat, water above the sky and water below the Earth. He is also writing : ³I think that the Sun is turning around the Earth. But I could have an opposite point of vew if I could know some more about the world.² Nice leçon of humility and relativity; his ideas have been true for million personnes and for a longtime. Also the great historian Henri Davenson wrote a traitry of music inspired by the theology of Saint Augustin, not later than 1942

Astronomy is a fondamental science. A student in astronomy must be a scientific on physics and a good mathematicien. Astronomy is not a pur science like mathematics, either un applied science like ingeneiring : optic, electronic or architecture. Even if astronomical knowledge is necessary for the conquest of the space, the deep motivation of an astronome is the curiosity to know more about universe.

This is the commun anthropologic point with music. Music is not a pleasure but a question to the universe.

The great initiater in this line is Pythagore. All we know about him is by his students, he never wrote a line himself, exactly like Socrates or Jesus. He was philosopher, mathematicien, musician and mystic. Partisan of the metempsychosis and of a highest

morality, he was transmitting fabulous secrets to his students after several years of ascetic life. We owe to Pythagoras the multiplication rules, the theorem of the square of hypotenuse, the decimal system. He was slaughtered by the crowd of Crotona, suspecting of overtaking the government of the city. We also owe him the Pythagorean scale in music which is based on the cycle of fifths.

Music, by an anthropological point of view, has two aspects : a) a numerical aspect, connection between numbers and b) a kathartic aspect καθαρισμός in greek which means : purification, an ethical fonction. In this sense greeks were speaking about the modal ethics. Every musical scale, had a special effect on human soul.

Music, is essentially a natural phenomenon like electricity, light, gravitation etc It is based on physical rules. Here the rules are applied to the vibration of a string

A single note of the piano is composed by several ones called "harmonics". The principal note being the "fundamental", then its octave, fifth, tenth, which is the third, one octave higher, twelfth which is the fifth, one octave higher, the seventh, ninth, tenth, etc

C C(oct) G E G Bb D E F# G G# A Bb

The untrained ear is listening only the fundamental. The "harmonics" sounds have an unconscious perception. This is the new scientific analysis of the sound, which can be controlled in a laboratory with a high precision. Pythagoras, with a simple instrument called "monocorde", made a great discovery using everytime a different length of this unic cord. He based his division on the numbers 1/2 for the octave, 3/4 for the fifth etc Why is there any right or wrong in music ? Why what is true for a culture is untrue for another ? Why what is beautiful at a certain periode, is unbearable in another ?

Musical examples and comments

Harmonie : The origine of this noun is greek. αρμονία which means arrangement, assembling (αρμος) In music it means organisation, ordre. The feeling of harmony exists in every people. For the greek *harmony* meant scale; as such it represented ethical and esthetical interpretations. Since the middle-ages, it goes from the melody to the polyphony. J.S. Bach was using harmony without knowing, after the XVIIIth century harmony becomes a science, an institution. Different

treaties concerning harmony are necessary to compose music. At the end of the XIXth century composers use the "musical coloring" added to the treaties of harmony. As an example : after hearing the indonesian *gamelan* during the international exhibition of Paris in 1889, Debussy uses the indonesian scales. With the dodecaphonism, harmony becomes a specific problem of organisation. With Stravinsky it loses its hedonistic meaning. His mass can't be used for choregraphy.

Musical examples and comments

CONCLUSION

From an anthropologic point of view we search for the main conceptions of the Universe in connection with musical systems in different cultures in space and time.

I. The western conception of the Universe as a spherical whole is the main conception of the world till Kepler: the Earth is flat, solid and fixed; the Sun, Moon and five known planets are situated on different spheres, all moving around the Earth. The Universe is finite. The last sphere is occupied by fixed stars. This antique conception went through the Middle Ages till Copernic. Similarly, Music is very centered harmonically; the main system is based on modes: Ionian, Dorian, Phrygian, etc.

II. Kepler misses the elliptic conception when he studies the planet Mars. The center of the Universe is no longer the Earth, but the Sun. In parallel J.-S. Bach, after testing the well-tempered clavecin (on which the distances between all the notes are equal), enjoys the new system. Modes of the Gregorian singing are over, except two: the major (Ionien) and minor (Aeolian) modes. We now have a bipolarity in the musical conception. In the Universe also we find two centers resulting from the elliptic trajectory of the planets.

III. In the intergalactic conception, there is no center in the

Universe. Pascal's hermetic phrase: "God is a sphere whose center is everywhere and whose circumference is nowhere", becomes a scientific reality. Music with Schoenberg and free jazz become atonal.

Three main theories of the Universe: one center with the Earth and 8 spheres for the Sun, Moon and known planets and the fixed stars (Ptolemaus); two centers resulting from the elliptic trajectory of the planets with the Sun as the main center (Galilei); no center in the general theory of relativity (Einstein). Three musical systems completely different one from another, but anthropologically (in their logical pattern) equivalent to the astronomic theories: modal system, tonal system, atonal system.

Geocentric system : modal music
Heliocentric system : tonal music
Intergalactic system : atonal music

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