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By Tai Wen-sai

- COMMUNIST CHINA -

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FOREWORD

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Following is the translation of an article by Tai Wen-sai (2071 2429 6357) in Jen-Min Jih-Pao, Peiping, 21 February 1961, page 7.

There are many questions in natural sciences, such as the origin of man, the origin of life, the origin of the earth, and the origin of heavenly bodies, etc., that are of interest to everyone. The first two questions are the concern of biology, archeo-biology and archeology. The last two are the objects of research by the science of the evolution of heavenly bodies.

Broaching the origin of astral bodies as the subject of scientific research may be said to have started with Kant (1755) and Laplace (1796), who theorized on the origin of the solar system. In the 16th century Cabannes brought up the subject of the motion of the earth, and positively identified the earth as but a planet of the solar system. The invention of the telescope in the 17th century laid the foundation for the development of techniques for astronomical observation and measurement. The discovery of the law of universal attraction and of the method of mathematical analysis laid down the foundation for the development of dynamics. Kant's and Laplace's theory was set up through the utilization of then-available principles of dynamics and based on the observation data of that time. Since the earth is a planet of the solar system, if the problem of the origin of the sun were solved, of course, the questions of the origin of the earth can be solved. Research on the origin of the heavenly bodies (including the earth) and their evolution is called "the science of the evolution of the astral bodies".

The Various Theories on the Origin of the Solar System

There was not much development during the entire 19th century in this field of science. Since the beginning of the 20th century, development has been going on at a faster and faster rate. The main reason for this is the rapid rise in the level of production, which supplied more-and-more powerful observation and measurement tools.

It cannot be denied, the problems of the origin and evolution of astral bodies are difficult and complicated. Since its formation to the present the earth has had several billion years of history (present

estimates are 4.5 billion years). The heavenly bodies are so far away from us and the number of bodies visible so innumerable, and they are increasing all the time. If we are to write the history of the origin and development of the various bodies, it would be undoubtedly a difficult and great task. Research in this direction is also closely linked with certain fundamental questions of philosophy.

In the past few thousand years, in the process of learning about the universe by mankind, there has always existed the struggle between materialism and idealism, and the fierce contest between dislectics and metaphysics. Each and every result of research in the study of astral body evolution has proved the accuracy of dialectic materialism.

The earth is a planet of the solar system, the sun is the central astral body of the same system. The sun is one of the millions of fixed stars. To study the origin of the earth, we must study the origin of the sun. But the study of the origin of the sun cannot be done independently, we must also study the origin and development of fixed stars in general. Only in this way can we adhere to the demands of the dialectic method and examine problems through the relationship between things in general.

In the more than ten theories concerning the origin of the solar system brought forth in this century, a portion has been generally called the "catastrophic theory." The main point of these theories is: the movements of the sun and fixed stars are multi-directional and varied. As a result, sometimes two stars might collide, or they might travel to a position close to each other and then go further away. There was a time when a fixed star came near to the sun and caused an extremely large wave on the surface of the sun, and a column of vapor was pulled out. Later the fixed star went away, but the vapor that was pulled out started orbiting around the sun, and gradually became the individual planets and satellites.

The possibility exists that two stars can get close to one another, or to collide. But based on the density of fixed stars in space (this density is very slight) and conditions of motion, we can calculate that the probability of two fixed stars getting so close as to cause the production of waves is very small. In the last ten-odd years there was a very important discovery in astronomy which made everybody believe this "catastrophic theory" even less. This was the discovery that surrounding about ten of the fixed stars there were some invisible "companion stars." This important discovery explains that the solar system is definitely not the only planetary system in the universe. Besides the earth there definitely are many heavenly bodies where the requirements of living things exist. The catastrophic theory became more and more untenable.

At present most people believe that the planets and satellites of the solar system were formed by boundless matter. Of course this does not mean that we should simply return to the nebular hypothesis of Kant and Laplace. But we should follow a similar path of development. This problem is now in the midst of being discussed by various authorities, and many points of view have been advanced. The principal contents of these discussions might be summarized into the following two points: how did the boundless matter originate; and through what physical process did this

matter pass, to become planets and satellites? Some people feel that the sun came about first, and in its movements in space came across a mass of boundless matter and captured a portion of it. Most of this was solid matter, but there was also some gaseous matter. These bodies of boundless matter at first revolved around the sun and had many different paths. The opportunity for collision was great, and as a result they formed planets and satellites. This is the main theory of Schmidt of Russia and his followers.

Other people think that it is still possible that the boundless matter which formed the planets and satellites was thrown off by the sun, but not according to the formula suggested by the catastrophic theory. They believe that the quality and degree of light intensity of the sun was much greater than those of today, and that the speed of the self-rotation of the sun was also much greater than now. In a certain era the sun threw off a great deal of gaseous substances. This added to the boundless matter (including solid matter) which existed originally in the space around the sun, and gradually formed into planets and satellites.

Still more people believe that the sun, the planets, and the satellites were all formed from the same mass of boundless matter. But these people still differ in their views as to the exact procedure for their formation. Most of them believe that this mass of boundless matter already consisted of gaseous matter and solid matter (dust particles), and was a "gaseous dust cloud". Most of them believe that the sun was the heavenly body that was formed first.

Until the present, there is not one theory that people can believe which explains the special characteristics of the solar system. This is to say that the problem of the origin of the solar system has not been solved. Because of this, some idealists have become bogged down in the mire of agnosticism. The principal proponent of the catastrophic theory for the origin of the solar system, the British scientist, Keens, in his decades of research on the evolution of astral bodies said finally, "The astronomers who do research on the origin of heavenly bodies can never believe their own conclusions concerning their research. The only conclusion that they can make is that there is nothing reliable about the study of astral body evolution."

This point of view is not correct. Understanding is a process. Each era's understanding of the universe is limited by the production level, observation techniques, and the level of scientific theory of that time. Therefore, very often, it is not all encompassing, complete or absolutely accurate. Any era's conclusions concerning a certain problem can be entirely wrong and have to be discarded. But they might also contain a portion which is accurate. This accurate portion is a relative truth and therefore is a portion of the absolute truth. The world is materialistic. All the things in the universe do not depend upon people's objective will for existence, nor develop according to objective rules and regularity.

There is nothing in the world that cannot be understood. There are only things that are not yet understood. Two new weapons have appeared

recently for the research in astral bodies. One is radiation astronomy; the other is astro-navigation. These will greatly speed up our understanding of the structure of the planets, satellites and comets.

Each Fixed Star Has Its Birth, Development, and Decline Stages

In the night sky we see points of light. Except for a very small portion, most of this came from the fixed stars which give off light themselves. Previously people had thought that fixed stars have no motion and never change. This point of view was dominant even to the 19th century. Developments in the study of astral-body evolution have dashed to pieces this metaphysical point of view of nature. Today each astronomical worker cannot but admit in the face of facts that there is not a single fixed star that is unchanging, and that each has its origin, development and demise. The results of research have proved Angus's words, "No matter if it is the sun or nebulae, individual animal life or its kind, or chemical synthesis or analysis, they are all of a temporary nature. Except for the constancy of change, constant changes in matter, and its incident motion -- which is based on regularity and rules of change -- there is nothing that is permanent" (see "Natural Dialectics," page 20).

An important discovery of the last 20 years has been the determination of the source of power of the sun and its fixed stars and the nuclear reaction which is going on within these heavenly bodies. This has allowed the connection between the study of the progress of the universe with study of the progress of confined-view-world physics. Our concept of energy has been built up in the first place through the study of the power capacity of the sun and fixed stars. The source of power of the sun and the vast majority of observable stars is the reaction of the concentration and change of the hydrogen nucleus into the live nucleus of helium. There is a close relation between the speed of reaction of the "hot" nucleus with the physical conditions of the interior of the fixed stars. In general, the bigger the mass, the greater the interior temperature, faster the nuclear reaction, and greater the speed of evolution.

After having done research on the distribution of the various fixed stars in space and on their motion, we have determined that there is a great difference between the ages of various stars. The youngest ones are but a few hundred thousand years old, while the oldest ones are several billion years old. The age of the sun has been estimated at five billion years, and might be considered one of the older stars, although there are very many that are much older than that. Less than one half of the hydrogen inside the sun has been used up, and it might last still another billion years. When the time comes that the hydrogen will be gradually used up, the interior of the sun will shrink, whereas the surface will expand. The degree of light will increase with the increase in volume, but at a certain time both the light intensity and the volume will decrease. At present, the internal temperature of the sun is about 15 million degrees. When all the hydrogen inside the sun changes into helium, the temperature will increase, because of the shrinkage, to 450 million degrees. The helium

nuclei might also change into carbon nuclei. The increase in temperature and pressure might lead to the formation of even heavier elements, and finally it might form iron. Or if the temperature conditions are ideal, elements heavier than iron might be formed. This is the picture that has been painted by the results of the research going on in the past few years. The achievement of such glorious results is really a great blow to the theory of the agnostics.

Concerning Problems of the Expansion of the Universe

Research on the stellar system is even more difficult than on the fixed stars, with respect to observation and theorizing. There are even more problems touching on the philosophical. The sun and most of the presently visible fixed stars belong to the stellar system (galaxy) known as the "Milky Way," which consists roughly of 100 billion such stars. From one end of the Milky Way to the other, the distance is about 10^{18} kilometers. Light or radio waves require 100,000 years to traverse this distance.

Penetrating this group of stars we can see other stars which we call "extra-galactic" nebulae. There are millions of these galaxial systems. Like the fixed stars they also gather into groups; some in groups of three to five stars, others in groups of hundreds or thousands of stars.

About 30 years ago, a special phenomena was discovered: the light pattern of the nebulae showed a tendency to gravitate towards the longer wave-lengthed direction (so called red shift in the nebular spectra). For instance, when the source of light and the instrument were departing from each other at a certain speed, the light pattern (spectrum) will show this kind of change. Besides, the change in the light-pattern is larger as the speed is increased at which the light source and the instrument separate. The farther away the extra-galactic nebula, the greater will the wave-length of the light-pattern be than ordinary wave lengths, and the closer to the red extremity of the spectrum it will become.

The phenomenon of the motion by the extra-galactic systems towards the red extremity has caused many arguments. Since no other explanation could be found for this, scientists in general tend to say that it was produced because the nebulae, in going farther and farther away from the center of our Milky Way, left at a greater and greater speed.

As a result, the scholars of the capitalist countries have propounded such theories as the "expansion of the universe" and other such idealistic views. Their purpose is a trial upsetting of the infinite nature of space and the concept of the infinite nature of the world. In the last few years certain people have gone a step further and combined universal expansion with the evolution of heavenly bodies. Their main points of contention are:

One school of thought holds that the entire mass of matter of the universe was originally concentrated inside a very small volume. At one time a very severe explosion took place and the matter was blown in all directions. In the same directions and at the same speeds they solidified

into fixed stars and stellar systems. Up to the present day the stellar systems are still rushing away. The faster ones having gone much farther. This is where the expansion of the universe reaches what can be called the outer limits. According to this view, the universe is infinite but matter is limited and had a beginning with regards to time. The Belgian Father Lemaitre, who belongs to this clique, believed that at the beginning of the universe it was a "primal atom" (or the atomic ancestor) with a large mass. Due to metamorphic changes of radiation this mass formed the entire universe. Along with this, originally space was also very small, but it also began to start an "expansion of space." They also declared that it seems that this was God's creation, and that the expansion of the will of God. He and other scholars of this school, either publicly or underhandedly, spread religious idealism. They called the explosion of super-dense matter a "creative movement," and called that time the "time of creation." In his talk on 22 November 1951, the Pope at the Vatican praised the principles of the expansion of the universe; and publicly declared that this directly leads to the proof the presence of God.

Another clique although agreeing that the universe is expanding, does not believe that the amount of matter concentrated at first in that small space was the only matter in existence at the beginning of the universe. If it were true that matter was limited to that in the small space, then, when the universe expanded, the density of matter in space should get smaller and smaller. But the results of observation prove that to the boundaries of observation the density of matter in the stellar systems has been constant. This shows that the stellar systems were evenly distributed. Based on this, they expounded a fundamental hypothesis: with regards to space the universe is evenly distributed, the large-sized structures are the same everywhere and do not change with time.

Since the universe is constantly expanding, how can the average density of the space of the stellar systems remain even and unchanged? In order to answer this question, they propounded the theory that matter is being constantly produced from nothingness. They insist that matter was not changed from other forms, and was derived in toto from nothingness. They also say that the matter thus created are the hydrogen atoms.

One of the originators of this theory, the British astronomer Hoyle says: "Matter does not come from anywhere. It appears by itself -- it is created. At certain times the atoms for the production of this matter do not exist, at other times they do exist. Of course this seems like a strange way of thinking. But in science, no matter how strange the thinking, if it results in its effects, it is all right." This is the point of view of positivism and idealism. So that objectivity might exist, matter can only be transformed from one form to another; it is not possible to get something out of nothing; it is impossible to produce matter from non-matter. If new hydrogen atoms or other basic ions are being produced incessantly in the space between stellar systems, then it could have only been produced from one form of matter -- maybe photons, or maybe metons or magnetic waves, or other as yet undiscovered forms of matter.

Whether the density of the inter-galaxial space is the same at various points, and whether it is the same as those in our immediate environment, it is impossible to say definitely, because of the difficulty in observation, magnitude of error, and lack of data. Even based on this undependable truth, we can say that it is erroneous to conclude (as this theory of stable-permanence does) that matter can be created. It is equally erroneous to conclude that the matter first created were hydrogen atoms.

At present many astronomical workers in Russia and other countries believe that all heavenly bodies which can be observed in space (the radius of which is about 4 billion light years) are likely to be part of an enormous collection of astro-bodies, known as the "total astral-system." The universe is infinite. Beside our total astral system there must be limitless numbers of such systems. As to how big our system is, it has not yet been determined. The boundaries could be beyond the range of present day observation equipment, or it might not be much larger. We are now waiting for the science of astro-navigation to do research and solve it for us.

The main error of the theory of universal expansion and stable-permanence is in mistaking the total astral system for the universe. The Red Shift of the nebular spectra could indicate that our system, in its development, is in the process of expansion. In the future it might contract and start "pulsating." Our system's entire mass might once have been concentrated in a small space, and was hyper-dense. It was possibly dispersed through an explosion. This is entirely likely and conforms with the view point of materialism.

The Relationship Between Astral Evolution Studies and Active Participation in Production

Although present day studies in this science have nothing to do with present day participation in production, this research is strictly necessary. As Comrade Ch'en Po-Ta (7115 0130 6671) says, "Certain research in astronomy and mathematics might seem to have nothing to do with present production efforts; but these researches can help other sciences to progress and develop, and broaden the horizon of science. It will be effective in the long run for the development of agricultural industries. The same applies to other branches of science. Some scientific research will be directly related to active participation in production. Other research and theory will have only an indirect effect. Maybe the effects will not be felt today, but they might be felt tomorrow" (See: "Speech at the Study Conference for Researchers of Academia Sinica").

Astral evolution science, like other natural sciences, should aim at changing the objective world. From a cursory glance, the developmental history of the heavenly bodies billions light years away might not have the slightest relation to the actualities of this world. But this science can very well serve earth science and nuclear physics and offer a whole series of solutions to their problems. Research in the progress of the universe has offered many clues to the probing of the structure of

matter and has opened up many new roads.

As already mentioned above, the clue leading to the research in nuclear power was the result of research in the capacity of the fixed stars. Studies in magnetic flux were the results of our quest for solutions to problems of astral evolution and astrophysics. Very rapidly they were utilized by the dynamics industries and other scientific or technological departments.

Research on cosmic rays was the job of physicists, but these rays were the objects of research by astral-evolution scientists. Many problems of the earth scientist as yet unsolved may be summed up as the problem of the origin of the earth. The structure of the earth, the appearance of the surface of the planets, the chemical composition of the interior of the earth, the principle and origin of gravity, the origin of volcanos, and the source of air and water are all related to the origin and early evolutionary conditions of the earth. When these questions are settled, geological survey, earthquake prediction, volcanic eruption prediction, electronic communications and the conservation of water and soil will all be greatly helped.

Because so many basic philosophical problems are related to this science, these workers in astral evolution should be led by Marxist-Leninist philosophy and should use their own conclusions to prove and uphold the natural viewpoint of materialism; they should criticize idealism and metaphysics in their explanations of the various theories of astral evolution.