IS ASTROLOGY NECESSARILY A PSEUDOSCIENCE?

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ABSTRACT

In my thesis I investigate the criteria of demarcation in philosophy of science and analyse the case of Western astrology. I argue that although astrology has exhibited several pseudoscientific features in the past, in the future it can be changed to a progressive scientific research programme according to Lakatos' and Thagard's criteria of demarcation. However, I show that scientific astrology may be quite different from traditional astrology.

I argue that in order to make astrology scientific, Gauquelin's statistical experiments should be continued, since statistics may reveal correlations between planetary positions in natal horoscopes and occurrences in human lives. Gauquelin prepared statistics only concerning professions and common planetary positions between children's and their parents' horoscope but I point out that further, more sophisticated statistics should also be made. And if significant correlations were found, it should be explored how natal horoscopes and life events hang together, namely what kind of causal process exists between them. On the grounds of these investigations, astrology would raise and answer new questions and would introduce new theorems while rejecting old ones; therefore it would become a progressive scientific theory.

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INTRODUCTION

In my thesis I investigate the issue of demarcation in philosophy of science and present the case of Western astrology since it provides an excellent example to my research both with its history and its theoretical assumptions. I explore what the main differences between sciences and pseudosciences are and how they can be disclosed. I choose astrology for my investigation because probably it is the most sophisticated and most complicated system among all pseudosciences. Additionally, I narrow the subject of my research to Western astrology, since although there are some other cultures where astrology was also developed, but those astrological systems are related to the philosophy and world-picture of those cultures and not to European or Western philosophy.

I show that in the case of Western astrology it quite difficult to determine whether it is a science or a pseudoscience, therefore it raises several issues regarding the criteria of demarcation provided by Popper, Lakatos and Thagard. Nevertheless, I do not concern the criteria of demarcation defined on the basis of sociology of science since it exceeds the scope of my thesis. My main question is in what sense and to what extent is astrology a pseudoscience; and I argue that although traditional astrology has several pseudoscientific features, it is not impossible to make astrology scientific. I present Seymour's and Gauquelin's theories that were raised in the last decades and were attempts to change it to a scientific system. My aim is to demonstrate how these theories should be developed and what kind of further research should be prepared in order to make astrology completely scientific.

First of all, further and more sophisticated statistics should be made which can reveal more correlations than those which Gauquelin found. If statistics show recurrent results, it should be investigated how natal horoscopes and occurrences in human lives hang together. Two explanations are possible: either the planetary positions are the causes of life events; or they have a common cause. The original Stoic theory assumed the latter, while Gauquelin and Seymour thought that there is a physical causal relationship between them. This explanation meets the requirements of a scientific explanation, whereas the Stoic idea was not scientific but philosophical.

In the first chapter I present the scientific and philosophical origins of Western astrology and show that astrology is neither a pure science nor a pure pseudoscience. I analyse Ptolemy's *Tetrabiblos* and some other texts written in antiquity that demonstrate the position of astrology and exhibit the arguments for and against it. I present the Stoic views on pantheism, cosmic sympathy and causal determinism because they were crucial in the

development of the astrological system and analyse some debates between Stoics and those who rejected astrology (Epicureans, Peripatetics and Neoplatonists). In addition, I demonstrate a group of cases from the later history of Western astrology with which I point out that one of the most significant pseudoscientific features of astrology is that planetary positions can be interpreted several ways; and I show that several political attacks were raised towards astrology but it has never been proved on a proper scientific basis that astrological predictions are impossible. Hence astrology never ceased to be despite of all prohibitions.

In the second chapter I present Popper's, Lakatos' and Thagard's criteria of demarcation. I argue that Lakatos' and Thagard's criteria are more appropriate than Popper's and their theory entail that traditional astrology can be changed to a scientific research programme. In this part I point out that there are some unsolved problems which concern sciences and pseudosciences equally: I demonstrate Popper's theories on improvability and zero probability which state that all theories –independently of being scientific or pseudoscientific– are equally improvable and the probability of any of them being true is zero. I also investigate the consequences of Hempel's deductive-nomological account which –opposite to the aforementioned ideas– clearly claims that scientific and pseudoscientific explanations are distinguishable; however, it does not provide a solution to how accidental generalisations and real laws can be discerned. I think these theories afford a further argument to prove that the demarcation criterion between sciences and pseudosciences is the progressiveness and not Popper's criterion of falsification.

In the third chapter I present two theories developed in the last decades about how astrology can be made scientific. I demonstrate Seymour's theory on physical causal processes between planetary motions and human lives and Gauquelin's statistical results which were an attempt to find correlations between planetary positions in natal horoscopes and human lives. I argue that Seymour's theory is rough in its present form and is only a hypothesis; however, Gauquelin's idea seems quite plausible and a further investigation of his research would be the way to change astrology to a scientific research programme. I point out that researches made by statistical method entail that scientific astrology –which is completely based on empirical observations– may be significantly different from traditional astrology, since it is not warranted that the same correlations will be found as traditional astrology holds but new correlations may be discovered and many old theorems may be rejected. However, if statistical correlations were discovered between planetary positions and life events, additional investigations would need to be prepared in order to reveal the causal processes between them. If it turned out that either planetary motions at the time of birth can cause certain life

events, or there is a common cause because of which they are perpetually connected; it would mean that human lives are determined at least to some extent. In that case, astrology and genetics may investigate similar issues since both of them would deal with congenital human characteristics and capabilities. Moreover, this would also entail that astrological claims can fit the system of natural sciences; and since astrology –alike genetics– would explore the laws of the natural world, it would become a natural science.

In my thesis I do not detail what natural scientific investigations should be done to reveal the causal processes between planetary motions and human lives because I am not an expert of natural sciences. However, I think Gauquelin and Seymour were on the right track when they declared that solar activity and the magnetic field of the planets might have causal connections to the nervous system of humans. But I do not know what scientific research should be made in the case if the initiator of the causal chain is not the planetary motions close to the Earth but a common cause which exist outside the Solar System. Nevertheless, if statistics show significant correlations, then the further questions should be raised by those scientists who investigate the cosmic effects on the Earth and humans.

Seymour and Gauquelin were not philosophers of science but they just investigated astrology. Seymour is an astrophysicist who thinks that astrology works because planets have obvious effects on the Earth and living beings; while Gauquelin was a statistician and psychologist who assumed on the basis of his statistical results that there is a correlation between planetary positions at the time of birth and walk of lives. My contribution is that I connect their initiations to the philosophy of science and show that according to their theories, astrology can be changed to a scientific research programme which meets the requirements set up by certain philosophers of science. So my answer to the title of my thesis is explicitly “no”: astrology is not necessarily a pseudoscience.

1. THE ORIGINS AND HISTORY OF WESTERN ASTROLOGY

In order to make clear the scientific and non-scientific aspects of Western Astrology, first we need to take a look into the historical origins of the astrological system. For astrology is neither a pure science nor a pure pseudoscience but somewhere in between: it is a mixture of (1) empirical generalisations based on observations and (2) philosophical assumptions. Although astrology has showed several pseudoscientific elements during its history, it has never been refuted on the grounds of proper scientific reasons, therefore its practice has never ceased and the possibility still exist that it can be changed to a scientific theory.

1.1. Astrology: Science or Pseudoscience?

In general, the origin of the debates concerning astrology is that it applies both the inductive and the deductive scientific research method. Preparing generalisations on the basis of astronomical forecasts is the scientific part of astrology, while philosophical assumptions and metaphysical commitments constitute its non-scientific part.

A special feature of astrology is that we cannot find any exact date when it was officially declared to be a pseudoscience. Already in antiquity some philosophical schools (Peripatetics, Epicureans, Neoplatonists) rejected it, while Stoics were the defender of it and made a huge contribution to the establishment and development of the astrological system. Among those who rejected astrology, there was no general agreement why it should be rejected.

In antiquity, there was no distinction between astronomy and astrology for a long time, moreover, many scientists dealt with astrology. One of the first authors who distinguished the words *astronomia* and *astrologia* was Isidore of Seville in the 7th century A.D. Before that time, usually *astrologia* was used in the sources, the expression "astronomia" appeared very rarely.[1] I think we can conclude from these facts that astrology was originally not established with the intention of developing a pseudoscience, however, later it became pseudoscientific (in a more strict sense) because there was no significant development in it, as Paul Thagard also points out.[2] A further pseudoscientific feature which became obvious only in later centuries is that there was no general agreement between astrologers how to interpret certain

[1] Tester 1990, p. 19.
[2] Thagard 1998, p. 32.

planetary positions and which system of astrological houses should be used. For example, several systems of houses were invented but none of them became generally accepted.[3]

Although on the one hand, numerous pseudoscientific features can be found in astrology, on the other hand, several scientific traits can be disclosed in it. The motion of Sun and Moon have obvious effects on the Earthly occurrences like the growth of vegetables or the biorhythm of animals and humans, hence it seems not impossible that other planets or stars also have influence on the living beings on Earth. The original Stoic theory of astrology involved that forecasts can be prepared only on empirical basis, namely empirical observations and generalisations should be done in order to discover the signs of the future. On the basis of these views, astrology had been developed as a science but later it became distort since there was no significant development in it.

In the presented texts later in this chapter we can find both good and bad arguments against astrology. The best argument is raised by Geminus of Rhodes who claims that from the obvious effects of Sun and Moon on Earth it does not inevitably follow that other planets or stars also have any effects on the Earthly life. This is the most serious scientific argument against astrology (I deal with this issue in details in the third chapter).

It is also a valid argument posed by Cicero that it is difficult to prepare exact observations and exact generalisations about planetary positions and human lives. However, this does not reflect a scientific behaviour: even if it is difficult to prepare exact observations, the aim is to prepare the most exact observations as possible and improve them again and again.

From the viewpoint of contemporary philosophy of science, it can be posed that astrology is not scientific because it is based on philosophical assumptions which are not accepted by the most of the scientists and philosophers. The original Stoic theory included that without the benevolence of God, human beings would not be able to predict the future. Moreover, if we lived in a non-deterministic universe, astrological forecasts could not work. (However, even in that case, astrology could have right in describing human characters, but this would entail that astrology is restricted to a certain scope.) The response of the defenders may be that astrology can work without any philosophical assumptions in the case if statistical correlations can be found between horoscopes and life events, as it was originally assumed by Ptolemy. Nevertheless, it is an open question whether such correlations can be found and whether they can be proved.

[3] Tester 1990, p. 239.

It should be added that many among those who attacked astrology, attacked it on the grounds of philosophical reasons (like Plotinus or the Epicureans or later the popes), namely they raised non-scientific arguments which are not relevant to the issue if astrology is scientific or not. And even if it is possible that the future cannot be predicted –as Epicureans, Peripatetics or some Christians state– it is not proved that this is the case. It is not a scientific behaviour if someone rejects astrological predictions without making any research about them. Furthermore, natural sciences make many successful predictions about the future, which is a serious argument for future being predictable and determined (even if it is not completely but partially determined).

1.2. Scientific Observations from the Beginnings to Ptolemy

The very beginnings of astrology can be found in Mesopotamia where a kind of proto-astrology was established around at 1800 B.C. However, the origins of a sophisticated and more complicated astrological system can be found in the ancient Greek culture.

Astrology was taken over by the Greeks in the 4th century B.C. and later, at the time of the blossoming of Hellenism, it has been widely dispersed in Egypt and in the Roman Empire. And finally, it became really popular around in the 2nd century A.D., in close connection with the spread of Stoic philosophy.[4] In Mesopotamia, astrological forecasts were originally prepared only for states and the members of the royal dynasties, whereas in the Hellenistic era, astrology became so generally accepted that personal horoscopes and forecasts were prepared for all kinds of citizens. This is shown quite conspicuously by the fact that many horoscopes remained extant from the first four centuries A.D., especially from the 1st and 2nd centuries.[5]

The most significant astrological treatise which was written in antiquity is Ptolemy's *Tetrabiblos* from the 2nd century. Ptolemy probably lived in Alexandria and was a mathematician, astronomer and astrologer at the same time.[6] In antiquity, astrology was practiced by educated scientists, and actually, at that time there was no distinction between astronomy and astrology. Ptolemy regularly made observations about the motion of planets and stars and his aforementioned work is a collection of astrological claims (i.e. claims about

[4] Tester 1990, pp. 12-13.
[5] *Ibid*., p. 46.
[6] *Ibid*., p. 57.

what certain occurrences in Earth are signified by certain planetary positions or an appearance of a star). He declares that astrology is capable of being investigated in a proper philosophical way and is based on the regular occurrences of the planets and the events observed by those who live close to nature.[7] So, according to him, astrology is based on empirical experiments and on the inductive research method of sciences.

Ptolemy, unlike Stoics, does not think that people are subject to the inevitable control of fate, but states that astrology is beneficial in the sense that it helps to be prepared for what is likely in the future.[8] He writes in clear and calm scientific style and explains the functioning of astrology with the physical effects of the stars and planets on Earth:

> The Sun, always acting in connection with the Ambient, contributes to the regulation of all earthly things: not only by the revolution of the seasons does he bring to perfection the embryo of animals, the buds of plants, the spring of waters, and the alteration of bodies, but by his daily progress also he operates other changes in light, heat, moisture, dryness and cold; dependent upon his situation with regard to the zenith.
>
> The Moon, being of all the heavenly bodies the nearest to the Earth, also dispenses much influence; and things animate and inanimate sympathize and vary with her. By the changes of her illumination, rivers swell and are reduced; the tides of the sea are ruled by her risings and settings; and plants and animals are expanded or collapsed, if not entirely at least partially, as she waxes or wanes.
>
> The stars likewise (as well the fixed stars as the planets), in performing their revolutions, produce many impressions on the Ambient. They cause heats, winds, and storms, to the influence of which earthly things are conformably subjected.[9]

Ptolemy's *Tetrabiblos* was considered scientific in antiquity and in the middle ages as well, since it was based on the observation of planetary motions and the idea that stars and planets physically influence the occurrences in Earth –the weather and the mental dispositions of humans as well. Also from contemporary point of view, this idea may be scientific since it does not assume any metaphysical theory. However, when Ptolemy enumerates the meanings and influences associated with certain stars, he does not explain their origins but only transmits the information. For example:

[7] Ptolemy, *Tetrabiblos* I.2.
[8] *Ibid*., I.3.15-16 and Burnett 2002, p. 200.
[9] *Ibid*., I.2.2-9.

> The stars in the horns of Capricorn have efficacy similar to that of Venus, and partly to that of Mars. The stars in the mouth are like Saturn, and partly like Venus: those in the feet and in the belly act in the same manner as Mars and Mercury: those in the tail are like Saturn and Jupiter.[10]

It is a general problem regarding not only ancient astrology but the whole astrology itself, that it is not explained in the texts how and why certain meanings were associated with certain zodiacal signs or planets. So the causal origins of astrological explanations are quite ambiguous. In our extant sources we can only read about the interpretation of certain constellations, but they do not mention how they were explored or invented. For example, Imbrasios of Ephesos (around at the turn of the 1st century B.C. and 1st century A.D.) presents the following prediction about the sick:

> If someone gets ill when the Moon is in Water-Pourer, and is waning in numbers and lights, and Ares is with her in opposition or quartile, the disease will be from a pre-existing cause, swollen groin, the shin, or trouble in the privates. Fever will be especially sharp, and there will be thirsts and desire for cold and frequent vomitings. […] If she [the Moon] is rolling along toward waxing and is in quartile [with which planet?] and the disease is not at all lessening, the patient will die around opposition.[11]

The vagueness of astrological writings is also clearly represented by some works of Vettius Valens who was a famous astrologer in the 2nd century. For example, he demonstrates a horoscope of a baby who died 13 days and 13 hours after his birth. Valens enumerates the planetary positions of the baby's horoscope and after that, by the virtue of a mysterious and ambiguous mathematical calculation declares that the planetary positions clearly showed that the infant would live exactly 13 days and 13 hours.[12]

Nonetheless, even at the time when astrology was highly popular and widespread, there were some authors who argued against it. In the 1st century A.D., the astronomer and mathematician Geminus of Rhodes wrote as followings:

> The theory concerning weather-signs amongst laymen proffers the absurd opinion that alterations in the weather come about from the risings and settings of the stars. Mathematics and physics holds another opinion. First, one must grasp that warning signs of rain-storms and winds occur around the Earth, and do not reach very high. […] They cannot reach the sphere of fixed stars, and even the clouds don't quite reach 10 stades high. […] Whether stars are fiery or aitherial, as some

[10] *Ibid*., I.9.25-26.
[11] Irby-Massie – Keyser 2002, pp. 92-93.
[12] *Ibid*., p. 112.

> suppose, they all share the same substance and power and have no sympathy with events on Earth.[13]

This text shows that even in antiquity, there was a debate about whether astrology is scientific or not. However, it is notable that Geminus in the first part of the above citation argues against the scientific approach of astrology which was held by Ptolemy as well. So he regards astrology as a theory which is in fact, scientific, but different from his scientific view and is mistaken. He mentions only at the end that sympathy is assumed between the stars and the Earthly occurrences, which is a philosophical hypothesis, therefore is incapable of being proved by empirical observations.

Cicero also attacks astrology in his *De Divinatione*. He states that astrology is quite useless because diviners and astrologers cannot instruct us in astronomy and no one consults them concerning philosophical problems or ethical questions, and they cannot give us any light on the problems of the natural universe or logic or dialectic or political science.[14] In addition, he rejects any belief in bonds of sympathy between things and holds that as far as our empirical observations can inform us, there is no causal connection between occurrences which are connected by sympathy. Cicero argues against the scientific aspect of astrology as well: from the effect of Moon on tides astrologers inferred that stars also have an effect to Earthly life, but this inference is unwarranted. Moreover, astrologers usually predict only great events like wars but cannot predict small ones. And he raises a scientific point: it is impossible to measure the motion of stars with exactness; therefore astrological forecasts cannot be exact even if astrology could work somehow.[15]

Geminus' and Cicero's criticism show that not only the philosophical but the scientific part of astrology was also attacked by some authors. In many cases of the astrological debates, philosophical and scientific arguments are mixed, but from the viewpoint of philosophy of science, only the scientific arguments can be regarded as valid.

[13] *Ibid*., p. 97.
[14] Cicero, *De Divinatione* II.3-4.
[15] Thorndike 1923, pp. 271-275.

1.3. The Influence of Stoic Philosophy

It is a widely accepted view that Stoic philosophy was an extremely important condition in the development of the (more or less[16]) complete system of Western astrology. Formerly, in Mesopotamia and Babylonia only the very origins of astrology have been established, but no complete astrological system was developed.[17] Stoicism contained such metaphysical theories which actually entailed the acceptance and development of divination and astrology, therefore Western astrology is inseparable of Stoic philosophy.[18]

The influence of Stoicism provided the pseudoscientific features of astrology, since Stoics declared on philosophical grounds that all parts of the universe is connected to each other and the microcosm is the reflection of the macrocosm. They assumed that there are correlations between human lives and the motion of planets because the whole universe is based on the same laws; and future is predictable because it is determined and God gives us signs about it. So the idea that future is predictable was originally not supported properly on scientific grounds, but it was a philosophical assumption.

Nevertheless, we should take into consideration that almost all the original Stoic texts are lost (we know only very few exceptions and they are primarily about ethics), hence the most part of Stoic philosophy is known on the grounds of secondary sources which are very often hostile towards Stoicism and/or state not clearly the Stoic views. Because of this reason, in many cases it is difficult to make clear what the Stoics exactly thought.

Notions Connected to Divination

Stoicism maintains three notions which can be connected to the development of astrology: the benevolent God which arrays the universe; the notion of cosmic sympathy; and the conception

[16] By "more or less complete" I mean that at the Stoic era, a full system of astrology was established which contained zodiacal signs, planets, houses and planetary aspects; however, in the later history of astrology, this system was enlarged with new planetary aspects and newly discovered planets.

[17] The collection of the most significant Babylonian astrological texts is the so-called "omen-literature". Omens concern only the fate of the country and the royal dynasty and are fully descriptive, e.g. "When the Moon occults Jupiter, that year a king will die. […] When Jupiter enters the midst of the Moon there will be want in Aharru. The king of Elam will be slain with sword: in Subarti […?] will revolt. […] When Jupiter goes out from behind the Moon, there will be hostility in the land." See in: Tester 1990, p. 13.

[18] Nevertheless, it is an interesting question why astrology was developed also in other cultures where Stoicism did not appear. The reason for this seems that in all cultures, astrology was originally closely connected to a religious or a philosophical system that maintained the view of universal harmony and the intelligent arrangement of the universe.

of fate which follows from causal determinism. These concepts altogether entail that future is predictable, therefore they do not support only astrology but all kinds of divination as well.

Stoics maintain that the world consists of two principles: one is the matter which is the passive, and the other is God which is the active principle. However, God and matter cannot be separated: God is immanent in the world in every place at every time. They argue that anything that can act or can be acted upon cannot be incorporeal; therefore God also must be material, since he is the acting agent while matter is completely passive. So their theory states that after all, God generates all motions and changes in the world while forming matter.

They conceive God as the benevolent and intelligent governor of the universe: God has a providential ruling force and arrays the universe in the best possible way. Namely, he ensures that only such occurrences can take place in the world which are always the best among all possibilities. All the occurrences are teleological because all of them support the best process of the universe. Therefore nothing happens by chance.[19]

Cicero reports the following Stoic argument for the existence of God:

> If you see a large and beautiful house, you could not be induced to think that it was built by mice and weasels, even if you do not see the master of the house. If, then you were to think that the great ornament of the cosmos […] were your own house and not that of the immortal gods, would you not seem to be downright crazy?[20]

In our sources we can read that Stoics hold the notion of the immanent God and cosmic sympathy, however, not so many arguments are extant regarding them, especially regarding cosmic sympathy (whereas we can find more Stoic arguments for causal determinism and fate). And it is worthy of note that in antiquity, philosophy and theology was not divided and this is the reason for that Stoic philosophy –from modern point of view– is a mixture of philosophical and theological assumptions.

Stoics mean by "cosmic sympathy" (or *cosmic sympatheia*[21]) that all parts of the universe are connected with each other and there is a continual interaction among all parts.[22] Cosmic sympathy is the result of the activity of God, since God governs the universe and all events and occurrences are originated by him. Because the whole universe is governed by God, all causal chains are interconnected by means of him and there are parallel occurrences between

[19] Sellars 2006, pp. 86-95.
[20] Cicero, *De Natura Deorum* II.17, translation: Inwood-Gerson 2008, p. 61.
[21] The original Greek word *sympatheia* may be translated as "co-suffering", "co-happening" or "being acted upon together".
[22] Sellars 2006, p. 103.

those causal chains. Therefore, from one certain occurrence we can infer to an other occurrence that is a part of a different, distant causal chain. Furthermore, Stoics think that all causal chains are determined by the providence of God, hence the future is determined too. From the determined future and the existence of cosmic sympathy it follows that future is predictable, which is to say that divination is possible. Because of the parallelisms of cosmic sympathy, certain things or occurrences in nature can be the signs of certain other occurrences in the future.[23] Cicero transmits the following Stoic argument for defending divination:

> But perhaps not all predictions are fulfilled. Well, just because not all sick people recover, it does not follow that there is no craft of medicine. Signs of future events are shown by the gods; if some people make mistakes in (interpreting) them, it is not the nature of the gods that erred but human inference.[24]

The Stoic theory holds that only corporeal entities can participate in causal chains, therefore the objects by means of which forecasts and divinations are prepared, can only show or sign the future but cannot affect it. This means that in the case of astrological forecasts, planetary positions are not part of the causal chains on Earth but they just sign the future. Stoics consider divination as an empirical science, since it is based on the observation of nature (e.g. observing the stars or the motion of birds).[25]

According to Stoicism, all causal chains are determined and nothing can exist or be generated without any antecedent cause. Nothing happens by chance but every determined cause leads to a certain determined result.[26] Some authors state that Stoics identify causal determinism with fate, e.g. Aetius states that they define fate as "a string of causes, i.e. an ordering and connection which is inescapable".[27] Or according to Gellius, Chrysippus – probably the most significant Stoic philosopher– claims that fate is "a sempiternal and unchangeable series and chain of things, rolling and unraveling itself through eternal sequences of cause and effect, of which it is composed and compounded."[28] However, the notion of fate includes not only physical causal determinism but also involves the conception of divine providence and a teleological universe. Since God is the active principle, he generates all motions, therefore he is the governor of all causal chains. As mentioned before,

[23] Cicero, *De Fato* VI.11.
[24] Cicero, *De Natura Deorum* II.12, translation: Inwood-Gerson 2008, p. 60.
[25] Bobzien 2001, pp. 165-167.
[26] Pseudo-Plutarch, *De Fato* 574d (SVF II.912).
[27] Aetius, *Vetusta Placita* I.28.4 (SVF II.917), translation: Inwood-Gerson 2008, p. 102.
[28] Gellius, *Noctes Atticae* VII.2.1-3 (SVF II.1000), translation: Inwood-Gerson 2008, p. 109.

Stoics think that God is immanent in the world, therefore the sum all causal chains is in fact God, as it was declared by some philosophers.[29] And some more definitions of fate are transmitted as below:

> Zeno of Citium called fate a power capable of moving matter and gave to the same (force) the names 'providence' and 'nature'. His successors said that fate was a rational principle for the things administered by providence within the cosmos, and again in other treatises they called fate a string of causes. [30]

So our Stoic sources show that the conception of fate involves the theory of causal determinism as well as pantheism and the notion of the teleological universe. According to the latter, fate includes the view that everyone has a special role in the rationally ordered universe and if someone follows her fate, she contributes to the perfection of the cosmos. Or in other words: our fate, whatever it is, is always the best among all possibilities.

The Possibility of Divination

In the Hellenistic period, Epicureans as well as Neoplatonists and Peripatetics criticised Stoics, especially their views about fate and causal determinism and the possibility of forecasting the future. Their primary criticism was that if future is determined, then any decision made by a free human agency is not possible. However, this consequence seemed absurd for them and argued that there are such decisions which depend on us (i.e. which are *eph' hemin*) and rejected causal determinism and the possibility of divination as well.

According to Susanne Bobzien, the prototypes of empirical sciences were medicine and divination in the Hellenistic era. For both aim to establish correlations between types of signs and types of occurrents in the future, namely both are prognostic in this sense. The correlations are figured out by the virtue of empirical observations, conjectures and induction. In the case of divination, universal correlations are established according to scientific methods. However, it is a significant difference between divinatory theorems and other kind of scientific theorems that the former ones connect signs with future facts, while the latter connect causes with effects.[31] The attackers of Stoicism did not accept that connecting signs

[29] Sellars 2006, pp. 100-101.
[30] Theodoretus, *Graecarum Affectionum Cura* VI.14 (SVF II.916), translation: Inwood-Gerson 2008, p. 101.
[31] Bobzien 2001, p. 64 and pp. 166-167.

with facts can be scientific and this is unacceptable also from the viewpoint of contemporary sciences.

One important point concerning divination is that from the view of deterministic universe does not inevitably follow that the future can be known by human beings. Stoics think that future can be disclosed only because God is benevolent and gives signs to humans (because he cares for them):[32] so the notion of deterministic universe and divine benevolence are both necessary conditions of divination.[33] However, Stoics do not hold that God gives signs for *all* things that happen in the world, but only few of them. Furthermore, our extant sources do not mention that divinations foretell human behaviour but they predict only such occurrences which take place in the future quite irrespectively of human acts.[34] If we regard divination in this sense, it does not exclude human decisions and moral responsibility.[35]

Epicureans do not accept the possibility of predicting the future. The Epicurean Diogenianus declares that Chrysippus' argumentation about divination is mistaken since it is circular:

> He says, if it were not the case that everything is encompassed by fate, it would not be the case that the predictions of the seers are true. This, too, is full of folly. […] In this way Chrysippus gives the proof, establishing each of them through the other: For he wants to prove that "everything happens in accordance with fate" from "divination exists", and he cannot prove that "divination exists" in any other way than by presupposing that "everything occurs in accordance with fate".[36]

The Peripatetic Alexander of Aphrodisias also raises this criticism in his work.[37] However, R. J. Hankinson defends Stoics by saying that this argument confuses explanation with support: the (supposedly) empirical facts of successful divinations support the hypothesis of determinism; and conversely, the deterministic hypothesis explains divination.[38]

On the one hand, in Stoic philosophy, the acceptance of divination bears a close relation to the view that propositions concerning future have truth values. A proposition uttered in the

[32] Cicero, *De Divinatione* I.101-102.
[33] Algra – Barnes – Mansfeld – Schofield 2001, p. 535.
[34] Bobzien 2001, p. 175.
[35] However, according to Cicero's *De Divinatione* II.90, the Stoic Diogenes of Seleucia thought the opposite of this: astrology is limited to the prediction of individual dispositions and is not able to predict future facts. And in II.88 Cicero remarks that Panaetius was the only one Stoic who rejected astrological predictions and doubted the capacity of divination.
[36] Eusebius, *Praeparatio Evangelica* IV.3.1-2 (SVF II.939), translation: Bobzien 2001, p. 89.
[37] Alexander of Aphrodisias, *De Fato* 201.32-202.2.
[38] Algra – Barnes – Mansfeld – Schofield 2001, p. 535.

present about the future is either true or false and a correct divination is a true proposition about the future. Epicureans do not accept determinism and reject that propositions about the future have truth values.[39] On the other hand, the Stoic theory regarding truth values is connected to causal determinism: only such occurrences are predictable which have antecedent causes. If there were any occurrences happening by chance, they would not be predictable.[40] Opposite to this, Epicureans maintain that the universe is not ordered by any divine intelligence but everything happens randomly in it, therefore the future is not determined at all. Cicero transmits a debate of Chrysippus and Epicurus concerning the logical structure of divinatory propositions. His example regarding the Stoic theory is the following:[41]

1) Let us suppose that this statement is true: "if someone was born at the rising of the Dog Star,[42] he will not die at sea".
2) In that case, this statement is also true: "if Fabius was born at the rising of the Dog Star, he will not die at sea".
3) Therefore the following two statements are contradictory: "Fabius was born at the rising of the Dog Star" and "Fabius will die at sea".
4) Let us suppose that Fabius was born at the rising of the Dog Star. In that case, it is contradictory that "Fabius exists" and "Fabius will die at sea".
5) Conclusion: the fulfillment of proposition "Fabius will die at sea" is not possible [if our presupposition at 1) was correct].

This example intends to show that if we formulate a divinatory statement in the above way, it expresses necessity, for we are led to the conclusion that "it is not possible that Fabius will die at sea". Cicero reports that Chrysippus does not want to accept this kind of necessity because he wants to defend the notion of free human agency and moral responsibility. Therefore he answers that we should reformulate our statement to this form: "it is not true that Fabius was born at the rising of the Dog Star and he will die at sea." In this case, we are not led to a fatalistic conclusion.[43] Hankinson draws up Cicero's example as below:

[39] Cicero, *De Fato* X.21.
[40] Bobzien 2001, p. 92.
[41] Cicero, *De Fato* VI.12 – VII.14.
[42] Dog Star i.e. Sirius or Alpha Canis Majoris.
[43] Cicero, *De Fato* VIII.15.

(1) Whoever is born at the rising of the Dog Star, will not die at sea.

(2) If Fabius was born at the rising of the Dog Star, he will not die at sea.

He points out that although this looks like a sound conditional, the Stoics' own account of soundness is that "there must be a connection of relevance (it is tempting to say causal relevance) between antecedent and consequent."[44] But (2) does not satisfy this condition, since "Fabius was born at the rising of the Dog Star" does not seem to be the cause of avoiding his death at sea. According to Chrysippus' reformulation we have a negated conjunction which does not entail a commitment to any necessary relationship between the two component propositions, so he provides a kind of solution with his argument. However, Cicero misses this point when he states that it is absurd that Chrysippus expects doctors and geometricians to reformulate their assertions in this way (since their statements are not based on divinatory signs but on physical causal relations).[45]

Neoplatonists also attack divination but on different grounds than Epicureans. They do not base their argumentation on logic but on Platonic doctrines. Plotinus, following Plato, maintains that stars are happy, divine and eternal beings. He not only thinks that they have a soul but also that their intellectual capacities are far above human mind and closer to the omniscience of the world-soul.[46] He claims that it is highly evident that the motion of stars affects not only corporeal objects on the Earth but the dispositions of the soul as well.[47] However, crimes are not committed because of a cosmic predestination but because of the decisions made by human agents.[48] Furthermore, he rejects the view of astrology that planets can be friendly or hostile to each other according to their aspects.[49]

Lynn Thorndike interprets Plotinus as he holds that "all things are full of signs", and it is possible for a sage to make predictions on the basis of them. He does not reject the Stoic view that there is a cosmic sympathy in the world, and agrees with Stoicism that human beings are responsible for all of their acts, even if the motion of stars or birds can predict the future. However, Plotinus thinks that stars and planets are not changeable beings, therefore they cannot have different attributes in different zodiacal signs, so regarding this point he does not accept astrology.[50] So I think, on the whole, Plotinus can be translated as although he accepts

[44] Algra – Barnes – Mansfeld – Schofield 2001, p. 536.
[45] *Ibid*., pp. 536-537.
[46] Plotinus, *Enneades* IV.4.6-8.
[47] *Ibid*., IV.4.31.
[48] *Ibid*., II.3.6.
[49] *Ibid*., II.2.4.
[50] Thorndike 1923, p. 305.

that there are some signs in the world by means of which divination is possible, astrology is still not acceptable since it attributes several changeable features to the unchangeable stars in different zodiacal signs. After all, Plotinus rejects astrology on the grounds of this reason. Nevertheless, it is obvious that he does not provide scientific but only philosophical arguments and denies astrology on the grounds of his Platonist philosophical convictions.

1.4. Cases from the Later History of Astrology

In this section I present and analyse some cases from the later history of astrology. In the first part, I demonstrate a story which shows that it has always been a special issue that a certain planetary constellation can be interpreted several ways and there has not been any general agreement about the exact interpretation of the planetary positions. In the second part, I present and analyse the political and ecclesiastical attacks towards astrology. These attacks exhibit that astrology was rejected several times on the grounds of political or theological reasons; and because astrology has never been fully refuted according to an appropriate scientific method, its practice has never ceased.

The Conjunction of 1524

According to our sources, many astrological predictions were prepared concerning the conjunction of 1524. Astrologers and astronomers have figured out a long time before that at the end of February 1524, a really unusual and unique planetary conjunction will take place. At that time only seven astronomical objects were used in horoscopes: Sun, Moon, Mercury, Venus, Mars, Jupiter and Saturn. Six of them dwelled in Pisces from the 23rd of February to the 6th of March in 1524; hence many astrologers predicted enormous floods for that time since Pisces is a water sign. Some of them predicted an extreme weather (huge amounts of rain and snow) only for that two weeks period when the planets were actually in Pisces, while others thought that the weather would be extremely wet in the whole year. A couple of sources state that some people have taken this alarm so seriously that they built ships or prepared in other ways for the floods.[51]

[51] Thorndike 1941a, pp. 178-192.

Our sources report quite different results regarding the success of the forecasts. Those authors who express their hostility or scepticism towards astrology, state that despite all predictions, the year 1524 was unusually dry.[52] However, some other testimonies, for example a calendar written by a certain Italian citizen Andrea Pietramellara claim that the weather was really extreme in that year. We do not have such texts which report floods or huge snowings between the 23rd of February and the 6th of March, but some testimonies state that the later part of that year was extremely wet. Pietramellara who lived in Bologna states in his calendar that between May and the end of November there were enormous storms in Italy with smashing wind and huge amount of rain. The clergy rang the bells in the temples several times in Bologna during the year, because they thought that by means of it God would listen to their prayers and would abolish the storms. Many animals died and many people needed to leave their homes because of the damages caused by the rain. And the weather became finally normal again only in December.[53]

We can find some quite weird explanations as well, for example, a certain astrologer Kilian Leib from Bavaria (Southeast Germany) recorded that however, it snowed and rained several times in February 1524, no floods took place. And after the end of that year, he connected somehow the planetary conjunction with Luther. I do not see what his reason for this was, since according to our sources, 1524 was not a significant year in Luther's life.

It is a quite surprising consequence of the conjunction of 1524 that even astrologers attacked each other and did not agree in a certain interpretation of it.[54] The aforementioned presentations show that one of the most problematic sides of astrology is that a planetary constellation can be interpreted several ways and there is no general agreement in the society of astrologers how a planetary position should exactly be interpreted and what event it predicts. Additionally, these descriptions also show that those who accept or reject astrology on the basis of personal and not scientific reasons, do not prepare objective and correct observations in many cases.

Attacks from Authorities

It is also a general problem that there have always been some astrologers who wanted to improve astrology according to the scientific methods, e.g. by the virtue of collecting more

[52] *Ibid*., p. 193.
[53] *Ibid*., pp. 231-232.
[54] *Ibid*., p. 233.

data and preparing observations with the inductive approach. However, there have always been such astrologers too, who did not want to reform astrology and wanted to maintain the old, traditional views. On the one hand, internal fights obstructed astrology from development, while on the other hand, some astrologers were able to smash this barrier and introduce new theories or new calculations. Among scientists who accepted astrology, Johannes Kepler and Francis Bacon argued that it should be reformed rather than rejected.[55] Not only in the Stoic era, but for example, in the second part of the 16th century many attempts were made to improve astrology. It is interesting that while many astrologers were working on the development of their field, at the very same time the Catholic Church expressed a serious prohibition against astrology and divination.[56]

In 1586 pope Sixtus V issued a bull which not only forbids practicing judicial astrology[57] and other forms of divination, but additionally, also prohibits reading or possessing of any books on the subject. In the bull he declares that God alone knows the future, therefore it is not possible for humans but even for demons to forecast it. However, natural astrology which concerns agriculture, navigation and medicine, remained still acceptable.[58] In 1631 Urban VIII approved and reaffirmed Sixtus' bull and completed it with several penalties even to confiscation of properties and death. Moreover, he emphasised that it is strictly forbidden to prepare any predictions "concerning political and ecclesiastical matters, especially the life of the pope or of relations of present pope to the third degree."[59] This prohibition makes one think that astrologers often prepared such predictions which are mentioned in the bull.

Similar cases can be found in antiquity too: in 11 A.D. Augustus issued a decree which forbids holding any private or secret consultations with astrologers or diviners. It also prohibits predicting anyone's death and it was invoked about twenty times when someone was suspected of plotting the emperor's death. Opposite to this, from Augustus on, almost all emperors had a court astrologer in Rome. They enjoyed a great power, while general horoscope sellers suffered persecution. In the 1st century A.D. they were banished six times from Italy, usually at such times when there was political unrest and astrological forecasts about the emperor's death would have been dangerous because of supporting rebellions.[60]

[55] Thorndike, 1958, p. 351.
[56] Thorndike 1941b, p. 99.
[57] Judicial astrology is that part of astrology which deals with future predictions concerning human lives or countries.
[58] *Ibid*., pp. 156-157.
[59] *Ibid*., p. 171.
[60] Tester 1990, pp. 50-51.

Nevertheless, these stories show that in several cases, astrology was not rejected because of scientific reasons, but because of the interest of either an ecclesiastical or a secular authority. In addition, it is noteworthy that the bull of Sixtus V declaring that "God alone knows the future" clearly exhibits that astrology was exiled on the basis of a non-scientific theological assumption; however, the impossibility of predicting the future was still not proved on proper scientific grounds. Therefore there still remained many people who did not reject astrology and practised it or turned to astrologers for preparing their horoscopes.

According to Jim Tester, astrology died only in the age of enlightenment because it fitted no more the generally accepted world-picture.[61] I think this expression is too strong since astrology is still practised today even if it is not so widely accepted like in former eras. Even if it is regarded as pseudoscientific, it is still alive, which can be seen from the facts that many astrological books are published and many people offer or resort horoscope readings.

[61] *Ibid*., p. 240.

2. SCIENCE AND PSEUDOSCIENCE

In this chapter I investigate the criteria on the grounds of which sciences and pseudosciences can be distinguished. I present the most significant attempts that were made in order to define the criterion of demarcation and analyse the case of astrology according to them; and show that Lakatos' and Thagard's definitions seem to be more plausible then Popper's and explain more appropriately why astrology is pseudoscientific.

In the second part of the chapter I present some problems concerning scientific laws which are relevant equally to sciences and pseudosciences. I show that even if they do not separate sciences from pseudosciences, they bring us up to the most appropriate criterion of demarcation.

2.1 The Criterion of Demarcation

Karl Popper states that "science is distinguished from pseudoscience – or from 'metaphysics' – by its empirical method, which is essentially inductive, proceeding from observation or experiment".[62] This claim transmits the principle formulated by the Vienna Circle: scientific statements must be empirical and based on observations. Everything that does not meet this requirement must be rejected as non-scientific. Popper's claim also emphasises that scientific method is based on induction, whereas deduction is not used in natural sciences but in mathematics and logic. However, in *The Logic of Scientific Discovery* he points out that universal scientific propositions can never be derived from singular statements,[63] as his famous example states: "no matter how many instances of white swans we may have observed, this does not justify the conclusion that all swans are white".[64]

According to Popper, the criterion of demarcation is that only such system is a science which is capable of being tested and refuted by experience. Because of the inductive method, scientific statements are not capable of being verified but only of being falsified. This means that not the verifiability but the falsifiability is the criterion of demarcation.[65] Nevertheless, this principle entails that a scientific truth is something which is not falsified yet. He remarks

[62] Popper 1998, p. 4.
[63] Popper 1959, pp. 40-41.
[64] *Ibid.*, p. 27.
[65] *Ibid.*, p. 41.

in his article *Science: Conjectures and Refutations* that some of his friends were admirers of Marx, Freud or Adler and they "were impressed by a number of points common to these theories, and especially by their apparent explanatory power". He adds ironically that whatever happened, it always confirmed these theories, "who refused to see it, either because it was against their class interest, or because of their repressions which were still 'un-analysed' and crying aloud for treatment".[66] Popper claims that psychoanalysis, marxism and astrology are pseudosciences because they are not able to give any clear and risky and empirically testable forecasts. They are not testable, therefore there is no possibility to refute them by experience. Opposite to them, Einstein's experiment concerning the general theory of relativity is an excellent example for a scientific theory, since involved risk and was confirmed by empirical experience.[67] Popper also adds that "every 'good' scientific theory is a prohibition: it forbids certain things to happen. The more a theory forbids, the better it is."[68] The further problem with astrology, psychoanalysis and marxism is that they do not meet this requirement: everything happens, they can explain why it happened in that way, so they do not forbid anything.

Nevertheless, many philosophers and scientists are not satisfied with Popper's theory since it states that we cannot have real scientific knowledge, as scientific statements are not capable of being verified. Imre Lakatos points out that one of the problematic aspect of Popper's view is that the criterion of being a science is independent of the facts, since something can be regarded as scientific if certain experiments or observations can be specified which can falsify the theory. He claims that Popper's criterion does not demarcate scientific theories from pseudoscientific ones, but demarcates scientific methods from non-scientific methods.[69]

However, the most problematic side of Popper's criterion is that it "ignores the remarkable tenacity of scientific theories".[70] This means that scientists do not abandon a theory merely because facts contradict it, but accept some anomalies or sometimes ignore anomalies if they do not find any explanation for them. All research programmes have a hard core which does not change even if anomalies are experienced, and a research programme is not refuted until a better one is not introduced.[71] Lakatos thinks that there are no isolated hypotheses but rather research programmes: a progressive research programme is able to

[66] Popper 1998, p. 5.
[67] *Ibid.*, pp. 6-7.
[68] *Ibid.*, p. 7.
[69] Lakatos 1973, pp. 22-23.
[70] *Ibid.*, p. 23.
[71] Lakatos 1998, pp. 24-26.

make successful predictions, whereas a degenerating research programme is not able to do this. He claims that both the adherents of Marx's and Newton's theory would not give up their principles even if serious anomalies appeared, so it seems that Popper's criterion of demarcation is not appropriate.

Lakatos agrees with Kuhn that the idea that "science grows by accumulation of eternal truths" is a false concept, and in several cases it is hard to decide which of the theories are scientific and which not.[72] For example, the Copernican theory and the Mendelian genetics had been condemned as pseudoscientific (the former by the Catholic Church and the latter by the Soviet Communist Party), however, later they became generally accepted scientific discoveries.[73]

Larry Laudan presents Lakatos' theory as it states that research programmes have three elements:

1) A "hard-core" (or "negative heuristic") of fundamental assumptions which cannot be abandoned or modified without repudiation of the research programme;
2) The "positive heuristic," which contains a set of suggestions or hints on how to change our specific theories whenever we wish to improve them; and
3) A series of theories [T_1, T_2, T_3 … T_n] where each subsequent theory results from adding auxiliary clauses to the previous theory.[74]

In Laudan's interpretation, scientific progress for Lakatos means exclusively the empirical growth of a certain tradition. The possession of greater empirical content or of a higher degree of empirical corroboration makes one theory superior to, and more progressive than another. Lakatos' theory is an improvement of Kuhn's but "unlike Kuhn who often takes the view that paradigms are incommensurable and thus not open to rational comparison, Lakatos insists that we can objectively compare the relative progress of competing research traditions."[75]

Laudan criticises Lakatos' model on scientific research programmes and claims that it has the following problematic features:

1) Scientific progress is exclusively empirical; the only progressive modification in a theory is such which increases the scope of the empirical claims of that theory.

[72] Lakatos 1978, p. 9.
[73] *Ibid*., p. 169.
[74] *Ibid*., p. 76.
[75] *Ibid*., p. 76.

2) Two theories can only be in the same research programme if one of the two entails the other.
3) The measures of progress require a comparison of the empirical content of every member of the series of theories which constitutes a research programme. But such comparisons are impossible, therefore Lakatos and his followers have not been able to identify any historical case to which the Lakatosian definition of progress can be shown strictly to apply.
4) Although one research programme may be more progressive than another at a certain point of time, we cannot conclude from this that which research programme should be accepted. Hence, according to Lakatos, there is no connection between a progressive theory and a theory of rational acceptability.
5) The claim that the accumulation of anomalies has no bearing on the appraisal of a research programme is massively refuted by the history of science.
6) Lakatos' research programmes, like Kuhn's paradigms, are rigid in their hard-core structure and admit of no fundamental changes.[76]

These objections show that Lakatos' theory is vulnerable at some points; however, I think Lakatos provides a more plausible criterion of demarcation than Popper and his objections against Popper are convincing. Nevertheless, Laudan did not provide any new criterion of demarcation.

Paul Thagard defines the criterion of demarcation similarly to Lakatos and agrees with him that Popper's principle of falsifiability is not appropriate. However, Thagard –following Popper– also admits that astrology is hardly testable but according to him, the main reason for astrology being pseudoscientific is that it is highly unprogressive. Thagard claims that a theory or a system of theories is pseudoscientific if it meets the following requirements:

1) It has been less progressive than alternative theories over a long period of time, and faces many unsolved problems.
2) The community of practitioners makes little attempt to develop the theory towards solutions of the problems; shows no concern for attempts to evaluate the theory in relation to others; and is selective in considering confirmations and disconfirmations.[77]

[76] *Ibid*., pp. 77-78.
[77] Thagard 1998, p. 32.

Thagard states that in the case of astrology, beyond that it is very unprogressive and the community of astrologers are not concerned with solving new puzzles, some further problems can be raised: (a) there are some facts which are not explained, e.g. the precession of equinoxes or the role of the newly discovered planets; and (b) there are alternative theories of personality and behaviour available –this is psychology which is also regarded as pseudoscientific by Popper. However, psychology is more progressive than astrology, therefore according to the first criterion, it has superseded astrology.[78] Thagard later modified his criterion of demarcation and added that a further feature of many pseudosciences is that they apply resemblances or analogies[79] instead of testing the theory or looking for statistical correlations.[80] This feature also highly concerns astrology.

Comparing the aforementioned criteria of demarcation, it seems that the most effective distinction between sciences and pseudosciences is that the formers are progressive and heuristic, while the latters insist on their traditions and almost never modify their theorems. It is an interesting entailment of Lakatos' and Thagard's theory that it is not determined for ever if a certain system is scientific or pseudoscientific, but this feature can change according to the success and progressiveness of that system at a certain era. So Lakatos and Thagard do not exclude that something that is regarded as pseudoscientific today, can change in the future and can become progressive and puzzle-solving.

Popper's criterion of demarcation makes a clear distinction between empirical and non-empirical systems of theories, which is an important difference between sciences and pseudosciences. However, with the notion of falsification he degrades sciences, because he claims that it is impossible to discover ultimate truths on the grounds of the inductive research method. Hence, the more theorems a science falsifies, the more advanced it is. This entails that the aim of sciences is not to verify theorems, but to falsify them. Many philosophers and scientists reject Popper's criterion since it does not formulate a positive but only a negative aim, which seems to be weird.

I think Lakatos is right in saying that it happens very rarely and only in extreme cases that a whole theory is refuted. He points out correctly that a complete theory is rejected usually only if a new, more sufficient or more successful system is introduced. Without a new theory an old one is not refused or is not recognised as pseudoscientific. However, I do not agree with Popper that astrology is a complete pseudoscience since some parts of it are based on

[78] *Ibid*., p. 32.
[79] For example, Mars has a reddish light, therefore in antiquity the concept of blood and war has been attached to it; or in folk medicine, turmeric has been considered to be the remedy of jaundice because of its yellow colour.
[80] Curd-Cover 1998, p. 74.

empirical experiences and observations. Furthermore, I think it is possible that the non-scientific part of astrology can be rejected, while the others, the scientific components can remain and astrology could become a progressive and puzzle-solving research programme. It is true that astrology has not solved any significant puzzles for several centuries, but this only entails that astrology is in a degenerating stage at the moment. Nevertheless, on the basis of new empirical observations it could be developed and new theorems could be introduced and old ones could be falsified.

Kuhn claims that astrology is not a pseudoscience because of the lack of its testability, but because that there has never been any puzzle-solving tradition in it.[81] I do not agree with this statement but think that in antiquity, when astrology was developed, there was a puzzle-solving tradition in it, since –as Ptolemy states– astrological theorems were established on the basis of empirical observations. However, later its development was not continued and it became pseudoscientific.

Additionally, it has also a great significance in the acceptance of a theory whether it is compatible with the spirit of the age (or *Zeitgeist*). Laudan points out that

> [R]esearch traditions and theories can encounter serious cognitive difficulties if they are incompatible with certain broader systems of belief within a given culture. Such incompatibilities constitute conceptual problems which may seriously challenge the acceptability of the theory. But it may equally well happen that a highly successful research tradition will lead to the abandonment of that worldview which is incompatible with it, and to the elaboration of a new worldview compatible with the research tradition. Indeed, it is in precisely this manner that many radically new scientific systems eventually come to be "canonized" as part of our collective "common sense".[82]

In the 17th century, astrology became incompatible with the generally accepted worldview, therefore its popularity dramatically decreased at that time.[83] Formerly, astrology had been taught at several universities of Europe, but from this era on, this become impossible (except some rare contemporary cases). It is obvious that traditional astrology is no more competitive with the highly progressive natural sciences, but I think, if astrology were changed to a progressive scientific research programme, it could be made compatible both with natural sciences and the currently accepted worldview.

[81] Kuhn 1998, p. 17.
[82] Laudan 1978, p. 101.
[83] Tester 1990, p. 240.

2.2 Scientific Laws

Popper points out that universal scientific propositions are never derivable from singular statements, however, the former can be contradicted by the latter.[84] As his famous example states: "no matter how many instances of white swans we may have observed, this does not justify the conclusion that all swans are white".[85] This means that the inductive approach does never lead to verification: universal statements can be falsified if counterexamples are found, but they can never be verified. Popper claims that a universal statement is considered to be a scientific law, until it is not falsified by counterexamples.

The general aim of sciences is to provide explanation to the states of affairs in the world. Hempel states that a scientific explanation must always involve a law; or in other words: without applying any law, an explanation is not scientific. According to Hempel's amended deductive-nomological model, a scientific explanation must meet the following requirements:

1) The explanans logically implies the explanandum-statement.
2) The explanans contains at least one general law that is required for the validity of the deduction.
3) The explanans must be testable.
4) The explanans must be true.[86]

It is formulated by the second condition that a scientific explanation always involves deduction: if we want to explain a certain fact, we deduce the explanation from a universal law. According to Hempel's model, the states of affairs are implied by universal laws, even if we can recognise those laws only by the means of the inductive method. So, the inductive generalisations can lead us to recognise the universal laws.

Hempel –similarly to Popper– also points out that a scientific explanation must be empirically testable. Additionally, his account implies that analogy that is often used by pseudosciences cannot be a scientific explanation, because an analogical account is not deductive.

However, it is an issue why laws explain. They are considered to explain either because they report causal dependencies or because they express some nomic necessity in nature.[87]

[84] Popper 1959, pp. 40-41.
[85] *Ibid*., p. 27.
[86] Rosenberg 2012, p. 57.

Nevertheless, some philosophers like Nancy Cartwright maintain that exceptionless, universal laws do not exist.[88] Many philosophers describe laws as counterfactual dependencies, but this description is problematic. Fred Dretske points out that an inductive generalisation itself does not entail a law: for example, it may be true that all dogs that was born and will ever be born at sea are cocker spaniels, however, this does not entail that there exist a law which determines that all dogs born at sea must be cocker spaniels. Laws express some kind of generalisation about the actual world, but the status of counterfactual statements is different: to say that "all Fs are Gs" is not the same as to say that "if this x were an F, it would be G". Concerning our example, "to be told that all dogs born at sea have been and will be cocker spaniels is not to be told that we would get cocker spaniel pups (or no pups at all) if we arranged to bread dachshunds at sea."[89] This entails that by the virtue of empirical observations, we are not able to make a distinction between real scientific laws and accidental generalisations. In addition, universal statements are never empirical statements, but only singular statements are based on empirical observations.

If we want to identify laws as they express causal dependencies, we must take into consideration that laws can be defined only as *ceteris paribus* laws. Therefore a distinction should be made between law (which is the causal force of a certain fact) and conditions. However, *ceteris paribus* laws are in many cases inexact, since at repeated scientific experiences it is hard to establish exactly the same conditions at every time.[90] Nevertheless, the obvious lack of *ceteris paribus* laws warrants that such fields like history are not sciences (because e.g. wars never break out among *ceteris paribus* conditions on the grounds of which we could generalise the circumstances among which wars inescapably occur). This problem appears in the case of pseudosciences as well: very often their statements express so complex and multiple occurrences that because of the lack of *ceteris paribus* laws, they are not able to prepare clear and exact forecasts or give correct explanations.

Furthermore, as Alex Rosenberg affirms, one of the main differences between sciences and pseudosciences is that scientific claims provide explanatory answers, while this capacity is missing from pseudosciences.[91] In my interpretation, this means that sciences formulate statements about causal dependencies or nomic necessities, while pseudosciences do not express such strict laws: either they state that they work on the basis of analogies, or if they

[87] *Ibid*., p. 57.
[88] *Ibid*., p. 75.
[89] Dretske 1998, p. 832.
[90] Rosenberg 2012, p. 95.
[91] *Ibid*., p. 83.

argue for certain laws, those laws are usually so wide that on the basis of them it is impossible to prepare empirically testable forecasts.

Nevertheless, Lakatos points out that there are (or might be) some scientific laws about which we cannot have empirical experiences. For example, according to Newton's theory, planets would move in ellipses only if they did not disturb each other in their motion. But they do disturb each other, therefore Newton introduced the concept of perturbation. However, we can have empirical observations only about the perturbed motion of the planets, but cannot experience a *de facto* elliptic motion.[92] In astrology, the meaning of zodiacal signs and planets has a similar status: no one has such character which is for example, completely an Aries character, but theoretically, the typical features of Aries and the other zodiacal signs can be formulated even if we do not have any empirical experiences about such persons. Nevertheless, it is an interesting case that even in normal sciences there are some laws about which we never can have any empirical observations but we can formulate them only theoretically.

Concerning traditional Western astrology, the following example clearly shows why it does not provide appropriate scientific explanation. A horoscope analysis of Hadrian (from the 2nd century) tries to explain why he became an emperor. It is worth noting that Hadrian was not a member of the former emperor's family but only a distant relative, so it was quite unexpected that he ascended the throne. The author of the horoscope analysis says:

> And why it happened in this way is explained as follows. He became emperor because the two luminaries [Sun and Moon] were with the Horoskopos [Ascendant] and especially because the Moon was of the same sect and in conjunction to the degree with the Horoskopos and with Zeus [Jupiter] which was also due to make its morning phase after 7 days. And the Moon's attending stars themselves were found in favorable positions, Aphrodite [Venus] in her own exaltation, Ares [Mars] in its own triangle and located in its own degrees […].[93]

This description does not involve explicitly any law based on inductive generalisation, even if there were prepared any inductive generalisations regarding the planetary positions and the career of the horoscope's owner. The most important problem is that not so many people have lived in the world who became emperors, therefore no generalisation is known concerning the correlation of personal horoscopes and becoming an emperor. This explanation is not scientific because it does not express any law of nature and does not account for how the

[92] Lakatos 1973, p. 21.
[93] Irby-Massie – Keyser 2002, p. 110.

explanans implies the explanandum: probably it is based on analogy instead of causal dependencies. Furthermore, the explanatory statement is not (or at least, hardly) testable since the planetary positions described are quite complex and probably they will not be repeated in the near future.

Popper's theories about unprovability and zero probability also raise serious issues to sciences; for according to him, scientific and non-scientific theories alike are equally unprovable and improbable. These ideas fit to his criterion of demarcation: since neither sciences nor pseudosciences are able to reveal ever valid and universal laws, the criterion of demarcation is the falsifiability of the theory.

His idea about unprovability can be explained by the following example. Newton's generalisation shows that every particle of matter attracts every other particle of matter. This law applies to all of the objects in the universe, anywhere at any time. However, we can observe only finite numbers of bodies, therefore Newton's theory vastly exceeds the scope of evidence. Therefore, "it is possible that all our observations are correct, and yet Newton's theory is false because some bodies not yet observed violate the inverse square law."[94] Newton's theory cannot be deduced from the empirical evidence, because it is a result of an inductive generalisation and not a law deduced from certain axioms. This entails that neither scientific nor non-scientific theories can be proven from observational facts, because no theory can be deduced from empirical facts. So according to Popper, "all theories all unprovable, scientific and unscientific alike."[95]

Popper's other theory, the principle of zero probability can be demonstrated briefly and simplifiedly in the following way:

> Consider a card randomly drawn from a standard deck of fifty-two cards. What is the probability that the card selected is the ten of hearts? Obviously, the answer is $^{1}/_{52}$. There are fifty-two possibilities, each of which is equally likely and only one of which would render true the statement "This card is the ten of hearts".[96]

Similarly, concerning Newton's generalisation, let's imagine that we name all the objects of the world by numbering them (like 1, 2, 3, ..., n, ...). If each number signs an object, we can say that the following possibilities exist:

[94] Curd-Cover 1998, p. 69.
[95] *Ibid.*, p. 69.
[96] *Ibid.*, p. 70.

1 obeys Newton's theory, but none of the other objects do.

1 and 2 obey Newton's theory, but none of the other objects do.

1, 2 and 3 obey Newton's theory, but none of the other objects do.

. . . . . .

All objects in the world [1, 2, 3, …, n, …] obey Newton's theory.

These possibilities are infinite in number and each of them has the same probability. The probability of any one of them must be zero, because if there is infinite number of objects in the world, the probabilities cannot have a finite value.[97] This entails that "no theory can increase in objective probability, regardless of the amount of evidence for it. For this reason, Lakatos joins Popper in regarding all theories, whether scientific or not, as equally unprovable and equally improbable".[98]

However, I think the principle of zero probability raises a serious question, namely whether there are infinite number of possibilities in the universe. Popper's principle can be true only in the case of infinite possibilities, however, first this assumption should be proved. But even if there were finite possibilities in the world, it would still stand that all of them are equally possible.

Nevertheless, it is an interesting feature both of the principles of unprovability and zero probability, that they concern sciences and pseudosciences equally. The concept of unprovability entails that scientific theories do not follow from empirical facts more adequately than pseudoscientific theories, but both of them are equally unprovable on the basis of empirical observations. The principle of zero probability neither makes any difference between scientific and non-scientific generalisations, so it seems quite plausible that the main difference between sciences and pseudosciences cannot be established on the grounds of their empirical content, but rather on the grounds of their puzzle-solving force and ability of developing new theories.

[97] *Ibid*., p. 70 and pp. 80-81.
[98] *Ibid*., p. 70.

3. HOW CAN ASTROLOGY BE MADE SCIENTIFIC?

In this part I present two attempts that were made in the last decades and aimed to modify astrology to a progressive scientific research programme. After that, I show that it is possible to cease the pseudoscientific features of astrology and present a possible way how it can be changed to a completely scientific system.

3.1 Seymour's Theory

The astronomer Percy Seymour developed a theory which connects astrology to natural sciences. In his work he points out that astrology can be liberated from pseudoscientific features, since real astrology does not involve any metaphysical or other philosophical doctrines but is based fully on scientific foundations. He does not agree with the original Stoic view that the planets and zodiacal signs etc. are signs of the fate, but maintains that there is a physical causal connection between planetary motions and the character and lives of human beings. As a scientist, he rejects that there are any empirically unobservable occult forces on which astrology is based and claims that "ancient astronomers-astrologers made sound discoveries concerning the links between the Sun, Moon, and planets, and the behaviour of individuals".[99] Seymour's aim is to clarify those causal connections which exist between planetary motions and human lives.

The starting point of his theory is that biologists discovered that there are many species – e.g. certain birds and fishes– which use the magnetic field of Earth to find the right direction when they are wandering. It also turned out that the magnetic vibration of Earth has many effect on living beings, including humans. Seymour argues that human nervous system reacts to the Earth's magnetic vibration, while the Earth's vibration is influenced by two factors:

a) The motion of planets in the Solar System.
b) The Sun's activity: solar wind and sunspots.

He thinks that therefore after all, the Sun and the planets of the Solar System have physical effects to human beings. He claims that the influences at the time of birth are decisive, because they constitute our first memories which affect us later during our lives.[100]

[99] Seymour 1988, p. 13.
[100] *Ibid.*, pp. 12-13 and pp. 132-135.

Furthermore, he assumes that the process of childbirth is initiated by the Earth's magnetic field, therefore the planetary positions at the time of birth have a crucial effect.[101] Hence, the natal horoscope can show those effects which influence firmly one's character, and the walk of life is determined (at least to some extent) by one's character. So this is a kind of explanation to why natal horoscopes can show both the character and the life events of an individual.

The advantage of Seymour's hypothesis is that it is a complete scientific theory and meets the aforementioned criteria of demarcation. It meets Popper's criterion since it is empirically testable and based fully on empirical statements and does not suppose any metaphysical tenets. And because of these reasons, it is falsifiable. It yields Lakatos' and Thagard's criterion too, for it is a progressive theory and is a real innovation in the astrological tradition. And it asks new questions (the effects of the magnetic fields of planets and solar activity to human beings), therefore it is puzzle-solving. Furthermore, it is also a significant advantage that it squares astrology with natural sciences and according to it, biology, astronomy and astrology can create a coherent system.

On the other hand, there are some problems and deficiencies concerning Seymour's theory. The general problem is that it is not yet worked out in details and is only a hypothesis at the moment. In addition, many people are not convinced that natal horoscopes have any correlation with human lives and human behaviour. Seymour has taken for granted that astrology works; however, first he should convince the attackers of astrology about this. First it must be proved that astrology reveals real laws; and it is only the second step to develop a theory about how it works. Furthermore, it is a question whether it is possible to prepare clear and exact forecasts from horoscopes. Popper argues that neither astrology nor psychology and other pseudosciences do this and this is an important distinction between sciences and pseudosciences. Even if it were proved that the magnetic field of the planets and the solar activity has physical causal influence to human beings, further research should be made in order to clarify their influence and prepare exact forecasts on the basis of them. Nevertheless, if it turned out that exact predictions can be made about human lives, it would certainly have some serious consequences to the theories regarding free will.

[101] Seymour 1998, pp. 121-124.

3.2 Gauquelin's Statistics

The statistician and psychologist Michel Gauquelin tested approximately 40,000 natal horoscopes and published some interesting results. He found two types of correlations: one that is between the planetary positions at the time of birth and the professions of the horoscope owners; and the other that is between the planetary positions at the time of birth of children and planetary positions in the natal horoscopes of their parents.[102] Concerning the former, the most significant results are followings:

a) Famous athletes tend to be born when Mars is either rising at the Eastern horizon or is close to the zenith point of the sky.[103]
b) Famous military men tend to be born when Jupiter is either at the Eastern horizon or at the zenith of the sky.
c) Doctors and scientists tend to be born when either Mars or Saturn is either at the Eastern horizon or at the zenith of the sky.
d) Politicians tend to be born when either Moon or Jupiter is either at the Eastern horizon or at the zenith of the sky and writers when Moon is in a similar position.[104]
e) He found some negative results as well: in all kinds of artist horoscopes Mars is much rarely located in significant position than in the average of horoscopes; and there is a similar correlation regarding the position of Moon and athletes.

It is worth noting that the statistics show these correlations only in the cases where the beginning of the labour was not artificially influenced by obstetrical drugs.

His other statistics which concern the correlations between natal horoscopes of children and their parents show that there is a planetary heredity: in many cases, parents and their children were born at similar planetary positions. Gauquelin presents his results as below:

> When the data […] were submitted to a statistical analysis, the magnitude of the hereditary similarity was so large that it could not be attributed to chance. To be exact, there was only one chance in half a million that the results were random; or 499,999 chances to one that planetary

[102] Gauquelin 1975b, pp. 228-230.
[103] In a horoscope diagram the Eastern horizon is the *Ascendant* ("rising degree"), while the zenith point of the sky or upper culmiation is called *Medium Coeli* ("mid-heaven").
[104] He noticed some more correlations as well between planetary positions and other professions, see in: Irving 2003.

> heredity was indeed real. An important qualification must be appended to this statement: The similarities were found only for the celestial bodies closest to the Earth or largest in mass. Only the Moon, Venus, Mars, Jupiter, and Saturn were found at the same place in the sky at birth from one generation to the other. Children have the tendency to be born when one of these bodies rises or culminates, if the same body occupied that region of the sky at their parents' birth.[105]

He adds that no result was observed about the position of Mercury, Uranus, Neptune, Pluto and planetary heredity. He thinks that the explanation for this may be that Mercury is too small and close to the Sun, while the other planets are too far from the Earth. Furthermore, it is an interesting observation that the position of Venus is not related to the profession chosen, while it is related to planetary heredity.[106]

Gauquelin assumes that the explanation of both types of statistical correlations is that the fetus reacts to external physical stimuli like solar wind and geomagnetic changes. The motion of planets causes geomagnetic changes in the Earth and Gauquelin supposes that geomagnetic changes can initiate the birth of the fetus. (This idea was originally raised by him and Seymour has taken it over and developed it.) However, this hypothesis raises the following issues. Firstly –as Suitbert Ertel argues– it remains a question why planets have stronger influence when they are rising at the Eastern horizon or when they are culminating comparing to any other time of the day. Secondly, there is no empirical evidence for planets having physical influence on the biosphere.[107] And thirdly, the average length of the labour process is approximately 11 hours. Henry Krips points out that it is not explained why there is a correlation between the planetary positions at the *moment of birth* (and not at the beginning of the labour process) and human lives.[108]

Those philosophers and scientists, who are open to new theories, maintain that Gauquelin's statistics show real correlations. But there are some scientists who do not want to accept his statistics, for example Lawrence Jerome criticises Gauquelin as he has misinterpreted the statistical results. According to Jerome, those statistics show only accidental occurrences but not causes and effects. However, he accepts that it might be true that people with certain character traits might tend to be born at certain planetary positions and from their character traits follows what profession they choose. He claims that even if this is true, it only shows that there exist biological clocks, which is accepted by natural sciences.

[105] Gauquelin 1969, p. 88.
[106] *Ibid.*, pp. 88-89.
[107] Ertel 1992, p. 248.
[108] Krips 1979, p. 379.

But this does not entail that there are any celestial influences to human character or human life.[109]

Those who accept the validity of Gauquelin's statistics, maintain that they seem to show law-like correlations: even if we do not know yet the mechanism how planetary motions and human lives or characters hang together, a further research may show more clearly their causal connections. Krips points out that in the history of science we can find examples where law-like correlations had been accepted, however their causal mechanism was discovered only later.[110] It is worth noting that Gauquelin does not assume the existence of any mystical forces but thinks that being born under a certain astronomical configuration is correlated primarily with our character and abilities. The explanation of the statistical results concerning professions is that our profession chosen is the entailment of our character and our abilities. Therefore he assumes that natal horoscopes have similar meaning to our genes and they hang together somehow. It is an important entailment of Gauquelin's theory that according to it (similarly to Seymour's view); astrology does not involve a quite different worldview from natural sciences, but is coherent with them, so they do not contradict each other. Hence, astrology can be changed to a scientific research programme and can become a part of the system of sciences.

3.3 Consequences for the Future

As I have mentioned, it is a question under debate if Gauquelin's statistics show real or accidental correlations. It is quite obvious that further investigations need to be made in order to determine this clearly and as a result, two ways are possible: either Gauquelin and his followers reject their assumption; or the sceptics will accept the validity of the statistics.

The general problem is that statistics can be prepared about anything, but a statistical result itself does not entail that there is any connection between the two examined things. However, if certain similar statistical results regularly appear, it makes one think that they reveal some correlations. A quite famous positive instance from the history of science is the discovery about how smoking and lung cancer hang together. Smoking became widespread after the first world war and in the 1930's the enormous increase of lung cancer cases were observed. Several statistics were prepared about lung cancer and they showed obviously that

[109] Jerome 1973, pp. 128-130.
[110] Krips 1979, p. 390.

in most of the cases smokers die from it, while it occurs very rarely that a non-smoking person has lung cancer. Despite of the statistics, many doctors did not want to admit that smoking is connected with the development of cancer. It took many years while it became a generally accepted view among doctors and scientists that smoking and lung cancer are strongly correlated.[111] This example shows that at first, statistics can show a connection of which mechanism will be revealed only at a later time. But without making any observations and statistics, it is impossible to get over this stage and discover a law which was unknown until that time. Therefore, even if some statistics show accidental results, it is not a scientific behaviour if someone rejects them without any detailed examination and without refuting them on the grounds of other data.

Gauquelin has made the first step to change astrology to a progressive and puzzle-solving research programme and I think further investigations need to be made in order to clarify his results. On the one hand, further data need to be tested and checked if they really show similar upshots. On the other hand, the research should be continued by preparing more refined statistics. There are several factors which can be tested, e.g. the planetary positions in the different zodiacal signs, or the planets at certain degrees of certain zodiacal signs, etc. A natal horoscope consists of several elements and Gauquelin prepared his statistics only on the basis of planets dwelling at the Eastern horizon or at the zenith point of the sky. However, it is also possible that certain planets at certain degrees have quite different causal relationships to humans; moreover, it is conceivable that some old theorems like the twelve zodiacal signs will lose their meanings and instead of them new theorems like the distance of a planet from the Eastern horizon or from the Sun will have explanatory force. There are several elements in a natal horoscope about which statistics could be prepared, so I think, first of all, a number of new statistics should be made and examined which of them show significant correlations.

In his work, Gauquelin draws attention to some statistics made by other researchers. For example, according to a survey prepared among 17,000 school children in New York, those who were born in May and June or in September and October, have a slightly higher IQ than those who were born at other seasons. Other statistic from Cincinnati shows that those children born during the summer had twice as good a chance to pass college entrance examinations as those who were born in winter.[112] These data indicate that Gauquelin was not the only one who tried to examine if there is any correlation between the time of birth and the walk of life, but some other tests also have been prepared.

[111] Witschi 2001, p. 4.
[112] Gauquelin 1969, pp. 80-81.

It is an important feature of Gauquelin's measurement that he was not biased to astrology and he himself claims that he has found some results which do not fit to the theorems of traditional Western astrology. One of his surveys was prepared about the natal horoscopes of the 576 members of the French Academy of Medicine and the result seemed to be surprising. He observed with his research group that Mars and Saturn are more often in a significant position (either just risen or culminated in the sky) in the horoscopes of those physicians than in the horoscopes of the statistical average.[113] This result was unexpected, since in traditional astrology, Neptune is the planet of doctors but not Mars or Saturn.[114] I think this means that Gauquelin was on the right way, since astrology can be changed to a scientific research programme only if researchers do not insist on the traditional, old theorems but are open to new ones. And this also shows that the aim is not to restore traditional astrology but to reveal real correlations even if they do not fit to the old astrological system. For example, even if Mars is traditionally regarded as the planet of warriors and butchers, if statistics showed that Mars is correlated with physicians then this new theorem should be accepted and the old one should be rejected. And this would be a real progress in astrology. Astrology has been in a degenerating stage for several centuries because almost none of the old theorems were rejected and no new laws were discovered. This statistical method could be the first step to change astrology to a progressive scientific system, since it is testable and is based fully on empirical observations. Traditional astrological claims were incapable of being falsified, but according to this method, they are falsifiable and hence the way is open to the progression and development of astrology.

It is a further consequence that if it were proved that planetary motions and human lives are really correlated then it should be investigated why this is so. If they are correlated, that means that there is a causal dependency between them: either one is the consequence of the other; or there is a common cause beyond them. It should be examined which of the two possibilities stands; and if the first is the case, how planetary motions influence human characters and walk of lives; and if the second is the case, what exactly their common cause is. If planetary motions themselves have a causal force to humans, it should be investigated what planetary positions cause certain characteristics or dispositions to choose certain professions or life events. For example, it should be explored how the solar wind exactly influences our nervous system or what kind of geomagnetic changes at the time of birth lead to what type of human characteristics. Or if planetary positions and Earthly occurrences have

[113] *Ibid.*, p. 84.
[114] Before the discovery of Neptune, Jupiter has been the signifier of doctors in traditional astrology.

a common cause, I think it would require a more difficult research to explore what precisely their common cause is. And this would raise the question whether the common cause is inside our outside the Solar System; and if the latter is the case, how it can be observed and tested. Nevertheless, this theory would in some sense lead us back to the original Stoic view that Earthly occurrences and planetary motions are perpetually correlated because they have a common cause. In Stoic philosophy, this common cause was God; however, scientific investigations may explore an empirically observable and testable physical common cause.

It is an advantage of Gauquelin's theory that astrology can be connected to natural sciences and moreover, if his theory were proved, it would mean that astrology itself is also a natural science for it examines the influences of the planets to humans and investigates the laws of the natural world. Gauquelin and Seymour assumed that the explanation of the statistical correlations is that the fetus has a genetically determined nervous system which reacts to the geomagnetic changes and is being born when he receives such stimuli from the planets which harmonises with his nervous system. If this theory is true, the natal horoscope can show the genetical heritage and the innate characteristics of its owner. However, as I have mentioned, if astrology became a natural science, it would have serious consequences to the theories concerning free will, since it is one of the most important features of natural sciences that they are able to give clear and exact predictions about the future. At the moment, natural sciences prepare forecasts mostly about the natural world and not about human behaviour or life events. If astrology became a natural science, it should also be investigated to what extent the future of human individuals is determined. Nevertheless, genetics examines similar questions; therefore it is possible that astrological and genetical claims will create a coherent system.

CONCLUSION

I have showed that astrology was originally established on the grounds of both scientific and non-scientific reasons, and in antiquity it was a quite progressive field. However, later it became unprogressive and did not raise new questions and there was no general agreement in the society of astrologers about how astrology should be improved. The unscientific attitude of several astrologers obstructed the development of astrology, but this does not entail that traditional astrology cannot be changed to a scientific system.

I have demonstrated three attempts to define the criterion of demarcation and pointed out that Lakatos' and Thagard's theory seem more appropriate than Popper's. I have presented those ideas which state that in some sense there is no difference between scientific and pseudoscientific theories since all of them are equally unprovable and improbable, furthermore, no distinction can be made between scientific laws and accidental generalisations. These theories show that the distinction between sciences and pseudosciences can not be determined on the grounds of that the former are able to reveal unquestionable and ever valid laws while the latter are not able to do this; but they show that the only one proper distinction between sciences and pseudosciences is that the former are progressive while the latter are unprogressive.

I have argued that on the basis of the statistical method, astrology can be made scientific; however, scientific astrology would be quite different from traditional astrology. Beyond Gauquelin's statistics, many other statistics should be prepared and analysed which of them show regularly recurrent correlations between planetary positions and life events or human characters. It is obvious that scientific astrology must be based entirely on empirical experiments and observations and should omit all kinds of philosophical assumptions. However, preparing statistics is only the first step: if it turned out that there are real correlations between planetary positions and human lives, we would need to make further research in order to discover their causal connections and causal processes. On the basis of these investigations, astrology can be changed to a progressive scientific research programme which meets both the requirements of natural sciences and the demarcation criteria stated by the philosophers of science.

This new astrology would fit the system of natural sciences because it would have several connections to sciences (mostly to biological and astrophysical theorems), moreover, it itself also would become a natural science since it would be based fully on empirical observations and would investigate the laws of the natural world. However, if it were proved that there are

real correlations between planetary motions and human lives, it would entail that human behaviour is predictable; therefore it would raise serious consequences to the theories regarding free will. Nevertheless, this question concerns not only astrology but genetics as well, therefore they together may create a coherent system of scientific theorems.

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