

Available online at www.sciencedirect.com**ScienceDirect**

Procedia Economics and Finance 10 (2014) 335 – 342

Procedia
Economics and Finance

www.elsevier.com/locate/procedia7th International Conference on Applied Statistics

Assessing Students' Opinion on Evolutionism by Statistical Methods

Aivaz Kamer Ainur^{a*}, Vlăducă Ion^b^a*OVIDIUS University of Constanta, Faculty of Economical Sciences, Constanta, Romania*^b*OVIDIUS University of Constanta, Faculty of Mathematics, Constanta, Romania*

Abstract

At present, in Romania, there are two dominant paradigms about the life on Earth. The first is the atheist-evolutionist paradigm, and the second is the Christian one.

The purpose of this article is to assess the students' opinion on the two explanatory models. For this purpose, there have been used the coefficients for the association between the main aspects of the two models. Starting from the two outlined approaches, this paper aims to investigate the opinions of the students from two different specializations within "Ovidius" University of Constanta – the Faculty of Economics and the Faculty of Theology - on the issues mentioned above.

© 2014 Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

Selection and peer-review under responsibility of the Department of Statistics and Econometrics, Bucharest University of Economic Studies.

Keywords: paradigm, evolutionism, scientific creationism, association coefficients, contingency coefficient

1. Main text

The origin of species may be explained by means of two models: the first model proposes the emergence of species by random factors, and the second one acknowledges the Creator's existence. Williams G.C (1996) argue that the first model necessarily includes the idea of the evolution of species; the simplest species emerged spontaneously, followed by a long process of evolution, i.e. the transformation of species with a gradually increasing complexity.

The spontaneous emergence of life and the evolution of species through random factors are very old ideas. Anaximander (610-546 BC) believed that animals have emerged from the sea due to solar heat. According to

* Corresponding author. Tel.: +040723372072.
E-mail address: kamer_aivaz@yahoo.com.

Empedocles (483-423 BC), life was born from the heated sludge wherefrom segments of living beings emerged, and beings emerged through the random combinations of these segments. Albertus Magnus (1193-1280) was convinced that plants can move from one species to another under the influence of soil and nutrition. Denis Diderot (1713-1784) believed that living things emerged spontaneously through random chemical combinations. Lamarck (1744-1829) believed that living things emerged spontaneously and then evolved. Charles Darwin (1809-1882) proposed the mechanism of natural selection in order to explain the origin of species. In his view, the process of natural selection was accidental; variations were generated randomly and the most adapted forms have survived. ([3], evolution and evolutionism).

Religious people have seen in the theory of the evolution of species a denial of the biblical concept of the creation by God of animals and plants. Although in his work Darwin made no reference to deity, being neither for nor against it, he was accused of atheism and his book *The Origin of Species* was banned in the U.S. Essentially, Darwin did not deny the existence of God, but His involvement in evolution.

Darwin's view had a strong influence on Romanian intellectuals. In the period following the Revolution of 1848, most of the young researchers who have gone abroad for specialization, returned home with materialistic ideas. When Darwin's (1859) perspective began to assert itself within the scientific world, Gr. Cobalcescu, Gr. Stefanescu, Em. Teodorescu, Victor Babes, I. Athanasiu, E. Racovita and I. Cantacuzino adhered to this view and transmitted it to their students. The development of biology in our country is closely related to the adherence to the Darwinian doctrine. The students of the early pioneers were also - at least some of them - militant Darwinists and others were materialists; the latter, through their mentalities, were very close to the Darwinian doctrine or accepted whole parts of it and developed it.

In a communication about Darwinism from 1872, the Academician G. Barițiu showed his concern that where Darwinism was penetrating, it was producing a total transformation of opinions and beliefs, in all branches of human sciences, even in legal sciences and religion was hit right in its roots .

Darwin's ideas have been fully exploited by the communist regime in Romania. The education reform in 1948 introduced the evolutionary biology in secondary schools, and in the faculties of Biology and Medicine. Biology was then called "the foundations of Darwinism" as a homage to Darwin. In the introduction to the 1957 Romanian edition of the *Origin of Species*, it is written that in his scientific work, Darwin is a materialist, an anti-creationist and an anti-finalist. With creation, Darwin denies the "aim" and the "intention" in nature.

The Communist Party paid special attention to the cultural and educational activities aimed at the youth's scientific and atheist education. In Romania, during the first nine years since the onset of communism, there were held 35,000 conferences on evolutionism. It is estimated that the number of people who heard these lectures reaches approximately four million. The album "The Origin and Evolution of Man," by Plisețki, was printed in 30,000 copies. The exhibition which presented Darwin's perspective on the origin and evolution of man was first installed in Bucharest and visited by 1200000 people. Then there were conducted 21 mobile exhibitions that went from town to town for four years. The exhibition went through 238 towns and the number of visitors exceeded 1500000.

After the Revolution of 1989, religious freedom has allowed the teaching of religion in schools and led to the emergence of Christian teaching books. According to the Christian teaching, God created the plants, the animals and the man, endowing the universe with a certain rationality.

Pupils and students had access not only to the hypothesis of evolution, but also to the Orthodox Christian teaching about the origins of life and man. However, apart from Religion classes, the education is based on the theory of evolution, and, in Psychology, it is considered that there is no immaterial soul, the psyche being only the manifestation of the brain.

Also, during this period (1990 to present), many pupils and students have learnt about scientific creationism which, based on the information theory, attempts to show the need for primary data sources that originate the genetic information of all organisms. Obviously, this theory is compatible with the Orthodox Christian teaching about the creation of living creatures.

In this article, we propose to study the students' adherence to evolutionism and to the Christian teachings on life and human emergence.

2. Methodology

The statistic collectivity investigated is represented by the students from the „Ovidius” University from Constanta, the sample being composed out of 474 students, 397 coming from the Faculty of Economic Sciences and 77 coming from the Faculty of Theology, which determines a guarantee probability of 95% with an error limit of 5%.

In order to assure the representativity of the sample, a multistadial random sampling scheme was used, on which base the researched collectivity was divided bearing in mind the proportions that the groups occupy considering 4 criteria: the sex, the age, the specialization and the faculty. It is the best method for obtaining the sample. The used percentages for determining these segments were calculated starting from the researched data from the website of the „Ovidius” University of Constanta regarding the statistical situation of the students.

The processing of the data with the view of the centralization and systematization of the information, the calculus of the indicators which describe the intensity of the bonds, as well as the testing of their meaning was done through the informatics product SPSS.

Due to the fact that within the questionnaire there are questions that have two answer options, the two variables were identified through two different classes or manners.

It is considered defined a property that assures the divisions of the units after the X characteristic in two classes, and another property assures the dichotomy of the units for the second characteristic, Z, then the grouping of the units after the two criteria has as a result the definition of the contingency table as follows:

	Y ₁	Y ₂	n _{i.}
X ₁	n ₁₁	n ₁₂	n _{1.}
X ₂	n ₂₁	n ₂₂	n _{2.}
n _{.j}	n _{.1}	n _{.2}	n

The association coefficient is used for measuring the dependency degree of two variables in the case in which each characteristic is defined through the second manner/ the product of the herds from the main diagonal of the contingency table defines the bond between the two characteristics, and the product of the herds from the secondary diagonal symbolizes the lack of the connection between the variables.

Having in mind this observation, the following indicators for measuring the association degree between the two characteristics is defined:

- The Yule association coefficient

$$Q = \frac{n_{11}n_{22} - n_{21}n_{12}}{n_{11}n_{22} + n_{21}n_{12}} \in [-1, +1] \quad (1)$$

The value of this statistical measure is interpreted in a similar way with the linear correlation coefficient. The more the indicator goes away from zero, the more the dependency between the two characteristics is.

- The association coefficient

$$d^2 = n \frac{(n_{11}n_{22} - n_{21}n_{12})^2}{(n_{11} + n_{12})(n_{11} + n_{21})(n_{12} + n_{22})(n_{21} + n_{22})} \quad (2)$$

- The correlation coefficient r_d or φ

$$r_d = \sqrt{\frac{d^2}{n}} = \frac{n_{11}n_{22} - n_{21}n_{12}}{\sqrt{(n_{11} + n_{12})(n_{11} + n_{21})(n_{12} + n_{22})(n_{21} + n_{22})}} \quad (3)$$

This has the advantage that it is a normalized indicator, having the same properties as the linear correlation coefficient.

- The G association coefficient is defined through

$$G = (n_{11} + n_{22} - n_{12} - n_{21})/n \quad (4)$$

3. Data and results

The first question refers to the emergence of life on Earth. It has three possible answers:

- Life emerged at God's command;
- Life emerged by random phenomena;
- I do not know.

The importance of this question is that the two main positions can be distinguished: creationism and materialism. Most students (70.7%) believe that life emerged at God's command; 27.4% believe that life emerged by random phenomena; only 1.9% say that they do not know.

The second question concerns the evolution of species and has the following possible answers:

- The evolution of species is a real fact;
- The evolution of species is a scientific hypothesis;
- The evolution of species is a philosophical hypothesis;
- I do not know.

The purpose of this question is the differentiation of the two positions on evolution (evolution as a real fact and evolution as a hypothesis).

Most students (66.2%) believe that the evolution of species is a scientifically proven real fact; 25.9% consider it a scientific hypothesis, and 4.4% say it is a philosophical hypothesis; 3.4% say that they do not know.

The relationship between the faculty where they study and the mentalities about the evolution of species is shown in the following contingency table:

Table 1. The evolution of the species

Faculty	Evolution of species	
	Real fact	Hypothesis
Economic Sciences	284	101
Theology	29	43

For this contingency table, the following values have been calculated:

$$Q = 0,61, \varphi = 0,26, G = 0,43.$$

These values show that there is a medium intensity connection between the two variables. It should be noted that 40.27% of the students from the Faculty of Theology who have expressed their position believe that the evolution of species is a proven fact.

In connection to the first two questions, the following association table would have been expected to result:

Table 2. The association table expected between the evolution of the species and the emergence of life on Earth

Life on Earth	Evolution of species	
	Real fact	Hypothesis
By random phenomena	High frequency	Low frequency
By God's command	Low frequency	High frequency

In reality, the following absolute frequencies have resulted:

Table 3. The real association table between the evolution of the species and the emergence of life on Earth

Life on Earth	Evolution of species	
	Real fact	Hypothesis
By random phenomena	91	36
By God's command	220	107

Table 4. Symetric measures regarding the association between the evolution of the species and the emergence of life on Earth

	Value	Asymp. Std.Error ^a	Approx.T ^b	Approx. Sig
Phi	0.042			0.368
Cramer's V	0.042	0.114	0.917	0.368
Contingency Coefficient	0.042			0.368
Gamma	0.103			0.359

a. Not Assuming the null hypothesis

b. Using the asymptotic standard error assuming the null hypothesis

The Q coefficient is 0.103, and the ϕ coefficient is 0.042. Both of these values indicate no connection between the two variables. For the G coefficient, there has resulted the value of -0.12, which confirms that there is no connection and, in addition, shows a reversed tendency due to the value of 220.

This result can be viewed in two ways:

- Although most students believe that life on Earth emerged by God's command, 67.27% of those who believe this think that the evolution of species is a proven fact;
- Although most students believe that the evolution of species is a proven fact, 70.73% of those who believe this admit the idea that life on Earth emerged by God's command.

The third question refers to the emergence of man and aims to differentiate the two main views on this topic:

- the man was created by God;
- the man comes from the animal world.

Most students (75.1%) believe that the man was created by God; 23.2% believe that the man came from apes or from an ape ancestor, 1.7% say that they do not know.

Although most students (66.2%) believe that the evolution of species is a scientifically proven fact, 75.1% believe that the man was created by God, so he did not emerge by evolution.

If it have been concluded that the evolution of species also included the man, it would have resulted the following table of association:

Table 5. The association table between the evolution of the species and the emergence of man

Evolution of species	Man	
	Emerged by evolution	Was created by God
It is a real fact	High frequency	Low frequency
It is a hypothesis	Low frequency	High frequency

In fact, the following data have resulted:

Table 6. The real association table between the evolution of the species and the emergence of man

Evolution of species	Man	
	Emerged by evolution	Was created by God
It is a real fact	81	229
It is a hypothesis	26	115

For this contingency table, there were calculated following values:

$Q = 0,220$, $\phi = 0,083$, $G = -0,130$.

These values indicate that there is no relationship between the two variables.

The result can be viewed in two ways:

- Although most students believe that man was created by God, 66.56% of those who believe this consider that the evolution of species is a real fact;

- Although the majority believes that the evolution of species is a real fact, 73.87% of those who believe this admit that man was created by God.

Regarding the connection between the emergence of life on Earth and the emergence of man, there resulted following contingency table:

Table7. The association table between the emergence of life on Earth and the emergence of man

Life on Earth	Man	
	Emerged by evolution	Was created by God
By random phenomena	85	40
By God's command	24	308

For this contingency table, the following values were calculated:

$Q = 0.929, \phi = 0.636, G = 0.71.$

As we see in table 8, the values indicate a strong connection between the two variables.

Table 8. Symetric measures regarding the association between the emergence of life on Earth and the emergence of man

	Value	Asymp. Std.Error ^a	Approx.T ^b	Approx.Sig
Phi	0.636			0.000
Cramer's V	0.636	0.020	11.532	0.000
Contingency Coefficient	0.536			0.000
Gamma	0.929			0.000

a. Not Assuming the null hypothesis

b. Using the asymptotic standard error assuming the null hypothesis

The fourth question concerns the existence of the soul. The majority (96.4%) believe that there is a soul; 2.7% believe that there is no soul, and 0.8% say that they do not know.

The connection between evolution and the perspective on the existence of the human soul is presented in the following table:

Table 9. The association table between evolution and the perspective on the existence of the human soul

Evolution of species	The human soul	
	It doesn't exist	It exist
It is a real fact	7	304
It is a hypothesis	5	139

The following values have been calculated:

$Q = -0,219, \phi = -0,035, G = -0,358.$ These values indicate that there is no relationship between the two variables.

The inverse association trend is given by the value of 304 which is very high compared to the other values.

Although the majority believes that the evolution of species is a real fact, 97.74% of those who believe it, admit that there is a soul.

In this case, another result would have been expected:

Table 10. The association table expected

Evolution of species	The human soul	
	It doesn't exists	It exists
It is a real fact	High frequency	Low frequency
It is a hypothesis	Low frequency	High frequency

The fifth question concerns Charles Darwin's perspective of God's existence. The majority (62.9%) say that Darwin was an atheist, 32.1% say that Darwin accepted the idea of God's existence, and 5.1% say that they do not know.

The sixth question concerns the scientific creationism and has the following possible answers:

- Scientific creationism is a rigorous theory;
- Scientific creationism is a religious doctrine;
- Scientific creationism is a misconception;
- I do not know.

The majority (60.3%) believes that scientific creationism is a rigorous theory, 20.7% believe it is a religious doctrine, 15% believe that it is a misconception, and 4% say that they do not know.

The connection between the perspective on the evolution of species and the perspective on scientific creationism is presented in the following tables:

Table 11. The association table between the perspective on the evolution of species and the perspective on scientific creationism

Evolution of species	Scientific creationism		
	It is a religious doctrine	It is a misconception	It is a rigorous scientific theory
It is a real fact	69	34	199
It is a scientific hypothesis	22	29	69
It is a philosophical hypothesis	6	5	10

Table 12. The association table expected

Evolution of species	Scientific creationism	
	It is a religious doctrine or a misconception	It is a rigorous scientific theory
It is a real fact	103	199
It is a hypothesis	62	79

Table 13. Symetric measures regarding the association between the perspective on the evolution of species and the perspective on scientific creationism

	Value	Asymp. Std.Error ^a	Approx.T ^b	Approx.Sig
Phi	-0.095			0.045
Cramer's V	0.095	0.100	-1.971	0.045
Contingency Coefficient	0.095			0.045
Gamma	-0.205			0.049

a. Not Assuming the null hypothesis

b. Using the asymptotic standard error assuming the null hypothesis

It should be noted that the two variables are not significantly related. One would have expected the following result:

Table 14. The association table expected

Evolution of species	Scientific creationism	
	It is a religious doctrine or a misconception	It is a rigorous scientific theory
It is a real fact	High frequency	Low frequency
It is a hypothesis	Low frequency	High frequency

If the evolution of species is a real fact, then scientific creationism is a misconception (a wrong scientific theory) or a religious doctrine. Conversely, if scientific creationism is a rigorous scientific theory, then it is likely that the evolution of species is not a real fact. However, most students did not follow this reasoning: 65.89% of those who consider that the evolution of species is a real fact say that scientific creationism is a rigorous theory and 71.58% of those who say that scientific creationism is a rigorous theory accept that the evolution of species is a real fact.

4. Conclusions

There is a strong connection between the perspective on the emergence of life on Earth and the perspective on human emergence. Most students accept the idea that life and man emerged through the work of God. However, there is no significant relationship between the perspective on human emergence and the perspective on the evolution of species. Most of those who accept the evolution of species think that the man was created by God. Also, there is no significant relationship between the perspective on the emergence of life and perspective on the evolution of species. Most of those who accept the evolution of species believe that life emerged by God's command. Although the majority believes that the evolution of species is a real fact, 97.74 % of those who believe it, admit the existence of the soul.

This situation is explained by the existence of two centers of influence after the Revolution of 1989: Evolutionary biology and Religion. Most students have taken from Religion the idea that man was created by God and that he has a soul and from Evolutionary biology they have taken the idea of the evolution of species. However, they failed to integrate this information into a unitary perspective.

References

- Darwin, Ch., *Originea speciilor prin selecție naturală sau păstrarea raselor favorizate în lupta pentru existență*, Ed. Academiei R.P.R., 1957.
- Williams G.C., *Adaptation and Natural Selection*, Princeton University Press, 1996.