

Giordano Bruno: A Cosmological view

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1 Introduction

The aim of this report is to give an overview of the life and work of Giordano Bruno, and to analyze closely his ideas of cosmology. It is written as an assignment for the 2003-2004 Cosmology course at the Kapteyn Institute of the University of Groningen.

2 Life

Giordano Bruno was born as Filippo Bruno in 1548 in Nola near mount Vesuvius in southern Italy. After joining the monastic order of the Dominicans in their monastery in Naples at the age of seventeen, he was given the monastic name of Giordano. This is also the name of the second religious head of the Dominican order.

Here he studied a variety of subjects. Aside from the usual scholastic philosophy as developed by Thomas Aquinas, he came into contact with the works of Aristotle and their derivatives by Arabian and Hebrew writers. He also studied works by the pre-Socratics, and the great classical writers such as Cicero, Virgil and Ovid. It is possible he also encountered Euclid and he must have read some astronomy, since he taught that subject some time later.

At the age of twenty-three, he was summoned to Rome by Pope Pius V, who asked him to explain his system of mnemonics. However, his stormy personality, coupled with his views on religion (he got into trouble several times for diverging religious practices, such as not worshipping the saints) and his studying the works of Erasmus, resulted in an indictment being prepared against him in Naples.

He fled from his order and shed his habit, which means he abandoned his monastic order, thereby cutting off all possibility of reconciliation with his superiors. Hereafter he wandered through Italy, getting by by taking jobs as a teacher. Finally, in 1579, he arrived in Geneva, where the Protestantism of Calvin had become the state religion. It has been suspected that he became a Protestant, but he probably was above the quarrels between Catholics and Protestants. However here too his lack of tact worked against him. In May of 1579 he joined Geneva University, and in August he published a book containing a violent attack on one of the most prominent professors at the University. Both Bruno and his printer were arrested, but while the printer was released after paying a small fine, Bruno was tried by the theological Consistory. He claimed that his writings had been completely misunderstood by the ministers of the Geneva Church, whom he considered to be 'mere pedagogues'. This unwise course of action caused him to look for a new place to go to. After some wanderings through France he ended up in Paris, where he attracted the notice of the king, Henry III, who was curious of Bruno's remarkable powers of memorization.

In those days the line between what we now know as hard science and the occult was etchy at best. Most people seemed to have believed in things like Black, White and Natural Magic. The mnemonic system of Bruno was thought by

many to be an application of some kind of magic. It was however, based on a system developed by Raymond Lull, which uses elaborate associations to aid memory. The King was delighted by these systems and offered Bruno a place at the Collège de France. This gave Bruno a time of rest, and he published work on mnemonics and philosophy. He also publishes a play, *The Torch-Bearer by Bruno the Nolan, Graduate of no Academy, Called the Nuisance*. In this play he shows his detestation of hipocrisy in both morals and learning. He deals rather harshly with the academics of the day, which does not endear him much to his colleagues. Also the religious wars between Huguenots (protestants) and Catholics make France a less than desirable place to stay, so Bruno moves on once again.

He finds a safe haven in London, where Queen Elizabeth has granted foreigners a considerable freedom of religion. Bruno lives at the house of the French ambassador. He stays at Oxford for a short time, but due to his criticism of the academics there he is not able to remain very long.

After leaving Oxford, Bruno settles in with the French ambassodor, and in this period in London he produces his major philosophical works, which are discussed in some more detail in the next section. When his host was recalled to Paris however, he had to move once again. Here he worked on some mnemonic and mathematical writings, until a pupil of his publishes *One hundred and twenty articles on nature and the world*, in which Bruno's view of the world was set out. This bold attack on all that was considered true, and especially the teachings of Aristotle, caused serious problems for Bruno, and he decided to go to Germany. He enrolled at Marburg University, but he was not allowed to teach there and moved on to Wittenberg. Here he is engaged as a lecturer for two years, until some political upheaval caused him to move once again. After some more wanderings through Germany, he was finally lured to Venice by a man who claimed he wanted to learn from him. Instead, he was handed over to the Inquisition in 1592. He was taken to Rome and cross-examined from time to time. He was told to renounce his views concerning the diverse worlds, but refused. Finally, in 1599, eight heretical ideas were extracted from his writings, which he should retract. He refuses, and in February of 1600 his books were forbidden, and he himself handed over to the secular authorities. He was burned at the stake on the 19 of Februari on the Campo dei Fiori in Rome.

3 Cosmology of Bruno

In the centuries leading up to Bruno, the Aristotelian idea of cosmology was predominant. This suggested that the universe consists of a series of concentric spheres with a central motionless earth. Immediately surrounding the Earth are three spheres connected with the other main elements (earth being one of these), arranged in order of decreasing density: Water, Air and Fire. Beyond these is a series of seven concentric spheres, each containing a planet(both the sun and the moon are counted as planets). This system puts great emphasis on the circular motion of the heavenly bodies and of the presence of an 'unmoved

mover'. It remained the standard interpretation of the Universe throughout the Middle Ages, right up to Kepler. Even Brahe and Copernicus thought that all heavenly bodies move in circles.

Copernicus still clung to the idea of a series of concentric spheres and circular motion, only he placed the Sun in the middle of the Universe¹ and the Earth in one of the surrounding spheres. He also proposed a spinning motion for the Earth to explain the difference in night and day.

Bruno however, devised a much more radical infinite universe with an infinite number of worlds. His main influences are Lucretius and Nicolaus of Cusa. Ironically these two writers take completely opposite positions. Lucretius was quite atheistical in his views, while Nicolaus sought a reinforcement of his theological ideas. Bruno had a lot in common with Lucretius: the search for truth, the vision of forces uniting in an infinite universe and the rejection of religion imposed by authority. Thus he was not anti-religious, but he opposed the idea of being told what to believe.

Nicolaus of Cusa, also known as Cusanus, was a bishop in Tyrol, and a loyal follower of the Pope. Nevertheless, he was a huge influence in Bruno's thinking. Cusanus was incredibly well read for his time. His interests include Christian, pagan, Moslem and Jewish writers. He argues that the universe can have no circumference and no centre, for if it had a centre and circumference it would be constrained within a limit, and this would be totally impossible. Just as the earth cannot be the centre of the infinite universe, neither can the sphere of the fixed stars or any other sphere be its circumference, however much the earth seems nearer to the center and the stars nearer to the circumference. In Cusanus' thought, God is both the center and the circumference of the universe. He also states that wherever in the universe the observer is, he will always appear to be in the center. This sounds a lot like the Cosmological Principle, which assumes homogeneity and isotropy. He also assumes that other celestial bodies are inhabited, each suited to their own habitat. For example, he assumes the inhabitants of the sun to have a 'fiery nature', and 'to be more spiritual than the inhabitants of the aqueous moon'.

These ideas had an enormous influence on Bruno. Just as Cusanus, he thought the universe was infinite and eternal. According to Bruno: "It is then unnecessary whether there be beyond the heaven Space, Void, or Time. For there is a single general space, a single vast immensity which we may freely call *Void*; in it are innumerable globes like this on which we live and grow. This space we declare to be infinite; since neither reason, convenience, possibility, sense-perception nor nature assign to it a limit. In it are an infinity of worlds of the same kind as our own. For there is no reason nor defect of nature's gifts, either of active or passive power, to hinder the existence of other worlds throughout space, which is identical in natural character with our own space... Beyond the imaginary convex circumference of the universe is Time. Fore there is the measure and nature of motion, since similar moving bodies are there".

¹I am using the capital U, since these people thought they were really describing the entire universe, while cosmologists nowadays know they can not yet come close to a complete description and thus use the lowercase u

Other than Cusanus, Bruno never uses Christian symbolism. He imagines an infinity of worlds, each finite like our own, with inhabitants in conformity with the conditions of their habitats. Thus, humanity has no special place, and we are equal to all other creatures throughout the cosmos.

From Lucretius and some Renaissance Lucretians, Bruno got the idea for *Minima* from which all things were formed. He viewed the phenomena around us as different groupings of these *Minima* which are in eternal motion. He saw an eternal process which could be called cosmic metabolism. In essence all matter goes through a process of which death is but a stage and life is a quality inherent to every part of nature.

In his cosmology, Bruno also uses the idea of *inherent necessity*. He considers the force leading to change in a body as a function of the nature of the body itself, which includes reaction to a particular environment in a particular manner. He thus sees the universe as a 'synthesis of freely developing innate forces impelling to eternal growth and change'(quoted directly from Singer).

He even considers this force as a Necessity, inherent in all beings. Or in his own words: *"The individual, whether corporeal or incorporeal, is never completed; and among eternally pushing individual forms, seeking eternally nevertheless those to pursue, resteth never content....This is the infinity of All ever bringing forth anew, and even as infinite space is around us, so is infinite potentiality, capacity, reception, malleability, matter"*. (From *De immenso*)

Bruno uses this theme of Inherent Necessity also as an argument for the infinite universe, since he cannot accept that the infinite nature of God is consistent with the creation of a finite universe. Also, since Man has this inherent necessity as well, he will strive for conformation with his inner nature, in fact, follow his own free will.

He also considers that all things contain the essence of all other things in them. This is another occasion where a close parallel can be drawn with our modern ideas, this is almost what could be interpreted as our scheme of elementary particles.

4 Some of Bruno's Cosmological works

Here I give a short overview of the cosmological works produced by Bruno.

4.1 The Ash Wednesday supper (La Cena de le Ceneri)

In this work he gives a satirical account of the people who disputed with him during his days at Oxford. In this work he states that Copernicus meant what he said, in spite of a foreword written to his work by a man named Osiander, who claimed that Copernicus meant his work as an exercise in mathematics and not as a representation of the real world. He takes the view that Copernicus was right in his claim that the earth was not the center of all things, and he

sums a list of persons from antiquity to the early renaissance who also kept this view.

From Copernicus the book goes on to Cusanus and others who had also developed the notion of an infinite universe, which was both an obsession and an inspiration to Bruno. At the close of the book he explains his own belief—the infinite universe with its infinite number of worlds called by the ancients” *ethera*, that is runners, messengers, ambassadors who bring tidings of the magnificence of the single Highest”. Their motion is dependent on their innate necessity, and their relative motion can be considered as an interpretation of the Earth’s local motion.

4.2 On cause, Prime Origin and the One (De la Causa, Principio et Uno)

This book concerns itself with the problems of Aristotelian philosophy. He discusses the nature of Cause and Origin. Also in this book, Bruno expresses his vision of an infinite spirit pervading an infinite universe. God is to be considered the essence by which everything has its being.

4.3 On the Infinite Universe and Worlds (de l’Infinito Universo et Mondi)

In this final work, Bruno uses, as in the previous works, the dialogue as the main form. In these dialogues, Bruno attempts to create a logical framework for his own ecstatic insight. Part of the argumentation is listed below:

Theme 1 Sense-perception must be interpreted by reason.

Theme 2 The universe is infinite. There is no proof of a boundary.

Theme 3 The universe is infinite because a finite world could not be self-contained and could not be imagined without position.

Theme 4 Quotes Lucretius: “If the universe is finite, what is beyond?”

Theme 5 The difficulty of defining position of a finite world in infinite space

Theme 6 A finite universe requires the conception of a Void.

Theme 7 The space containing our world would be void but for it. Therefore the space beyond is as our space; and in both is eternal action.

Finally this results in theme 17: **An infinite universe is satisfying to our mind and the contrary brings difficulties and inconveniences.**

5 Summary

Giordano Bruno saw the universe as infinite. It does not matter where an observer is, for he will always seem to be in the center. This could be considered to be one of the first tidings of the homogeneity of the universe which we now know as part of the cosmological principle. All stars were worlds inhabited by intelligent life, a Man was not unique. The universe and all in it is made up of minima, which were the smallest and indivisible unit in the Universe. He is

also convinced that everything in the universe has an inherent necessity which somehow causes everything to change into new forms. In the work of Giordano Bruno we find subjects which seem to parallel our current notions of cosmology and particle physics. We should be careful with such statements however, since it is easy to see what you want to see in these arguments.

6 References

- Giordano Bruno: His Life and Thought, D.W.Singer, Greenwood Press 1968



Figure 1: As a fitting conclusion to this short report: the statue of Giordano Bruno at the Campo dei Fiori in Rome, the place where he was burned as a heretic...