

SCIENTIFIC INTERPRETATION OF THE FATIMA EVENTS

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INTRODUCTION

The events and apparitions that took place in Fatima are very unusual as they are supported by extensive written evidence. This evidence was made available to the public thanks to the publication of a book¹ by the late Fina d'Armada.

This book provides comprehensive information about the events through the eyes of seers and witnesses. In such cases everything depends on the trustworthiness of witnesses and people gathering information. After reading the book I believe that the children were trustworthy witnesses especially as they were interviewed immediately after the events. The statements of witnesses describing the display in the sky on 13th October do not differ much and this provides some confidence that they are also reliable. Presented with such records I felt compelled to look at this evidence, analyse the Fatima events and eventually write my own book.²

It is very difficult to distinguish between genuine, reliable witnesses and opportunists who have subsequently learned about the facts and later produced statements based on the "me too" approach. Therefore in my analysis I have excluded statements which surfaced during later investigations of the events. Using the published materials I try to present scientific explanations of the possible techniques applied during these events without involving supernatural forces.

HOW THE APPARITIONS COULD BE PREPARED

In the case of the apparitions I based my analysis on the interviews with the children, Lucia's published memoirs and some observations by bystanders. The main purpose of these considerations is not to prove that the proposed methods were indeed applied, but to show that the events in Fatima can be explained by known phenomena which obey the

1 D'Armada, F. 1980. *Fatima – O que se passou em 1917*. Amadora: Livraria Bertrand.

2 Kulczyk, W.K. 2012. *We are not alone in the Universe*. Winchester: John Hunt Publishing.

universal laws of physics. I have to admit that some aspects of these events cannot be explained by contemporary science, but this is caused by the limitation of our knowledge rather than any supernatural character of the observed events. We still do not know all the laws of nature, especially relating to biological systems, and very little is known about the functioning of the human mind. For the purpose of this analysis I made an assumption that whatever happened there had to be subjected to the laws of nature.

During the apparitions very intricate interactions occurred between the visionaries and whoever was masterminding these events. From the information obtained from Lucia, Jacinta and Francisco we can infer that the seers could see the appearing figure, the girls could hear her, and that Lucia's questions were correctly received by the responsible instigators as sensible responses were given.

HOW THE IMAGE OF THE FIGURE COULD BE GENERATED

From the information provided by the seers it is possible to conclude that the image of the figure could be produced using an optical projection, rather than being generated in the seers' minds as a result of hypnosis or hallucinations. This confirms the fact that the children were not in a state of ecstasy, on the contrary, they were fully conscious of what was happening around them. The optical projection hypothesis supports the observation that the children, during the appearances of the apparition, had to lower and rub their eyes as the light radiating from the figure was blinding.

In order to produce an optical image a source of light and a source of the image are needed. We know from Lucia's memoirs that every apparition was preceded by a beam of light. She noticed that the Lady always arrived and left from the east, therefore the beam of light did not come down vertically, but was at a certain angle to the ground.

The figure appeared only when the light stopped directly above the tree. Many witnesses noticed that during the apparitions the intensity of sunlight decreased even though the sun was not obscured by clouds. The lowering of the intensity of solar radiation supports the hypotheses that an optical method was used, because bright sunlight would reduce the visibility and quality of any projected visual images.

The fact that the appearing Lady had always stood high on the top of the tree also supports the optical projection hypothesis. If she stood on the ground, for example under the tree, the leaves and the branches would obscure the optical beam coming from above. To prevent the beam being obstructed by other people or tall objects, the image must be placed high above them.

I have not found information concerning the generation of the image, but it is plausible to assume that it was prepared using a digital device such as a computer. This device could also control the animation and the transfer of images to the appropriate converter which would modulate the light beam. Such converters are at present universally used for the optical projection of computer images on big screens.

In order for the optical projection to produce a visible image, besides the source of image and the source of light, a screen is also needed. So what could be used as a screen in Cova da Iria?

In the statements of the children and many witnesses, there is often the description of a cloud which was visible above the tree where the figure was appearing. The cloud was fine and looked more like a mist and it seems that it surrounded and covered the appearing figure. After the apparition was finished it rose and disappeared. It was described by the witnesses, as a cloud of smoke and was observed each time from June till October.

This small cloud probably functioned as a screen for the image projection. At present it is possible to project optical images on natural or artificial clouds using strong laser light. Without the cloud the clarity of the image would be very poor and worse still, the figure could become transparent. In such a case it could be possible to see other objects, such as clouds or flying birds through the figure which would confuse the children.

To make a cloud, water and a source of heat was needed. Since the apparitions took place on a semi desert-like area, a tree was the only substantial source of water. The cloud could be generated as a result of heating the tree with pulses of infrared radiation invisible to the eye. These pulses could generate a rumbling noise similar to thunders frequently described by witnesses standing close to the tree.

From the description of the witnesses, before the apparition appeared, young shoots of the tree were firm and climbed straight upwards, but after the event they sagged and bent. If the shoots were heated from the eastern direction, this side lost more water, became softer and tilted towards the east under its own weight. One witness, Maria Carreira, describes that in June the tree was in blossom and after the apparition she noticed a round area, about 40 cm in diameter, at the crown of the tree where the shoots were tilted to the east. I carried out an experiment by shining infrared light on vertical young shoots which, after a minute of heating, bent towards the source of light.

Lucia says in her memoirs that she could see the light beam, which at the beginning she regarded as lightning, coming near. We can draw the conclusion that the ray of light was not sent directly to the tree, but came gradually closer to it. So the beam moved on the surface of Earth, and when it came across the tree, stopped and stayed in this position. In practice it

would be very difficult to aim an optical beam from a long distance directly at the tree, not knowing how it could be affected by ambient conditions. A similar method is commonly used by the air force to aim laser bombs at targets.

Examining the information provided by the witnesses it is possible to propose a hypothesis that lasers were used as the source of light. Laser light, being monochromatic and coherent, can be used to generate holographic images, its intensity can be modulated by micro-waves and audio signals and it can be easily aimed at a target. It is possible to transmit laser light over great distances as a narrow beam. At present lasers emitting white light, which consist of a large number of monochromatic waves, are available.

Assuming that lasers were used for the optical projection, this raises the question of how far away they were placed. Assuming that the diameter of the laser beam on the Earth's surface was about 2-3 metres, it can be estimated that the source of the light could be located at a distance from 100 km up to 1,000 km from Fatima. So the lasers did not have to be in the vicinity of the apparition, but equally could not have been on another planet. It is probable that they were placed on a low orbit around the Earth. So the apparitions were only possible during specific times of the day and their duration was limited. This is confirmed by the fact that they were usually around noon and lasted for no more than 15 to 20 minutes.

The light from lasers placed beyond the Earth's atmosphere could be obstructed by clouds and then any optical projection would become impossible. So clouds could potentially be a considerable obstacle. It appears from witnesses statements that during the apparitions the sun was shining. Even on the 13th October, when there were heavy clouds until 1:00 p.m., before the appearance of the figure the sun came through. It is difficult to imagine, that just a few minutes before the apparition the clouds disappeared by chance, so they were probably dispersed by some sort of heating such as infrared radiation.

HOW THE VISIONARIES COULD HAVE RECEIVED THE VOICE

During the apparitions Lucia and Jacinta could not only see the Lady, but could also hear her, and Lucia communicated with her. The children noticed at once that during these communications the Lady did not move her lips, which looked very odd. From this observation one could conclude that the sound was generated and transmitted independently of the image. It is relatively easy to generate the sound of a voice using a synthesizer, however the synchronization between the optical image and voice generation could be much more difficult. It cannot be ruled out that those who contacted the visionaries did not have sufficient knowledge about facial movements during speaking. An ill-matched synchronization would only make a bad impression on the children because it would be immediately noticeable, like a badly dubbed film.

The technique used for acoustic communication during the apparitions is not known to us. There is a possibility that modulated light beams could be used as a carrier of the acoustic waves and these waves were directly transmitted to Lucia and Jacinta causing the vibration of some parts of their heads resulting in sound being transmitted through the bone to the ears. This could explain why Francisco could not hear the Lady's voice.

It has been suggested that microwave radiation could have been used for communication with the girls. It is well known that the human ear can hear modulated microwave radiation.³ However, microwave radiation propagates in a wide diverging beam and could not be focused on only two seers. From a distance of a few kilometres the microwave beam would be received by hundreds of people and its transmitted power would have to be very large.

Witnesses standing near the children claimed that when the Lady answered Lucia's questions, they could hear a sound similar to the buzzing of an insect. So it is possible that these people heard some distorted high frequency sound waves, which could have been produced as the result of a process similar to non-linear mixing of high frequency carriers.

HOW LUCIA'S VOICE WAS TRANSMITTED

Questions asked by Lucia had to be passed on immediately, because the Lady answered them without any delay. Recipients were probably beyond the Earth's atmosphere, therefore they could not directly pick up the sound waves. One should also rule out the possibility of the propagation of sound waves over a greater distance in the atmosphere because this would cause a noticeable delay in sound transmission.

One of the possible solutions is a laser microphone widely used by spy services. The microphone operates on the principle that sound waves emitted by a person cause objects in the vicinity, such as window panes, to vibrate. The laser light sent to such an object measures its amplitude of vibration and in this way recovers the original sound wave which caused these vibrations. So the sound waves emitted by Lucia could, for example, cause the vibrations of tree leaves or droplets of water in the cloud above the tree. These vibrations would modulate the laser beam which, after being reflected from these objects, would be received and processed by special devices.

Because only a very small fraction of the light which was originally sent would reach the recipients, in order to get a good reception it was necessary to use very strong lasers. It is

³ Elder, J.A. and Chou, C.K. 2003. Auditory Response to Pulsed Radiofrequency Energy. *Bioelectromagnetics Supplement 6: S162- S173*.

possible that the lasers used for the transmission of Lucia's voice were also used for the optical projection and therefore the light radiating from the figure during the apparitions was so strong that it blinded the children.

During the apparitions certain phenomena occurred which we are not able to explain because our knowledge is still insufficient. These inexplicable phenomena include the selective control of the transmitted vision to the children which was not visible to bystanders.

It is possible to propose a hypothesis that the senses of other witnesses were blocked so that they could not see the light. This hypothesis can be supported by the fact that during the preparations for the apparition which should have taken place on 13th August but did not, pilgrims at Cova da Iria for the first and only time saw flashes of light seen normally only by the seers. Perhaps in this case the control was not applied and the onlookers senses were not blocked.

HOW THE DISPLAY IN THE SKY COULD BE DONE

After examining the witnesses' statements there is not the slightest doubt that it was not a solid object moving in the sky, but a kind of optical display.

To make a whirling and dancing disc visible at the same time to thousands of people, an image visible in a large area had to be produced. One could assume that for generating such an image an optical projection method was applied. Supposing that the image was projected on a screen positioned at a distance of 1 km from Cova da Iria at a height of 1 km, the diameter of the disc would be about 10 m. To generate such an image it is possible that several lasers were used, generating strong, colourful, monochromatic light beams which were projected on special clouds acting as a screen.

Observations confirming optical projection

All the witnesses confirmed that the disc was colourful, but the surface colours were not uniform – they were silvery in the middle and glittering in all sorts of colours at its periphery. The colours were changing in a certain repetitive pattern.

During the whirling, the rotary disc motion could be seen not in its centre, but mainly at the rim. Assuming that the image was created by the superposition of several laser beams of different colours, it is very difficult outside laboratory conditions to obtain a perfect overlap of all the beams. Where the overlap was precise, observers could see a uniform, silver colour, but on the periphery where the superposition was not as accurate, they saw various colours. To generate a rotational movement of the disc, the optical beams had to be specially modulated.

As a result of diverse air temperature and the associated uneven air densities, optical monochromatic beams of various colours travelling through the Earth's atmosphere are differently deflected. As a result of this process rays of different colours, after passage through the air, are shifted with reference to each other resulting in their inaccurate overlapping.

The witnesses also observed shaking, or “dancing”, of the disc which can be explained by similar atmospheric influences. As a result of the optical beam passing through layers of hot moving air with varying temperatures, it became subjected to varying diffraction causing its position to change. This caused the image of the disc to also change its position resulting in the shaking effect. We can observe a similar phenomena when we see stars twinkling at night. These observations confirm that the optical beams used for the display travelled a long way through the atmosphere.

As for the apparitions, a screen was essential for projecting the image of the disc. This function was also performed by clouds, however they were not natural clouds. These special, small clouds had to be continuously produced, because when one disappeared a new one appeared in its place. During the display the disc came close to the ground, so we could conclude that the screen created from these peculiar clouds stretched from the surface of the Earth to the height of at least 1 km.

Since the disc was in the same location in the sky as the sun, it was necessary to considerably limit the intensity of the sun's rays. And for this purpose artificially made clouds were used. The blocking of the sun's rays was very effective, because none of the observers looking in the direction of the sun were blinded. The weather conditions before the show helped the formation of clouds because abundant rain fell before the display and the entire area was soaked with water. The artificial clouds were probably generated by heating an area of the Earth using infrared radiation. This is supported by the statements of some witnesses who testified that their soaking wet clothes, after the display, were completely dry.

Many witnesses noticed that both the people and the landscape changed colour as if illuminated by coloured lights. The colours changed non-stop through all the colours of the rainbow and were patchy where some areas were more strongly illuminated than others. Such a phenomenon can only exist when a monochromatic source of light is used, and is caused by interference between different parts of the beam. This observation confirms the application of lasers for the optical projection of the disc.

Photographic evidence

The best proof of the optical projection would have been photographic evidence, unfortunately no photographs of this phenomenon exist. We know that Judah Bento Ruah, a

photographer who arrived in Fatima with Avelin de Almeida, a journalist from a daily newspaper "O Seculo", took pictures of the people on the fields of Cova da Iria. Photographs taken by Ruah during the display show numerous witnesses of the event, but there is no disc shining in the sky. Perhaps Ruah did not want to photograph "the sun" in order not to over expose the negatives, but it is also possible that these negatives were not sensitive enough to record the light from the disc.

From the photographs taken during the display it appears that almost everybody is looking at one point in the sky. By extrapolating the direction of their viewing, and the knowledge that the sun was 43 degrees above the horizon, one could assume that the disc was not in the view of the camera and it appears as though it was excluded on purpose. One cannot see any distinct shadows on the pictures, therefore one can conclude that the spectators were illuminated by diffused sun light, so it could not have originated from the disc. This attests to the fact that the light emitted by the disc was very faint. Perhaps it was weak to ensure the safety of the spectators. To take a photo of a safe laser⁴ display, a film with a sensitivity of ISO 0.5⁵ would have to be exposed for over 2 seconds (with $f=4$), while to take good photographs of people on a cloudy day the shutter speed would have to be set to about $\frac{1}{4}$ second.

DISCUSSION

The above scientific analysis of the events in Fatima does not answer the question of how these events were really prepared. It is not possible to establish the true events and we will most probably never learn what specific technical methods were used in Fatima. The purpose of this analysis is to establish that everything the visionaries and witnesses saw and heard can be explained and would be possible to restage applying techniques based on the known laws of physics. Perhaps we are still unable to reproduce the Fatima apparitions, but we know the technical solutions which could be applied to design similar displays. Certain issues, e.g. selective reception of the information and personal visions associated with the secrets, are still incomprehensible to us, confirming that the organizers of the apparitions had a level of knowledge superior to the achievements of our contemporary scientists. The display in the sky would be much easier to produce and we have the technology and sufficient understanding to be able to recreate it.

4 Safe laser light level given by American National Standards Institute (ANSI136.1) is 167mW/m^2

5 Typical sensitivity of photographic glass plates at that time.

The one hundredth anniversary of the events in Fatima gives us the opportunity to review what really happened there. It has been proposed⁶ that the Fatima events were similar to many UFO events. We feel uncomfortable when faced with new and unexplained events and we therefore try to convince ourselves that these events are similar to other observations. I believe that events in Fatima are unique because no other unexplained phenomena have been announced several months in advance. There is no other paranormal event which has been predicted and witnessed by 50,000 people. Comparing the Fatima events with UFO events is questionable because other observations are not supported by the same quality of witnesses and documentation.

After comparing Fatima with UFO events I came to the conclusion that ufologists suffer the same lack of imagination as astronomers searching for extraterrestrial civilisations on the SETI⁷ programme. They believe that extraterrestrial civilisations are just slightly more advanced than us, say a couple of hundred years, and use similar technologies to ours such as microwaves, rockets, etc. It is more likely that these civilisations could be many millions or maybe even a billion years old and they are different from us beyond our imagination.

I believe that the Fatima events could have been organised by such a civilisation and what I have tried to present here is not proof that these events used a specific technical solution but to show that these events could have been arranged using currently known technologies.

6 Fernandes, J., D'Armada, F. 2007. *Heavenly Lights*. San Antonio: Anomalist Books.

7 Search for Extra Terrestrial Intelligence.