

Report on the Analysis of Anomalous Physical Traces: The 1981 Trans-en-Provence UFO Case

JEAN-JACQUES VELASCO

Centre National d'Etudes Spatiales, 18 Avenue Edouard Belin, 31055 Toulouse, France

Abstract—Following information received through law enforcement channels, the Unidentified Aerospace Phenomena Study Group (GEPAN) of the French National Center for Space Studies decided to investigate an observation of an unusual flying object made on 8 January 1981. The witness reported that the phenomenon had left a circular imprint on the ground. Samples gathered within this "ring" were independently analyzed by four laboratories and were compared to reference samples collected outside the trace. These analyses led to the conclusion that a significant physical phenomenon had indeed interacted with the environment at the site, producing abrasions, thermal impact and unexplained effects on plants.

Part One: Field Investigation

1. Chronology of the Trans-en-Provence Case

On Friday January 9th, 1981, police authorities in Draguignan, France received a telephone call reporting a sighting of an aerial phenomenon which the author of the observation could not identify. In addition the witness indicated the presence of physical traces on the ground at the site. These events were reported to have taken place on the previous day (Thursday January 8th) in the nearby town of Trans-en-Provence.

The Groupe d'Etudes des Phenomenes Aérospatiaux Non-identifiés, or Unidentified Aerospace Phenomena Study Group (GEPAN), organized within CNES, became aware of the case through the Gendarmerie on the morning of Monday January 12th. It was learned that law enforcement authorities had taken soil samples on the day of the report. Since it had rained heavily over the weekend, GEPAN investigators decided it would be fruitless to travel to the site immediately. Instead, they requested speedy delivery of the samples collected on the previous Friday.

GEPAN further learned about the nature of the traces through a telex received during the afternoon of January 12. Several private groups also heard of the case through local press reports and went to the site. One of their investigators began his study on January 13th.

2. Information Collected by Police Authorities

The Draguignan Gendarmerie had first been alerted by the witness' neighbors. The site was visited by an officer on Friday, January 9th about 11:30

a.m. The physical traces were observed, the witness was interviewed, photographs were taken, and soil samples were gathered according to standard police procedures. A few days later these samples were indeed forwarded to GEPAN while vegetal samples were sent to a laboratory of National Institute for Agronomical Research (INRA).

A short time later complementary samples were collected at the request of the analysis laboratories, as follows: (a) reference vegetal samples, gathered by the Gendarmerie on January 23rd and (b) a complete series of vegetal samples gathered by GEPAN itself on February 17th.

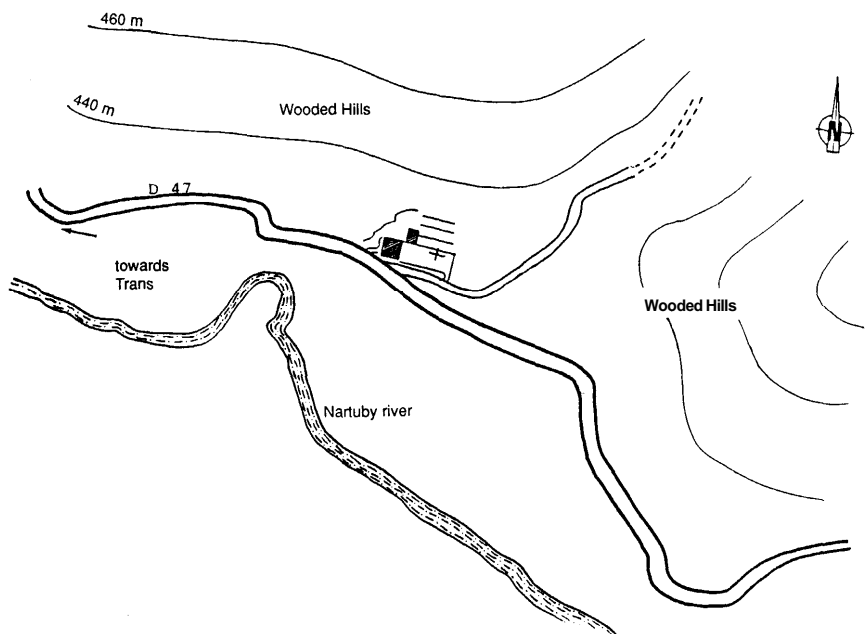
The decision to intervene was made by GEPAN because this particular case presented two types of information that could be confronted and correlated, namely the single witness report and the physical traces observed at the site. GEPAN does not routinely investigate cases when a single source of information is present because in such instances the investigator is unable to make comparisons and inferences among data coming through different channels.

Under the methodology used by GEPAN, to each type of available information there correspond a set of appropriate analysis techniques. Physical traces only constitute a useful channel of information to the extent that the analysis can be conducted before these physical effects have been dissipated. Among other requirements this involves securing the site rapidly and obtaining rigorously-controlled samples under normal weather conditions. These minimal prerequisites were found to be satisfied in the Trans-en-Provence case: Accordingly GEPAN proceeded with its full investigation.

3. *Environment of the Site*

The village of Trans-en-Provence is located 3 km south of Draguignan. Mr. and Mrs. Nicolai live on a property situated 2 km east of Trans, on the side of a hill overlooking the valley of the Nartuby river (Figure 1). This valley is oriented east-west and contains numerous orchards and small agricultural plots. The sides of the valley are covered with woods and with Mediterranean vegetation. The sparse dwellings have their openings (windows, doors) facing the valley. Many terraces dug into the hillside make possible more intensive use of the soil for cultivation. Retaining walls, locally known as "restanques" and generally built out of native stone, have an average height of two m.

The plot of land owned by Mr. and Mrs. Nicolai is located some distance away from the D47 road, on the north side of the valley. A dirt road runs along the property. It ends 400 m away at an isolated farmhouse. The property is structured in such a way as to make the best possible use of the contour of the hillside. The house is built over several levels of retaining walls and it is partially dug into the hill. The driveway is covered with asphalt at the level of the basement, 30 m away from the road running to the west. On the left side



Scale: 1/5000

Fig. 1. Location of the Nicolai property.

of the villa are some stairs leading to the living quarters. To the right a slope prevents access to the upper terrace, which is reached through the dirt road previously mentioned.

This terrace or platform is linked to the other levels through stairs located behind the house. However, it is almost never used, except to play "petanque" (a game of skill using metal spheres, very popular in the South of France). To the northeast side of the hill are two higher levels (labeled level two and level three on Figure 2), each about one m high. Two structures rest on these levels: a pumphouse at the edge of level three and a stone cabin straddling both levels.

Above the larger platform are two levels that are used as vegetable gardens, about 50 m long and 2.5 m wide. Woods of conifers and leaf-bearing trees, some dozens of meters tall, surround the property, except on the southwest side facing the Nartuby valley. No obstacles of any significance, such as power lines, telephone lines or TV relays, are visible from the Nicolai property. In fact, from the large platform where the phenomenon was seen, the visual field is totally open to the Southwest over nearly 180 degrees. The only obstacle to the line of sight is the landscape on the other side of the valley, about 2 km away (Figure 3).

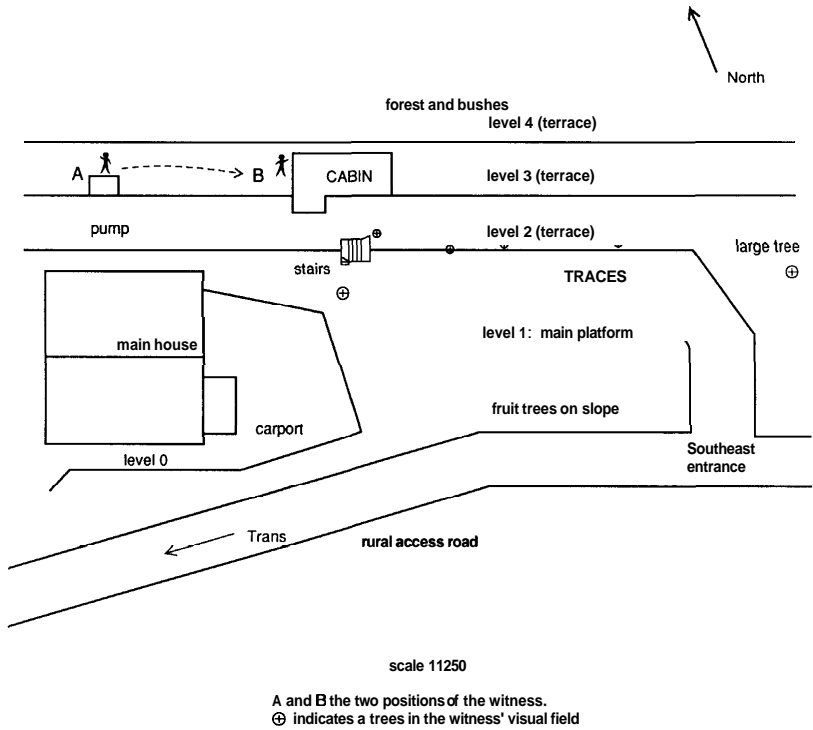


Fig. 2. Map of the property (drawn by Gepan).

At the time of Mr. Nicolai's observation the nearest weather station registered the following measurements 17 km to the southwest of the site:

- Temperature: 6.8 degrees Centigrade
- Humidity: 30%, no precipitation
- Wind: Southeast at 2 m/s
- Clouds: 2/8, good visibility.

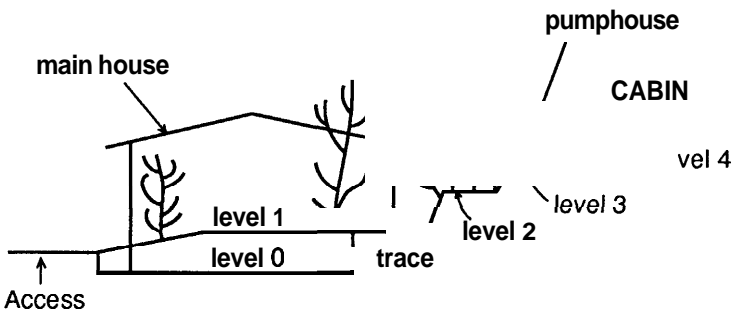


Fig. 3. Details of the location.

4. *Testimony of the Witness*

I have lived in Trans-en-Provence at my current address for nearly 14 years. My wife and I live alone. She is the cleaning lady at the social security office in **Draguignan**. I have not worked since November 1979. I was previously an employee of the S.C.N.I. company. This firm went out of business and I was laid off. I receive a disability pension because I suffered from a heart problem since 1973.

Yesterday, January 8, 1981, I was busy around the house as I am practically every day. I was behind the house, which is built over a "restanque" (raised level). I was building a concrete shelter for a water pump. Behind my house on the same level is an expanse of flat ground. It is reached through a path along the base of the house.

It was about 5 p.m. The weather was turning colder. My attention was attracted by a slight noise, a sort of faint whistling. I turned around and I saw a device in the air at the height of a big pine tree on the edge of the property. This device, which was not spinning, was coming lower towards the ground. I was only hearing a slight whistling sound. I was not seeing any flames, either below or around this device.

While it was continuing to come down, I went closer by walking towards the stone cabin above my house. When I placed myself against the wall of the cabin I could see very well over the roof, since this cabin too is built over a raised level. I was on the higher level, about 1.2 m from the roof [Figures 4 and 5]. From that position I clearly saw the device resting on the ground. Right away it lifted off, still emitting a slight whistling sound. Reaching a point above the trees it left at high speed towards the forest of Trans, that is towards the northeast.

When the device lifted off I saw four openings below, through which neither flame nor smoke were escaping. The device kicked off a little dust when it left the ground. At that instant I was about 30 m away from the landing site. Later I went to the spot and I noticed a circle about 2 m in diameter. At certain places along the circumference of the circle were traces like abrasions.

When my wife came home in the evening I told her what I had seen. My wife thought I was joking. This morning in full daylight I have shown her the trace of the circle. My wife called our neighbor Mr. X on the telephone. He came over with his wife. I showed them the trace, too. It is then that they advised us to call the Gendarmerie.

The device had the shape of two saucers, one inverted on top of the other. It must have measured about 1.5 m in height. It was the color of lead. This device had a ridge all the way around its circumference. Under the machine I saw two kinds of round pieces as it was lifting off, they could be reactors or feet. There were also two other circles which looked like trapdoors. The two reactors, or feet, extended about 20 cm below the body of the machine. I have not felt any disturbance of the sense of vision or hearing.

The witness was also interviewed separately by an investigator with a civilian research group, who summarized his testimony as follows:

Mr. Nicolai is busy with some masonry work on a terrace just above his villa. As the evening comes, he wants to finish the job before the night. Suddenly, at the end of the dirt platform he sees a round object, dark in color, "fall" from the sky just between the tops of two high trees. Since this fall was not accompanied by any noise he is surprised and he looks carefully at the spot where the strange object has landed. He is about 80 m away. The device is motionless against the retaining wall (half clay, half dry stones) that borders the platform towards the hillside, to a height of about 2 m.

From his location the witness observes something like a large inverted bowl, dark gray in color, dull. Surprised, he walks towards this strange object and comes to a



Fig 4. View of the site retaining wall and forest.

position at the edge of the level, about 45 m sway from the traces that will be observed after the departure of the object. Then he discovers a sort of ovoid vehicle, with the general shape of two half-spheres of unequal volume, clearly separated by a flat ledge, extending at least 15 cm and forming a ring around the metallic mass which has a lead-aluminum appearance. The top part extends above the retaining wall, hence the machine has a height between 2 and 2.5 m. The witness does not see any antenna, any porthole, any opening. He notices no extension, no external mechanical peculiarity. The whole thing seems smooth and compact to him. He estimates the horizontal diameter of this machine to be larger than its height. He has no time to continue his observation. The machine lifts off, making a slight amount of dust and with a soft whistling. Then it seems to tilt, exposing its underside and it takes off at lightning speed, passing exactly between the two tall trees, at the exact spot from which it had seemed to "fall."

The witness has noted that the landing trajectory is not identical to the take-off trajectory. When the machine rises and tilts on its departing path the witness notices

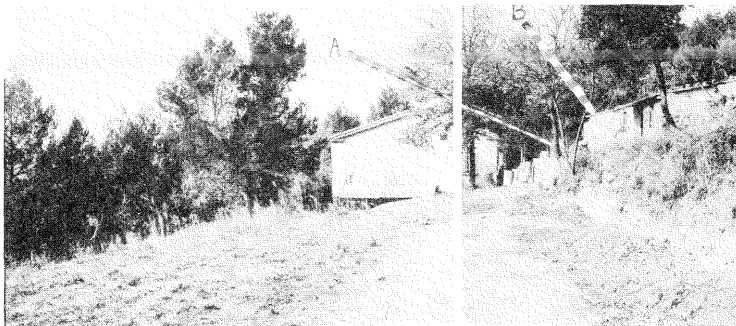


Fig 5 View of the site Mr Nicolai's house seen from the trace A and B are the locations of the witness when the object was first observed and when it landed, respectively

four accessories under the device. He compares them to masonry pails in diameter and length. But he acknowledges that his description is imperfect and approximate, since the observation has been very brief because of the speed of the object and its almost instantaneous disappearance. He has not heard any particular engine noise in the silence of the countryside. He has felt no heat, no vibration. He has felt no disturbance either during the observation or afterwards. He has only been very impressed by this unusual sight. He makes the drawing shown in Figure 6 representing the device.

Worried and amazed, he goes inside his house and tells his wife about the sighting. Skeptical and distrustful, she recommends to him not to stay home to avoid having another encounter. The next morning they go together to the place where Mr. Nicolai has noticed some clearly visible traces which they are sure were not there the day before. Observing the material character of the sighting they think it useful to call the local Gendarmerie immediately for reassurance.

5. *GEPAN's Reconstruction of the Phenomenon*

Given the fact that this is a single-witness case (no additional witness was uncovered at a later date) the GEPAN investigation on February 17, 1981 centered on the gathering of additional samples, especially vegetal samples. The witness was heard as well as his wife, and a brief reconstruction of the sequence of events was conducted at the site.

Trajectory. The witness states he began to perceive the phenomenon in the sky above the trees at the back end of the large platform, more precisely between two tall conifers that tower above the wood. Mr. Nicolai states that the motion was fast and continuous, without sudden changes in speed, and that there was no stop until the time when contact was established with the ground (Figure 7 and Figure 8). When asked to locate the impact area Mr. Nicolai points to the spot where the traces are still visible. The departure trajectory is described by the witness as similar to the path of arrival. However, some additional details will be given below (see "departure").

Duration. According to our reconstruction the arrival phase of the phenomenon was quite brief, of the order of a few seconds. Then the witness leaves his work and moves to the cabin wall. The phenomenon is at ground level on the terrace. The witness watches for a few seconds. Suddenly the phenomenon rises, flies over the wood and goes away towards the East at a high rate of speed, rising in altitude according to its decrease in apparent diameter.

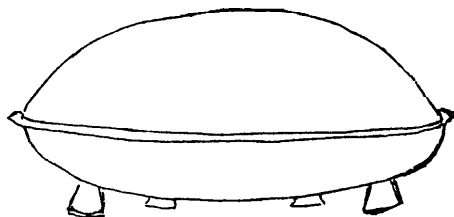


Fig. 6. Drawing of the "device" for a private research group (drawing by Letémoïn).



Fig. 7. Landing trajectory.

From the data given by Mr. Nicolai, we estimate the global duration of the sighting to be between 30 and 40 seconds. It is noteworthy that the witness was in good observing conditions throughout the event. His position on the higher level, behind the pump shelter or behind the cabin provided a fairly open vision field of more than 90 degrees, with only three trees as obstacles. Distance. If we consider the beginning of the approach phase until impact, the estimated distance may be about 20 m. The distance between the pump

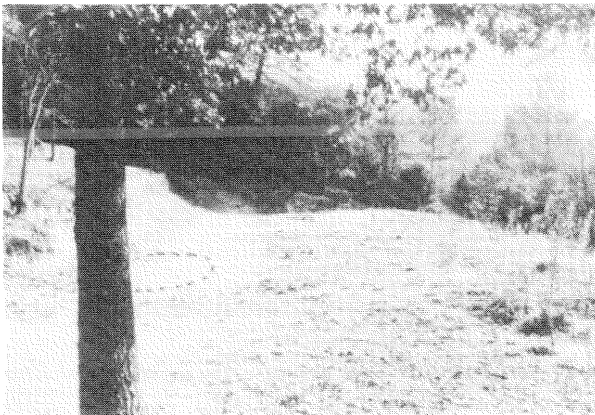


Fig. 8. Landing site: the platform and location of the trace

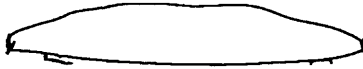


Fig. 9. Side view (object on the ground).

house and the cabin is 17.5 m. From that cabin to the impact point, the distance is 30 meters. It is likely that Mr. Nicolai was never more than 70 m away from the phenomenon, and never less than 30 m.

Shape. Mr. Nicolai does not say very much about the shape of the phenomenon as it descended. After it stopped and he was able to get nearer, he was better able to observe the object. This is consistent with the claim that the approach and the landing took place very fast. The witness gives a precise description of two phases: when the object was on the ground (Figure 9), and when it took off (Figure 10).

When the object was on the ground, the witness does not compare the phenomenon to a known object, but he refers to it as a *device* ("engin"). He stresses that on the side of this device was a thick ridge, flat in color, that circled the object. Under the device were two things compared to feet or pods.

When the object takes off Mr. Nicolai is able to see it from underneath. Its shape is circular. In this visible area he observes four circles of smaller diameter, arranged symmetrically in a perpendicular position. They are clearly seen and he compares them to *masonry pails*. (The witness, it will be recalled, was a professional contractor.)

Dimensions. Mr. Nicolai estimates the dimensions of the device with respect to available references before him. This is fairly simple to do since the object is located on a platform limited by a retaining wall of known height (2.5 m). He states that the outside diameter is about 2.5 m, the height is between 1.7 and 1.8 m, and the diameter of the small circles is that of a pail. It is noteworthy that the resulting **diameter/height** ratio (computed as 1.42) is very different from that shown on the witness' drawing of Figure 9 (computed as 5.66),

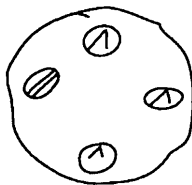


Fig. 10. Bottom view (object taking off).

and also from that drawn for the investigator of the private group (Figure 6) which is calculated to be 2.25.

Color. Mr. Nicolai states that the *device* is gray in color, comparable to zinc, darker and more flat in the thick lateral region. When he watches the bottom of the *device* the four pods seem to him to be darker than the rest, but always of the same general color.

Sound. The witness states that it is the sound that drew his attention to the object in the first place, while he was busy on the pump shelter, about 70 m away. He was then looking in the opposite direction and had to turn around to see it. He has great difficulty in defining the nature and the level of the sound. He compares it to *a wind blowing fairly strongly*. He does not say whether or not the sound stopped during the landing. The shock at the impact point was recalled like that of a stone falling on the ground. During the take-off phase the sounds were of similar amplitude as they were during the approach.

The Take-of phase. It is during this phase that the witness observes the greatest quantity of details. This is understandable since the witness is now at the closest point, about 30 m: He has overcome his feeling of surprise and is able to react. According to him, the object was testing on the ground for several seconds before it suddenly rose vertically over several meters, tilted above the platform, continued to rise in this position and disappeared in the sky.

6. GEPAN's Interview of the Witness

Mr. Nicolai is a man who has been ill for several years: He suffered an infarctus with subsequent relapse which now prevents him from exercising his professional activity. He was very tired when we visited him. After the reconstruction of the events, he had to go inside and rest while we collected the samples. Afterwards, Mrs. Nicolai told us that he could see us again. She gave us some additional details about his observation, and she expected from us some explanations in return.

We had our conversation in the family kitchen, where Mr. Nicolai was waiting for us. He resumed his narrative, trying to find an explanation that would satisfy his curiosity. He reviewed the various kinds of flying craft (airplanes and especially helicopters) but he stated, "It isn't possible to land here, there are other sites in the valley that are more convenient, more flat."

Mr. Nicolai came back to the *device*, and especially to the marvelous technology it represented, repeating, "It made practically no sound, it flew vertically, it fell like a stone and it didn't break," and he concluded "it's probably a military device, there are some nearby." He was alluding to the camp at JOUVAN, not far from Trans.

First Reactions. We have stressed the fact that Mr. Nicolai did not observe the object passively; instead he went closer to this device that had landed on

his property, while staying on guard behind the cabin wall. His first idea was that of a military craft. This was still his hypothesis when we came to see him, in spite of many visits by policemen, journalists, civilian investigators, and others. He felt sure he had been confronted with a type of military equipment he found remarkable for its flight characteristics and its landing precision. He eliminated right away the helicopter idea because of the proximity to the retaining wall: "The device was almost against the wall."

After the event he resumed his work on the pump shelter. When his wife came home about an hour later he tried to explain to her what he had seen that afternoon. Mrs. Nicolai did not believe her husband at all. Given his state of health, she even advised him to go and rest. The next morning he convinced her to come and see the traces which were still visible. Mrs. Nicolai went with him and observed the traces. She then realized that something had indeed taken place and that her husband had not told her the story as a joke. She immediately decided to tell her neighbors who had a certain social status (revenue service inspection) and who could advise her regarding the steps to be taken. These neighbors alerted the Gerdarmerie at Draguignan.

Belief System Changes. During our interview Mr. Nicolai told us that he has heard the word UFO ("OVNI" in French) on television. The family TV set is in the kitchen where he eats all his meals and where he spends several hours a day watching various programs. Otherwise Mr. Nicolai tells us he practically never reads, not even the newspapers. Thus, he does not know what the letters UFO stand for: we explain the meaning of the term to him.

The witness tells us that he has often heard this word since his observation. Private group members and journalists have spoken to him about "extraterrestrials" to find out if he had observed any. He answers frankly, without any hesitation and even with a little smile, that he has never seen any such thing. He then starts discussing life in the universe. He doesn't know precisely what this concept refers to; he confuses the notions of "universe" and of "galaxy." He speaks about the stars and believes that if there are stars, there are other forms of life, and that such extraterrestrial life would manifest in a way identical to ours.

Regarding his religious beliefs and their evolution after his sighting, he answers that he believes in God and that this event changes nothing about his beliefs. His wife who attends the interview, insists in getting into the discussion to answer in place of her husband. She speaks about her own religious views. She explains that for the last few years she has evolved towards less strong beliefs. She does not have a precise idea about the meaning of the terms "Universe" or "Space" and she shares her husband's notions about extraterrestrial life. At the end of our interview she insists in pointing out that we would never have met with her husband if it were not for the trace visible on the ground. She does not quite understand why people are so interested in what her husband has observed.

Follow-up Investigation. As a result of inquiries made to civilian and military agencies in the area regarding aerial traffic over Trans-en-Provence we were

told by ALAT that it seemed only a helicopter flight had taken place, at an altitude of 200 m about 4:30 p.m. on January 8, 1981. Trans-en-Provence is located close to one of the largest camps for military maneuvers in France, at JOUVAN. We alerted military authorities to find out if any unusual activity had taken place on that day. The only notable event around the time of the sighting was a short-distance firing of a tank gun using a blank shell. The gun fired towards the west, and the event took place over 25 km North of Trans-en-Provence.

7. Synthesis of the Witness' Report

There are very few differences, as the reader can observe, between the various versions of Mr. Nicolai's basic testimony. However, these versions are far from identical. The differences have to do with the choice of words. (In terms of linguistic analysis, these differences appear with the use of a neutral vocabulary, an evocative vocabulary or a "significative" vocabulary). Naturally, this choice of words may be due to the investigators themselves rather than to the witness.

Because of Mr. Nicolai's case imperfect command of French we tend to believe that the differences between the various versions are due to the investigators. For instance, in the version given by an investigator from a civilian group, the text is more literary and more dense: he "is surprised . . . strange object . . . impressed by this unusual sight . . . worried and amazed and it often refers to preexisting imagery in the mind of the investigator: "he discovers a sort of ovoid object . . . the witness does not see any antenna, no porthole, no opening. . . lightning speed." This version fails to note that it is the slight sound (whistling) that attracted the witness' attention. In contrast, the narration mentions a displacement of dust when the device leaves the ground, a detail which did not appear in the GEPAN interview. Finally, the drawing given by the witness to that private group is fairly different from that supplied to GEPAN: it is more in line with the "classic" UFO and it is drawn with a surer hand.

In summary, the differences we have noted do not lead to a negative assessment of the witness. His own subjectivity does not seem to have impacted his testimony either on the affective scale (expectations) or on the cognitive scale (existing hypotheses). However, the verbal expression difficulties Mr. Nicolai experiences may have encouraged the investigators to inject their own subjective interpretations into the testimony. The analysis becomes too complex at this point to lead to a precise, detailed conclusion about this single-witness account. We can only state that it is generally consistent.

Part Two: Soil Sample Analysis

1. The Trace and Physical Samples

At the end of his observation, Mr. Nicolai went to the place where he thought the observed object had landed on the ground. At that precise loca-

tion he discovered some unusual traces, clearly seen on the ground of the platform. These traces have now been examined, photographed, sampled, and analyzed in various laboratories.

The traces were located in the large platform at level 1, near the dirt path at the south-east entrance to the property. They were visible on the hardened dirt near the retaining wall, 22 meters away from the tree to the left of which Mr. Nicolai saw the shape at the beginning of the sighting. As early as Friday January 9th, the Draguignan Gendarmerie examined the traces and stated:

We observe the presence of two concentric circles, the first one 2.20 m in diameter, the second one 2.40 m in diameter. These two circles leave a crown 10 cm wide. On this crown two diametrically opposed sections are visible, about 80 cm long . . . which present black striations similar to abrasion traces.

A drawing was made (Figure 11) and four photographs were taken (Figures 12, 13, 14, 15).

A few days later, the investigator sent by the private group gave a somewhat different version. Instead of two diametrically opposed sections, clearly more marked than the rest of the ring, he observes:

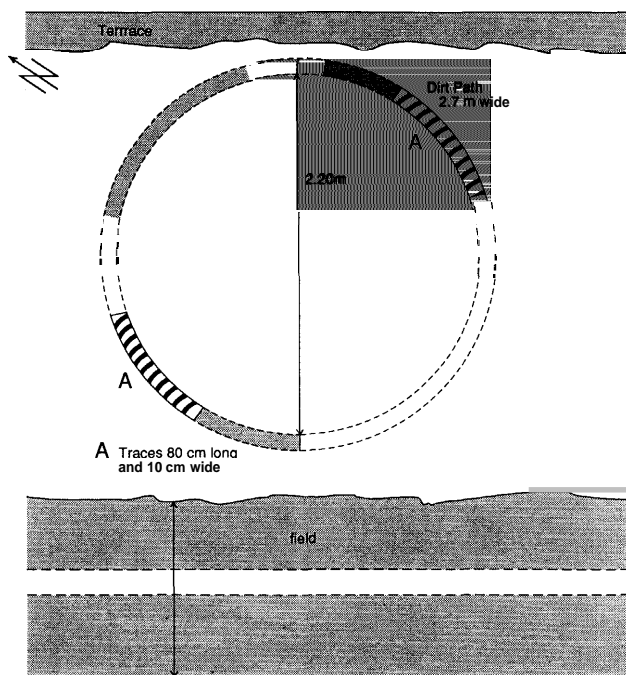


Fig. 11. Drawing of the trace by the Gendarmerie.

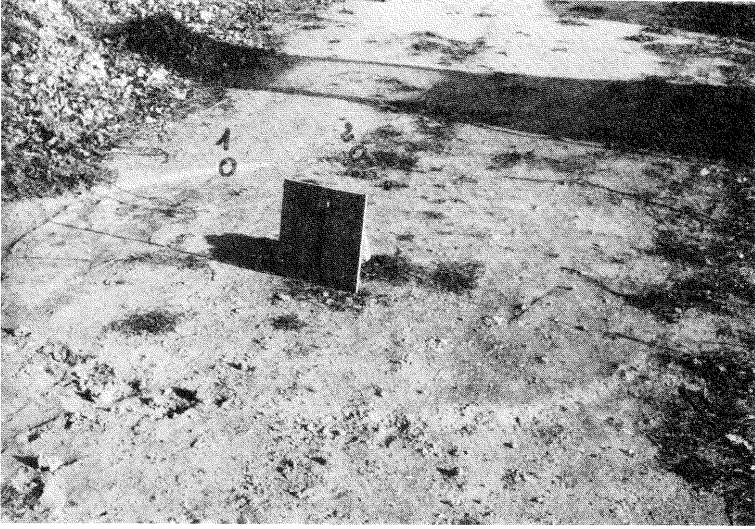


Fig. 12. Location of the trace.

Rather a horseshoe which bears regular striations as if a metal had been dragged over the area . . . over this striated surface perfectly clean, all trace of vegetation has disappeared. (This last observation was incorrect — Author).

On February 17, 1981, or 40 days after the sighting, the trace was still visible, probably because of the slight amount of precipitation since January

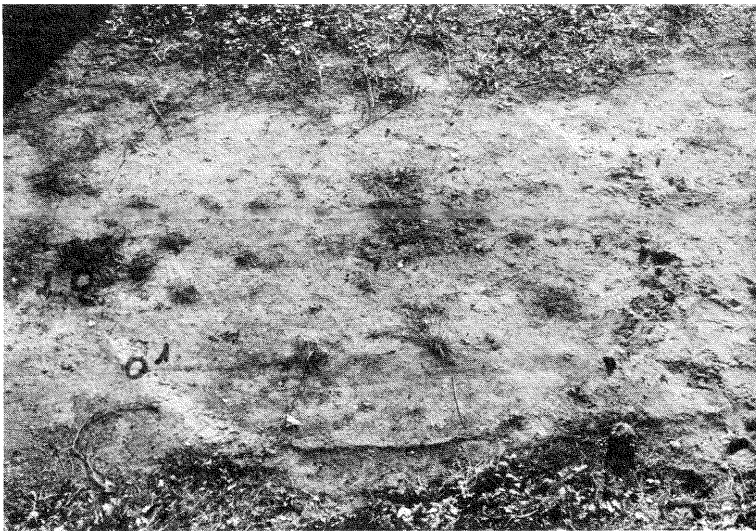


Fig. 13. Location of the trace.

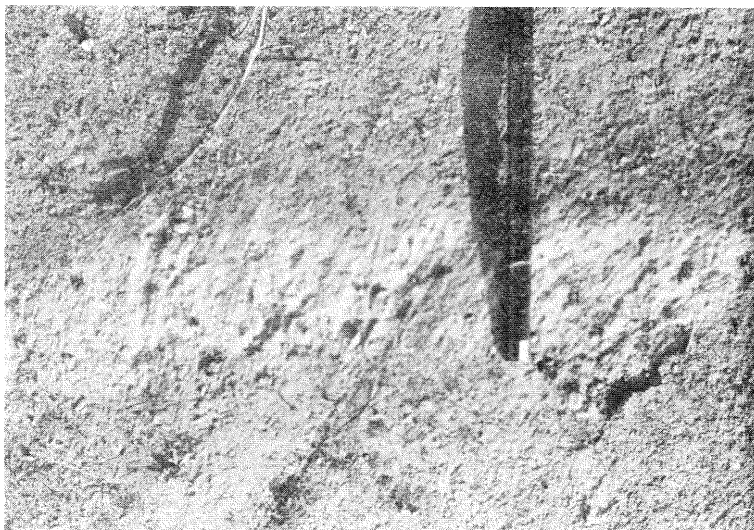


Fig. 14. Close-up view of the trace.

8 (a single storm shortly after that date) but also because this part of the property is not used often. One could still see an arc-shaped area, lighter than the rest of the terrain. The dirt was heavily compacted there, forming a crust about 1 cm thick. In some places the surface seemed to have been rubbed over a short distance,



Fig. 15. Close-up view of the trace.

Three sampling operations were conducted over this area:

On January 9 four samples were taken by the Gendarmerie, consisting of a dirt sample (P1), small quantities of surface soil (Q1) and depth soil below the crust (Q2), and an alfalfa sample.

- On January 23 the Gendarmerie took new samples at the request of the biological analysis laboratory. These vegetal samples were taken far away from the trace (about 20 meters away).
- On February 17 GEPAN took a new series of 8 vegetal samples. A new soil sample called P2 was collected outside of the trace area, 3 or 4 meters away.

Table 1 summarizes the characteristics of the four soil samples.

The analysis began at CNES with the visual examination of sample P1 using a binocular enlarging lens. A selection of areas presenting an interesting appearance were later examined under a microscope.

The samples were then forwarded to various laboratories equipped for physical and chemical analysis in an effort to determine the element composition of the P1 and P2 samples, and to identify possible variations between the two samples. It was thought that such systematic comparisons might lead to the discovery of mechanical, thermal or radiation effects correlated with the phenomenon. (Samples Q1 and Q2 were not used at this stage). The following sections present the results of these independent analyses.

2. Visual and Microscope Analysis (CNES-Toulouse)

A series of photographs were taken using an optical microscope with low magnification. In these tests sample P1 was divided into two parts, respectively designated as P1a and P1b.

Sample P1a showed heavily compacted dirt with a crust 6 to 7 mm thick, predominantly composed of very dry limestone with only a few traces of dessicated vegetation in the form of moss. Curved striations are clearly seen on the surface, indicating that this dirt has been exposed to a rubbing effect that has resulted in the abrasion of some silicium grains (Figure 16). Further

TABLE I
Physical samples

| Id | Date | Location | Area | Description | Amount | Depth |
|----|--------|-----------------------|-------------------------|-------------------------------------|-------------|---------|
| P1 | Jan 9 | on the ring | tens of cm ² | surface spots | about 100 g | 2 cm |
| P2 | Feb 17 | 4 m away from ring | tens of cm ² | small shovelful of loose soil | about 200 g | surface |
| Q1 | Jan 9 | on the ring | few cm ² | surface soil | few g | surface |
| Q2 | Jan 9 | on the ring | few cm ² | depth soil | few g | 2 cm |

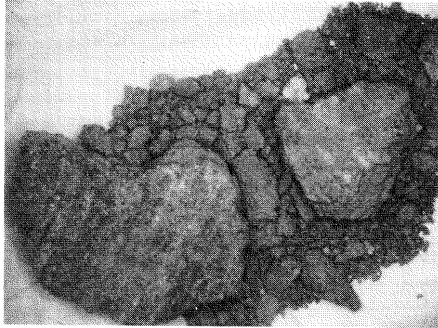


Fig. 16. Sample P1a, magnification – 1

examination disclosed a spot where a small silex had been not only imprinted but ground to the level of the surrounding dirt (Figure 17). The soil has been fractured on either side of this silex, possibly under a combination of mechanical and thermal action. To the right of this area in Figure 17 it appears that the soil is darker and contains small vegetal shoots that have germinated after the gathering of the sample. The abrasion effect is less visible in that area.

Sample P1b comes from the same part of the ring as P1a. It exhibits similar compression effects as well as striations. It also shows a darker area that could correspond to foreign material or even to a transformation of the surface material (Figure 18). This is clearly observable on Figure 19 and also on Figure 20, where some plants are germinating and pushing back the black material.

3. *Physico-Chemical Analysis (SNEAP)*

The SNEAP laboratory in Boussens is often entrusted by GEPAN with preliminary analyses aimed at detecting and identifying organic or mineral

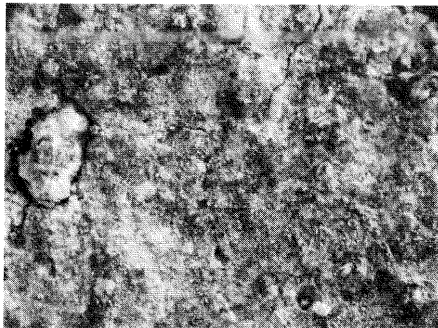


Fig. 17. Sample P1a, magnification = 6.4.

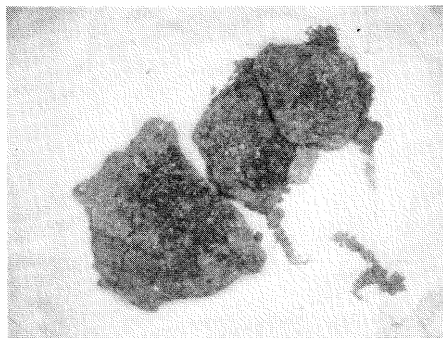


Fig. 18. Sample Plb, magnification = 1

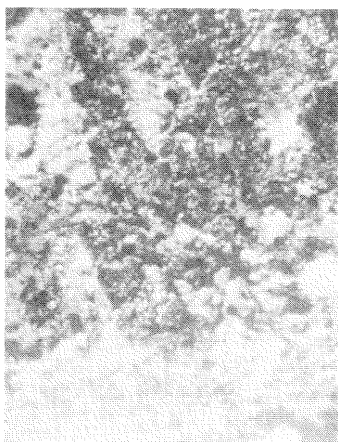


Fig. 19. Sample Plb, magnification = 5.

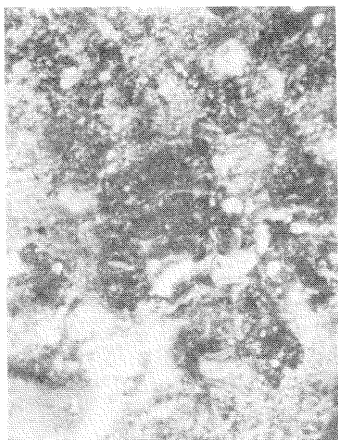


Fig. 20. Sample Plb, magnification = 13

items or elements in samples. In this particular case the laboratory conducted two types of analyses, the first one on the black area identified previously, the second one on the striations of sample P1b.

The analysis disclosed that the sample contained none of the organic compounds that are characteristic of combustion engines using hydrocarbons. An electronic microscopic analysis of the same P1b sample showed the presence of Iron overlaid over limestone rocks in the form of striations about one micron thick. This iron element was not accompanied by chromium, manganese or nickel as commonly found in steel. The technique employed here (using a CAMECA probe) did not allow the investigators to distinguish between free iron or iron oxide.

4. *Electronic Diffraction Studies (Toulouse University)*

Further analysis was conducted at the Paul Sabatier University in Toulouse (Ranguel Faculty) by dissolving parts of the samples in water, desiccating them by ultrasound dispersion and processing them by electronic diffraction. When applied to P2, this analysis led to the identification of at least three compounds: $\text{BaCa}(\text{CO}_3)_2$, $(\text{CaO}_2, 8\text{H}_2\text{O})$ and to a lesser extent Fe_3O_4 . The first two compounds may have been an artifact of the process itself.

When applied to P1b a larger concentration of $(\text{CaO}_2, 8\text{H}_2\text{O})$ was found in crystalline form. It is noteworthy that at least one of the components of this sample is in a mono-crystalline state, which is not found in the reference sample (namely P2).

5. *Control Study (Metz): Mass Spectrometry by Ion Bombardment*

In order to permit a more objective interpretation of the analytical results, GEPAN entrusted various laboratories with the same tasks. Thus the LAMMA analysis laboratory at Metz University was sent part of the soil, both from the reference sample and from the hardened ring. The scientists at Metz performed a mass spectrometry analysis by ion bombardment. When applied to the ring sample they found the following:

- Negative ion analysis disclosed that the larger black particles (100 microns) exhibited the presence of $\text{C}_2\text{H}_2\text{O}$ with a significant effective section. They also found ions 63 and 79 which are typical of iron phosphate. The negative spectra thus obtained were analogous to those of some polymers or petrochemical residues.
- Positive ion analysis showed that the black particles differed from the surrounding dirt through the lack of Aluminum. The elements Sodium, magnesium and titanium were only present in very small amounts. The dominant component was Calcium. Other fragments already found in negative ion analysis confirmed the existence of a carbon-based polymer matrix.

From these tests it was concluded that the larger black particles appeared to be a combustion residue.

6. *Control Study (Pau): Spark Mass Spectrometry*

The Laboratoire d'Analyses Physiques (LDP) based in Pau is specialized in physico-chemical trace analysis applied to mineral and organic materials. The CNES staff has been familiar with this establishment since the days when it performed lunar soil element analysis on behalf of CNES, working from rock samples provided by NASA. LDP uses a spark mass spectrometer and applied this instrument to fragments of the same soil samples that had been provided to the laboratories mentioned above.

The analysis showed that the sample contained common soil with a limestone-clay base. Little difference was found between the reference sample and the sample which contains a visible foreign deposit. The only detectable elements in this deposit are zinc and phosphate. The laboratory offers the hypothesis that this may be due to the rubbing of black paint based on "Carbon Black."

7. *Synthesis of the Analysis Results*

The various analyses reported above show that the area of ground where the phenomenon is reported to have been observed by Mr. Nicolai has indeed undergone certain alterations of a mechanical and thermal nature, as follows:

- Mechanical effects are exhibited on figures 14 and 15 where one can see dark and light areas corresponding to curved striations with precise groove-like contours. A piece of silex has been cut and it even appears to have been superficially ground or polished. The dirt gathered at this particular spot is hardened, compacted and it exhibits a crust which contrasts with the reference sample, which is loosely structured.
- Thermal effects produced by friction were noted by the SNEAP laboratory because the sandstone is found to be more compact under the black iron (or iron oxide) trace than at other locations. In addition, grains of CO_3Ca are not "swarming." Hence they cannot have been heated up to more than 600 degrees C, a process which would have dissociated, then recombined this compound. Furthermore the Ranguel laboratory failed to reproduce the observed microcrystallisation by heating the sample to 1,000 degrees for two hours.

In summary we find that a strong mechanical pressure, probably due to a shock, was exerted at the surface of the ground. Superficial modification of the structure (striations and erosion) took place. A heating effect which may have been caused by this shock, but which did not exceed 600 degrees, was subsequently observed. Foreign elements consisting in a small quantity of iron (or iron oxide) over a limestone grain, and a small but detectable amount of phosphate and zinc were deposited at the site.

Conclusions

The report by Mr. Nicolai describes an observation made in daylight from a distance of about 30 meters, for a duration measured in multiples of 10 seconds, during which time the phenomenon was stationary. The investigation failed to discover any indication, either in the behavior or in the discourse of the witness, that would cast doubt on his report because of exaggeration, invention, or distortion. However, the absence of evidence is not evidence of absence, and this lack of grounds for doubt does not establish the truth of his testimony.

Complementary efforts were attempted through physical analysis of visible impressions in the environment. The particular conditions of the terrain did not allow precise measurement of mass, pressure, or thermal effects. However, we were able to show in quantitative fashion that a large-size event had indeed occurred, triggering mechanical deformations, heating, and perhaps even the depositing of trace materials. Possible interpretations (shock, friction) remain too vague for us to conclude that they absolutely verify the testimony of the witness.

Biochemical analyses (Bounias, 1990) encompassed the effects on photosynthesis, lipids, sugars, and amino acids in plants found at the site. Multiple differences were found between the reference vegetal samples collected far from the imprint and those that were located closer. In most cases these differences are graphically exhibited as logarithmic or bilogarithmic functions of distance, measured away from the center of the imprint. However, current knowledge about vegetal trauma is still too fragmentary for us to draw a single, precise conclusion from this remarkable set of results. We can only observe that they furnish yet another confirmation that a large-size effect did take place at this particular location. Whether or not it corresponds to the description given by the witness remains to be proven.

We find ourselves balancing between two expectations: First, the desire to "prove" that the witness' report is "true" (or, alternately, that it is "false"); second, the hope to reach a precise physical understanding of the events that have taken place, whatever they are. It is important to note that these two aspirations are not contradictory. In fact they meet precisely within the scientific mode of reasoning. It is only through understanding that one can demonstrate. Conversely, the "proofs" brought to light by physical analysis are only measured by the clarity and the precision of their interpretation.

At the present time these "proofs" do remain vague. This state of affairs will last until more advanced research programs can address physical and chemical interactions both specifically and systematically. Thus, it is natural for the investigation we have presented to ask more questions than it solves. What is important here is that the right questions are indeed posed. In this respect the Trans-en-Provence case represents one of the more enriching investigations ever undertaken by GEPAN.

Translator's Note

The above text is primarily based on the 65-page *Technical Note No. 16* published by CNES on March 1st, 1983 (CNES, 1983). In view of the space limitations imposed by a Journal article, the structure of the presentation was simplified and only the most significant illustrations were retained. The section of the Technical Note describing the analysis of effects on vegetal samples, which is now the subject of a separate, updated publication by Dr. Bounias, was not included in the translation.

While the CNES report used fictitious names for the witness and for the town itself in accordance with French privacy laws, much of that information has become public knowledge in the intervening time. Therefore we have found it simpler to use the actual names throughout.

The translator had the opportunity to meet several times with Mr. Velasco, to review manuscript laboratory notes about the case, and to travel to Trans-en-Provence on November 19, 1988 to interview Mr. Nicolai and his wife and to visit the site with Dr. Bounias. Independent French and Belgian investigators who are still conducting their own analysis of the case were also consulted. They were kind enough to report on their work in progress. These interviews, which are gratefully acknowledged, highlighted the significance of specific items in the analysis and thus influenced the format of the final presentation.

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