and played their part with a will. The Press now needs reminding that allegedly we are at peace and the public has a right to know, and the newspapers a duty to tell, the facts and nothing but the facts. The public is beginning to ask for the truth about the UFOs and not just what the Air Ministry wants it to know. We are not suggesting necessarily that there is anything sinister behind our mystery (though several investigators, of whom Dr. Olavo Fontes, of Brazil, is the most prominent, thinks there may be), but it has occurred to many people that if strange objects can penetrate our defence system, which is supposed to include a radar umbrella, and look real enough to several trained witnesses and to justify a jet fighter being sent up in pursuit, it would be better if we had an Air Ministry that took the matter seriously. Our defences cost us dearly enough and the taxpayer cannot afford fools in authority. It is not necessary to ask these officials to believe in flying saucers. As a first step in education, might we suggest that they consider first the possibility of a secret weapon? There is plenty of evidence that the objects, whatever they are, are solid and intelligently piloted. Is it of no concern that we are regularly being overflown? And is it a just reward for those who report the matter to be laughed to scorn by the very authority to which we look for our protection? If our Members of Parliament and our newspapers cannot help us, to whom can we turn?

The Government's behaviour has led to folly in high places. Believing in these baseless communiqués, many an eminent scientist and astronomer has also gone astray. Swallowing the propaganda neat, people like Dr. Menzel have written, perhaps unwittingly, learned tomes in support of government policy. One need not be a Professor at Harvard (though it undoubtedly helps) to invent a series of rationalisations for each incident. Each saucer *could* have been this or it *could* have been that. It also *could* have been a flying saucer. The argument runs endlessly, but we know that experts can be fallible and that the Wiltshire crater, which was at first said to have been caused by a meteorite, was not so caused. Those experts who made fools of themselves cannot now run to cover any more by saying it *could* still have been caused by a meteorite. All we now need to ask is: "Where is it and what has happened to the piece of old ironstone which you once held in your hand in triumph?" This is perhaps the most significant part of the incident. A whole process has been put into reverse. An "explanation" has exploded in the face of authority and it is interesting to note that the reflexes still work as though nothing had ever happened. The cursed crater must still be explained away or it will stand as a permanent scar on a professional reputation. The best thing that Patrick Moore can do is to remain silent and never again offer an opinion about flying saucers. We doubt whether he will take our friendly advice, so he will now face the certainty that every time he pontificates he will hear a thousand cries of "Seen any good meteorites lately?" and he will taste the most corrosive of all acids, the ridicule that blows back in a pedant's face.

The believer in saucers has had much to bear, but his best armour has always been the facts, the pattern and the emerging system of a new science which Aimé Michel and Jacques Vallée have pioneered. Here is a better defence than the ignorance and prejudice on which the Menzels and the Moores of this world have so unwisely staked their reputations.

Miracle of Surgery

Huw Thomas said that ten years ago newspapapers all over the world were full of reports of flying saucers . . . they had not made headlines until recently when five mysterious craters were found in various spots in England. A film taken in Adamski, California, was shown. It featured two bright spots in the sky, which the cameraman said were flying saucers.

Report of television programme in *Coulsdon & Purley Times*, September 27, 1963.

TRANSLATION BY
G.W. CREIGHTON

RECENT DEVELOPMENTS IN ORTHOTENIC RESEARCH

BY JACQUES VALLÉE

IN this article we shall return once more to the French sightings of September 24, 1954. These sightings are well known, as they provide the most typical example of distribution along straight lines, as Aimé Michel pointed out in 1958. During the past two years a series of investigations have been carried out with a view to verifying the hypotheses put forward by him under the general name of Orthoteny, and in the course of these investigations —to which we will return later—a number of methods of analysing the alignments have been perfected. We do not propose to describe these methods in detail in the present article, but will simply give a general outline of them in order to explain to the reader one of the most recent developments which, if confirmed, might well be a new and significant indication in favour of the Straight Line Theory.

Methods for checking the alignments mathematically

No simple answer can be given immediately to the question of how we can know whether given points on: he surface of the earth are aligned or not. Since the distances between these points amount to as much as 100 kilometres, merely to link up the sightings by means of a straight line drawn with a ruler can produce only very rough indications, sufficient for the discovery of new facts but inadequate for their verification. But no hypothesis is valid if it is unproven. On the other hand, once we begin to deal in distances of the order of 100 kilometres, the problem at once arises of defining what one means by " alignment ". And here once again it is to Aimé Michel that the credit is due for having suggested that the alignments be regarded as local portions of Great Circle lines of the terrestrial globe. This point has now been proved mathematically, and it can be shown that, for example, the Bayonne-Vichy alignment is in actual fact a Great Circle arc.

It is consequently possible to determine with precision whether or not a given sighting belongs to an alignment, and thus to verify the whole body of propositions advanced by those who support the theory of Orthoteny. In order to be able to do this it is, of course, necessary to know the exact co-ordinates (latitude and longitude) of the points where the sightings occurred.

Let L_1 and φ_1 denote the co-ordinates (longitude and latitude) of the point M_1, L_2 and φ_2 the co-ordinates of M_2. The great circle given by M_1 and M_2 is defined (Fig. 1) by the quantities:

Longitude of the node (T)=longitude of the point N where the Great Circle intersects the equator.

Inclination (u)=angle at this intersection:

T and u are related by equations of the form:

$$(1)\begin{cases}\tan\varphi_1.\cot u=\sin T.\cos L_1-\cos T.\sin L_1\\ \tan\varphi_2.\cot u=\sin T.\cos L_2-\cos T.\sin L_2\end{cases}$$

From which we derive:

$$(2)\ (\tan T.\cos L_1-\sin L_1)\tan\varphi_2=(\tan T.\cos L_2-\sin L_2)\tan\varphi_1.$$

A third observation point M_3 will then be said to belong to the same great circle if its co-ordinates (L_3, φ_3) verify the relation:

$$(3)\ \frac{\sin(T-L_3)}{\tan\varphi_3}=\cot u$$

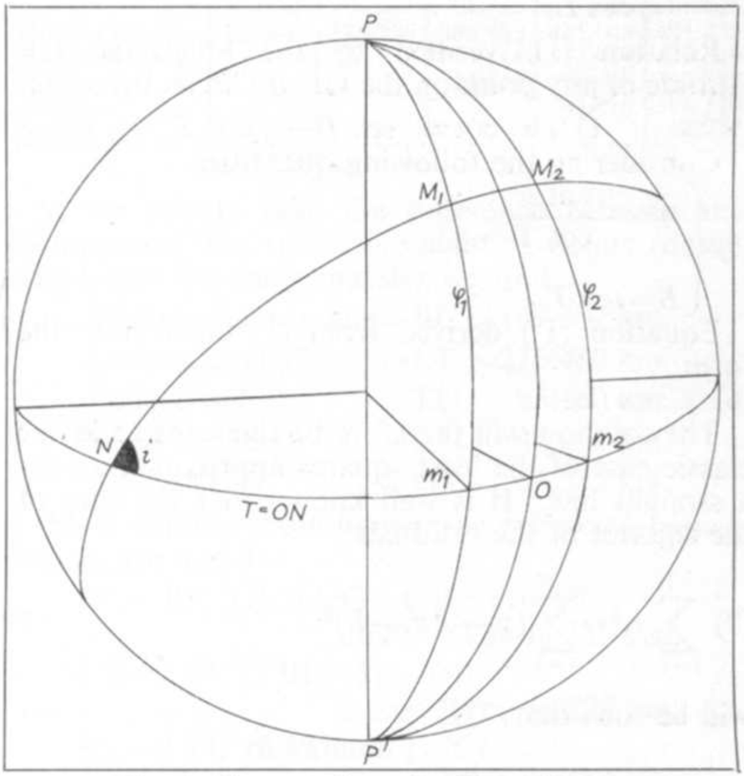

Fig. 1. Computation of a Great Circle.

By using these elementary formulae, considered as a first approximation, we have developed a series of checks of the statistical validity of the alignment systems observed, according to Michel, during the French wave of 1954. In the case of the Bayonne-Vichy alignment, to which I give the code designation of BAVIC, the computation of the elements gives:

$T=42°$ 0810 west of Greenwich, $u=55°$ 5413.

Computation of the elements of a Great Circle by the Least Squares Method

When a Great Circle is defined by more than three points (and one should not expect a three-point alignment to be "significant") we could merely take for its determination a mean value of T and u. The precision obtained that way is fairly good as far as only interpolation is concerned. But it is not good enough to justify conclusions or hypotheses of any kind concerning the Great Circle at a great distance (for example, more than 1,000 kilometres) from the region where the basic observations were made.

To avoid this difficulty, we have developed a more precise method for the great circle computation. In this new method the elements are computed by least squares, i.e. in such a way as to minimise the sum of the squares of the residual differences between the observed points and the theoretical points.

Let us take the following substitution:

(4) $x_i=\frac{\tan \varphi_i}{\cos L_i}$ and $y_i=\tan L_i$

Relation (1), verified by the longitude and latitude of any point on the Great Circle, becomes:

$$(1') \quad x_i \cot u=\sin T—y_i \cos T$$

Considering the following quantities:

$$(5)\begin{cases} A=-\frac{\cot u}{\cos T} \\ B=\tan T \end{cases}$$

Equation (1′) derived from (1) takes now the form:

(6) $y_i=A.x_i+B$

The solution will therefore be the same as in the classic case of the least squares approximation for a straight line. It is well known that the sum of the squares of the residuals:

$$(7) \quad \sum_{i=1}^{N} \epsilon_i^2=\sum_{i=1}^{N} (y_i—Ax_i—B)^2$$

will be such that: $\sum_{i=1}^{N} \epsilon_i^2$ minimum

if the following conditions are satisfied:

$$(8) \quad \frac{\partial(\sum_{i=1}^{N} \epsilon_i^2)}{\partial A}=0 \quad \text{and (9)} \quad \frac{\partial(\sum_{i=1} \epsilon_i^2)}{\partial B}=0$$

From (7) we obtain the well-known relations:

(10) $A\ (\Sigma x_i^2)+B\ (\Sigma x_i)=\Sigma x_i y_i$ and

(11) $A\ (\Sigma x_i)+N.B=\Sigma y_i$

Consequently, the expressions of A and B take the form:

$$(12) \quad A=\frac{(\Sigma x_i)\ (\Sigma y_i)—N\ (\Sigma x_i y_i)}{(\Sigma x_i)^2—N\ (\Sigma x_i^2)} \text{ and}$$

$$B=\frac{(\Sigma x_i y_i)—A\ \Sigma x_i^2)}{(\Sigma x_i)}$$

From which T and u can be derived easily.

In the case of BAVIC, this method leads to values slightly different from the values found above:

$T=42°$ 1790 west of Greenwich, $u=55°$ 4931.

The difference on the value of T (longitude of the node) is of the order of magnitude of one-tenth of a degree (0° 1): the error on the point N where the Great Circle intersects the equator is approximately 10 kilometres (6 miles).

Following these calculations, we can evaluate, as a means of control, the orthogonal distances of the points observed on the theoretical trace-line of the Great Circle, and hence the mean error, and we can calculate the corresponding standard deviation. We calculate likewise a coefficient—which we call "the coefficient of validity of the Great Circle"—by means of the formula

$$v=\frac{N}{3\Delta} \qquad (13)$$

where Δ is the mean error in kilometres and N the number of the sighting points that make the alignment. The formula is drawn up in such a manner that a three-point alignment defined to the nearest kilometre has a coefficient of validity equal to 1. For BAVIC, we get $\Delta=0.384$, and $N=6$, whence $v=5.2$. It is, however, important not to attach an absolute value to the numbers obtained, for if we are absolutely strict we ought to introduce also the total length of the alignment and other statistical parameters, as the detailed discussion of the validity of an alignment across a given region is extremely complex.*

Are the sightings disposed geometrically along the alignments?

It remains nevertheless a fact that the significant character of an alignment such as the Bayonne-

*NOTE: If we bring into the calculation the length of the alignment, using the formula $W=\frac{N}{3\Delta}\cdot\frac{L}{200}$ (L=length in kilometres), then we find, for BAVIC: $W=12.8$. A three-point alignment defined to the nearest kilometre and 200 km. long would give us $W=1$.

Vichy line is unquestionable. And the fact that we have to hand a means for calculating the theoretical trace-line of the Great Circle, permits us to grapple with a fundamental question which, treated without the aid of a precise mathematical device, could lead only to confusion and uncertainty. This question is: Are the sighting-points disposed along the alignments according to a simple law? Or, to put it in other words: If we calculate the distances between the successive sighting-points can these distances be reduced to a fundamental interval?

It is important at this stage to warn those investigators who might wish to make this experiment —without first doing the requisite set of calculations—using, for example, a ruler and a map, or using some other elementary procedure for working out the distances. For a very slight lateral distance in relation to the mean alignment can alter the validity of the length-values arrived at, and our own findings are given only with reserve, as future research on other alignments may or may not confirm them. It nevertheless seems important to us to indicate them, for they may perhaps put other investigators on the road to even more important results.

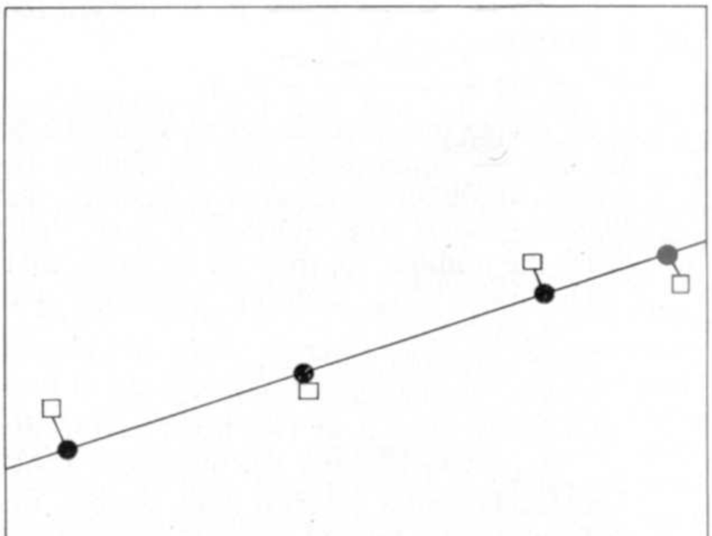

Fig. 2. The straight line is the theoretical great circle fitted through the observations by the Least Squares Method.
The co-ordinates of the points have been computed using detailed maps, from all available information concerning the position of the witnesses. Bayonne and Vichy are known fairly precisely; Lencouacq is a Type I observation defined very accurately. Tulle, Ussel and especially Gelles (Type IV observation made at night) are poorly known (to the nearest mile only).

The method followed by us consists in calculating the distances, not between the sighting-points themselves—which are inevitably subject to a certain degree of error—but between the points which belong to the theoretical trace-line of the Great Circle and which represent the "ideal" positions for the sightings. These points are consequently the bases of the perpendiculars dropped from sightings onto the theoretical trace of the alignment (Fig. 2).

In the following table we give, for each sighting-point, the co-ordinates used for the calculation by least squares, the distance in kilometres to the theoretical alignment, and the co-ordinates of the nearest Great Circle point to the point in question. What we are going to calculate are the distances between these theoretical points.

Table 1

Sighting	Point Observed		Distance to Mean Great Circle	Theoretical Point	
	Long.	Lat.		Long.	Lat.
Bayonne ...	1.47300	43.49100	0.037	1.47329	43.49126
Lencouacq	.40800	44.10200	−0.318	.40555	44.09974
Tulle ...	−1.75000	45.26000	0.151	−1.74885	45.26109
Ussel ...	−2.30900	45.54700	0.179	−2.30765	45.54830
Gelles ...	−2.76400	45.77000	0.786	−2.75809	45.77574
Vichy ...	−3.43300	46.11900	−0.835	−3.43925	46.11286

The distances between the theoretical points are given (in kilometres) in the following table.

Table 2

	Lencouacq	Tulle	Ussel	Gelles	Vichy
Bayonne ...	109.447	325.746	380.905	425.098	491.478
Lencouacq ...		214.938	269.748	313.661	379.619
Tulle ...			54.114	97.467	162.583
Ussel ...				43.210	108.110
Gelles ...					64.727

If we merely take the difference between the distances of the successive sighting-points (designated now by their initials) we find:

Bayonne-Lencouacq = BL = 109.302 km.
Lencouacq-Tulle = LT = 216.480 km.
Tulle-Ussel = TU = 55.160 km.
Ussel-Gelles = UG = 44.054 km.
Gelles-Vichy = GV = 66.355 km.

Now, among these figures the following coincidences are noted:

UV = BL (UV = UG + GV = 110.409)
error: 1 km. in 110 km.

LT = 2 BL (2 BL = 218.604)
error: 2 km. in 220 km.

BL = 2 TU (2 TU = 110.320)
error: 1 km. in 110 km.

accordance with a letter from Jacques Vallee on p. 32 of Vol 10. No 1 (Jan/Feb. 1964) GWC

On the other hand,

GV/6 = 11.060 km.
UG/4 = 11.013 km.
TU/5 = 11.040 km.
LT/20 = 10.824 km.
BL/10 = 10.930 km.

The MEAN of which numbers = 10.973.

If now we examine all the values of one same distance which can be extracted, by combination, starting from Table 2, we find:

						Mean Values
BL =	109.302					109.302 km.
LT =	216.480	215.119				215.779 km.
TU =	55.160	54.811	54.114			55.028 km.
UG =	44.054	43.775	43.216	43.075		43.530 km.
GV =	66.355	65.934	65.093	64.875	64.707	65.375 km.

These values lead us to:

GV/6 = 10.896 km.
UG/4 = 10.822 km.
TU/5 = 11.005 km.
LT/20 = 10.780 km.
BL/10 = 10.930 km.

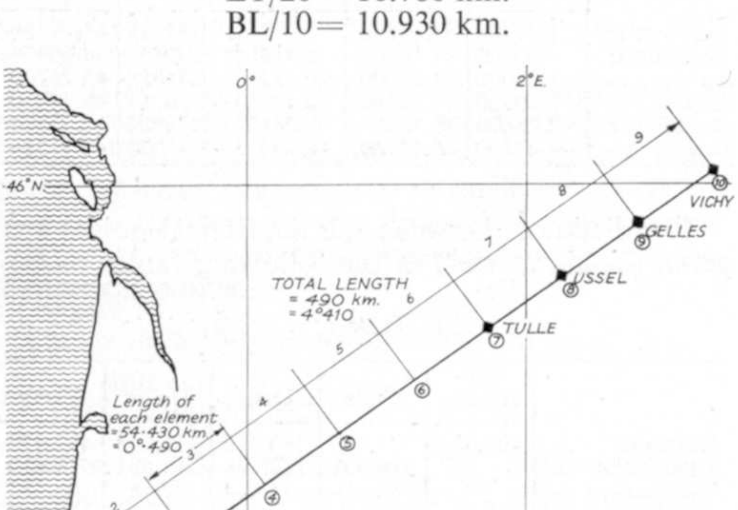

Fig. 3. The geometrical distribution of the sightings defining the Bayonne-Vichy alignment (September 24, 1954).

The MEAN of these numbers = 10.886.

Finally, we arrive at the conclusion that the sightings on the Bayonne-Vichy alignment on September 24, 1954, are geometrically disposed following a Great Circle arc, as is shown in Fig. 3.

Conclusion

Given the French sightings of September 24, 1954, at Bayonne, Lencouacq, Tulle, Ussel, Gelles and Vichy, and considering, on the one hand, the topographical distribution of these sightings and, on the other hand, the lengths of the Great Circle arcs by which they are joined, we get then the following results:

(1) The Great Circle arc having appeared to be the curve which provides the best portrayal of the sighting-points, we have computed the component elements of the Bayonne-Vichy Great Circle by a direct trigonometric method and by least squares, which lead us then to the adoption of the values:

L = 42° 13 ~~is not equal~~ plus or minus to 0° 05 West of Greenwich

i = 55° 52 ~~is not equal to~~ plus or minus 0° 02

(2) If we divide the Bayonne-Vichy Great Circle arc into ~~ten~~ nine equal parts, and we number the points so obtained in such a manner that Bayonne bears the number 1 and Vichy bears the number 10, then we establish that:

The Lencouacq sighting coincides with point No. 3.
Tulle coincides with point No. 7.
Ussel coincides with point No. 8.
Gelles is located at two-fifths of the distance Ussel-Vichy, starting from Ussel.

The fundamental interval that defines this distribution is a Great Circle arc of the length of 54.430 km., corresponding to an angle, at the centre, of 0° 49.

If we consider the distances of all the points between themselves, we establish that these values permit us to take, as the common denominator, a distance of 10.930 km.

These results are verified to the nearest hundredth.

The truth: some suggestions for the investigator

by Peter F. Sharp, B.Sc.

Pilate therefore said unto him, Art thou a king then? Jesus answered, Thou sayest that I am a king. To this end was I born, and for this cause came I into the world, that I should bear witness unto the truth. Every one that is of the truth heareth my voice.

Pilate saith unto him, What is truth? And when he had said this, he went out again unto the Jews. . . .

St. John XVIII, 37 & 38.

PERHAPS if Pilate had not chosen to make his exit at that point we might be very much wiser about truth. Being unfortunate in not having a divine definition of truth, I propose, for the purposes of this discussion, to define truth as " a precise description of the facts as they are."

In our subject truth is frequently a preoccupation of the researcher and usually his preoccupation is in direct proportion to the strangeness of the case he is studying. For example, if a witness reports seeing a silvery, oval-shaped object flashing silently across the sky, his report would go on file almost without question. But if, on the other hand, he reports seeing a space craft on the ground, or even worse, claims to have actually met hominoids from inside it, his account will receive an entirely different reception. In fact, if the researcher is of one school of thought the witness will be practically dubbed a liar before questioning starts, and similarly others of the opposite persuasion will almost have him signed up for a lecture tour before meeting him. Familiarity breeds, not contempt, but acceptance; the unusual has doubt as its handmaiden.

As already indicated, one of the dangers in the rarer type of sightings is the preconceived notions of the investigator. A bigoted or biased researcher is a block to the truth if only in that he will unduly stress those parts of the report that fit his beliefs. This being in addition to having a preference for those questions that will tend to get the witness to reply in the pattern he, the questioner, expects him to according to his preconceived beliefs. For example, there is still a small school of thought that accepts that many, if not all, UFOs originate here on earth. Supporters of this thesis can be understandably excused if they interpret markings on the side of space craft as being from a terrestrial alphabet, or if they emphasise any sounds made by the object and play down unearthly characteristics. Because emphasis and bias cannot be humanly eliminated from reporting (and the American Government's experiences with automatic punch-card systems seem to have been less than successful), we should only build theories based on a large number of cases so that the statistical probability outweighs human prejudice. The outstanding case, in my judgment, of building up a theory on such a paucity of evidence that the theoretical superstructure topples under its own weight was that propounded by Civilian Research Interplanetary Flying Objects in their newsletter *Orbit* in 1955. This was that the actions of the UFOs were so hostile as to " constitute a state of interplanetary war." Eight years on from that statement I do not feel it necessary to make any comment.

The two points I have been trying to make in the above are:

(i) the investigator should always bear in mind the scarcity factor, i.e. his normal reaction is to become increasingly sceptical as the unusualness of the case increases.

(ii) theories must only be built on wide experience and documentation; e.g. orthoteny would be a poor thing if only Aimé Michel could find orthotenies.

In what follows there will be some truisms, and in anticipation of the criticism that I am merely stating the obvious I must point out that it is all too easy to lose sight of the obvious, especially in this subject, and we never lose anything by its restatement.

The majority of people, to the best of their