THE TRUE STORY OF THE GREAT BLACK-OUT

by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

An Introductory Note by the Editor in Chief of *The Sunday Herald and Globe*

Earlier this year an event occurred the like of which we have never experienced before. A small group of scientists in Devon, initially as bewildered as the rest of us to its cause, picked up a few strands of raw information as clues, and followed them through.

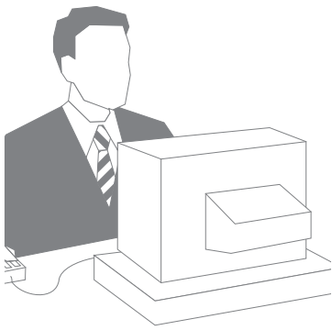
These people, as we are sure they would concede if pressed, were no experts in the field of astrophysics (except their leader, Dr. Ivan Bassinger). But they had the intelligence, perseverance and, let's be honest, luck to discover and explain what we all want to know: *What caused the Great Black-Out and will it happen again?*

In this Supplement, exclusive to *The Sunday Herald and Globe*, they tell their own stories in their own words.

William van Neumann

A 'New' Star

by Ivan Bassinger, PhD, Head of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon



Last summer proved to be a traumatic one for all of us living on this planet.

We all remember the evening in June when all electric power systems failed, everything that used or relied upon anything magnetic or electric stopped working.

This did not only apply to the United Kingdom, to Europe, or to the developed World.

Although they have far less reliance on electromagnetic devices, the peoples of the Third World were hit just as we were.

The millions who were killed and injured at this time will never be forgotten as long as there are people to remember them.

When 'normality' was restored three months later, the world looked to Science and Scientists for an explanation of the calamity, but, to be honest, I don't believe that any of us had an inkling of why the disaster had occurred.

I am the Head of the Department of Astrophysics at the University in Tiverton, Devon. We are not a well-known group of people; we are a new University, founded only in 2002; and I am just setting up a team of postgraduate students who come from an assortment of different disciplines, having studied French, Oriental Theology, Human Biology, and PPE (Politics, Philosophy and Economics).

However, we were lucky in being the first group of scientists in the world to discover the *true* origin of the catastrophe. (I would like to note here that serendipity played a valuable part in our discoveries.)

THE TRUE STORY OF THE GREAT BLACK-OUT

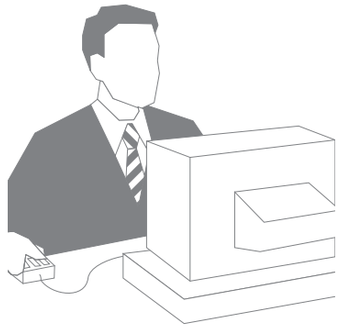
My Team

by Ivan Bassinger, PhD

My group of research post - graduate students at the University consists of the four young people shown here:

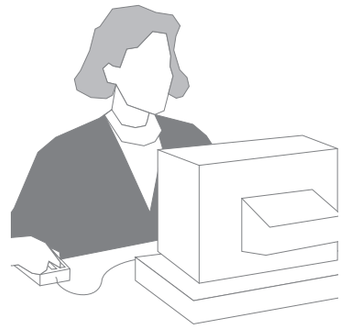
- **Anna Hobson**

- **Clive Morgan**



- **Martin Smith**

- **Louisa Taylor**



They were aided by the Press Association, and in particular, Assad Jamir

Also, several citizens of the beautiful village of Bossington in north Devon made various contributions to our work (**two most helpful contributors from Bossington** have asked for anonymity). And **Clifford Gates** from there first drew our attention to the strange signals that seemed to emanate from the region of this star. Collaborators from other countries include:

- **Fred Schuster**, the Canadian who first saw the aliens' star on 17th June last year
- **Tom Hastings**, professor of mathematics at the University of Boise, Idaho, USA
- **Jean le Camp**, of the University of Paris, France

and we owe our inspiration to:

- **Carl Sagan**, the author of ***Contact***, made into a successful film.

Let's Start at the Beginning...

Our department happened to be studying a star that had only recently been discovered; it is a 'brown dwarf'. Most amateur and indeed professional members of the world of astronomy dismissed this particular star as being of relatively minor interest compared with the more sexy theories of galaxies, the Big Bang, dark matter, dark energy and other more esoteric studies.

The star is called 2009UMa7 — not the most friendly of names, but to astronomers it means that it was the seventh stellar object to be discovered in 2009 in the constellation Ursa Major (perhaps better known as the Great Bear, the Plough or Charles' Wain).

The star first came to our notice on the 17th June 2009, when it was seen at 18:36 by Fred Schuster, a Canadian astronomer; he drew it to the attention of a group of astronomers and other scientists who were subscribers to an internet forum relating to newly-discovered stellar and other objects in space.

I first looked at it using my own telescope, but was able on the 25th June to use a more powerful one, and saw what seemed a normal brown dwarf of magnitude 4.6.

However there was nothing normal about the effects it had on us later this year.

Having studied its emissions thoroughly during the past few weeks, we (my research students and I) are firmly of the opinion that *there is an intelligent life form* on a planet orbiting that star, that has discovered a method of *drawing off energy from other stars*. That is what happened to us this year.

What is more, they say they will leave us alone for the next 10,000 years. It seems that they are drawing energy from ours and other stars because their own star is dying and does not provide them with the energy that they need. (Remember, all our own energy needs ultimately can be traced back to our own star, the Sun.)

by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

Except where credited otherwise, all the articles in this special news supplement are the work of my team of students involved in the first term of their post-graduate research — assisted by Assad Jamir of the Press Association — (see the previous page).

What is a Brown Dwarf?

A brown dwarf is a star that hasn't got quite enough matter in it to be able to collapse successfully into a 'proper' star and so cannot 'burn' hydrogen into helium.

That sounds a little bland, so we'll explain it further. Stars are normally formed when a rotating cloud of gas becomes smaller due to its own gravity. As it shrinks its gravitational energy is converted into heat; as it collapses, the faster it spins, the smaller and hotter it gets.

That is how our Sun was formed some five million years ago.

Eventually the collapsing gas cloud becomes so hot that it can transform its hydrogen, which forms the vast majority of its matter, into helium through the process of nuclear fusion. Once that starts it can go on for billions of years, as it has and will in our Sun.

But some gas clouds haven't quite got enough material in them to permit thermonuclear reactions to take place. They get quite hot (perhaps millions of degrees), but even temperatures like this aren't enough to get the vital hydrogen – helium reaction going.

This is the case with brown dwarfs. By the way, the artist's drawing shown here is probably more or less correct for the type of brown dwarf that was involved in the Great Black-Out; despite its name, the 'brown' star involved would look plum- or magenta-coloured if we were close to it.

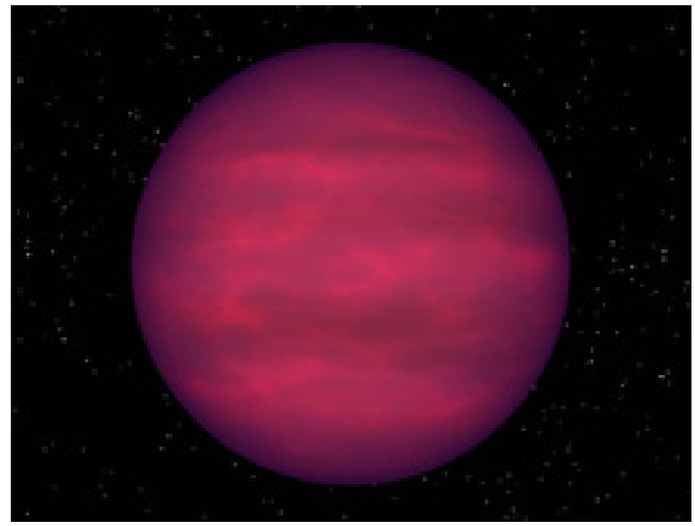
Some brown dwarfs, just like other stars, may have a system of planets revolving round them. Our Sun is a typical star in this respect.

We believe that there is a race of alien beings on one of the planets in orbit around 2009UMa7. And they are becoming rather desperate because their star is dying; it is running out of energy.

They need more energy from somewhere, and as the Sun is possibly their closest neighbour they are looking upon it as a likely source of energy.

Somehow, and at the moment we have no idea how they do it, they have the technology to 'suck' the energy that they need from our Sun.

The reason why all our lights failed last summer was because their mechanism for drawing energy from the Sun also had our planet Earth in its range.



An artist's impression of a brown dwarf star, from Wikipedia

Starting in Astrophysics

by Martin Smith

It was right at the end of the academic year at Tiverton, in late June this year. The Astrophysics Department had been set up three years earlier under Dr Ivan Bassinger, and the first batch of under-graduates were taking their final exams.

On the 20th June, several students, including me (Martin Smith), were contacted by Dr Bassinger, and we were offered places in the first year as research post-graduate students, provided we achieved appropriate grades in our own first degree courses. Our new courses were due to start on the 20th September.

On the 21st June, as everyone is aware, the Great Black-Out started. It ended on the 8th October; I was able to phone Dr Bassinger and to reach Tiverton the following day. Louisa arrived on the 10th, and Anna and Clive on the 11th. We were the first group of post-graduates in the University's Astrophysics Department.

The subject was completely new to all of us: I had studied French, and the others Oriental Theology, Human Biology, and PPE (Politics, Philosophy and Economics) – not exactly 'appropriate' backgrounds for working in a highly meticulous academic scientific subject! But we were all keen to learn and to do what we could.

Initially we were given a list of topics to read up on, as Dr Bassinger was obviously very busy sorting out the undergraduates' results from last year and organizing this year's courses, his preparations having been thrown into chaos by the Black-Out.

THE TRUE STORY OF THE GREAT BLACK-OUT

Starting to Study 'Our' Star

by Martin Smith

Because he was so busy, our Head of Department, Dr Bassinger, called Louisa and me into his office and first asked us if we had heard of a 'new' star called 2009UMa7; neither of us had. (Meanwhile Anna and Clive were sorting out their accommodation and other domestic matters.) He said that there were some stories going about that this particular star had something to do with the Great Black-Out; he wanted us to find out whatever we could about it, and gave us a DVD of his observations of the star when it first appeared in our skies on the 17th June last year, a year before the Black-Out started.

We found that it looked like an ordinary brown dwarf, as described in text books, probably quite close to the solar system, possibly closer than Proxima Centauri, which is four light-years away and believed to be our closest stellar neighbour.

Louisa found that most brown dwarfs are about the same size, with masses a few tens of times that of the planet Jupiter.

By this time Clive and Anna had joined us, and everything that follows in this report reflects our joint work, with Dr Bassinger giving us the benefit of his experience, advice and contacts.

Dr Bassinger told us to try looking through archives from several years ago, and to use the internet where appropriate. I recall him telling us to 'beware the cranks' pervading the web! We didn't find out much at all, except that one photographer, an old friend of Dr Bassinger, had taken a photo of the star only moments before the Black-Out began. He said that, although he was using a monochrome film, he visually saw the star disappear with a flash of green. This was confirmed by one of his neighbours who was painting the sky at that time and she placed what she called a 'splodge' of green onto the canvas where the star was. The interesting fact was that they both agreed on the exact hue of green.

We continued with our researches, and on the 15th November I gave a public presentation on ***The New Star and the Black-Out: Our Knowledge so Far***. The preparation of the presentation was a joint effort of the four of us students; I was just the 'front man'.

Brown Dwarf and Great Black-Out

The star first appeared on the 17th June 2009 at 18:36, according to the most reliable sources and we suspect it emerged from behind a cloud of dust. Almost *exactly* a year later, on the 21st June 2010 at about 23:36 the Great Black-Out occurred; by 23:47 on the same day, the star had vanished – some observers gave the time as early as 23:41. There were at most eleven minutes between the events, possibly only five minutes; perhaps even less. Then on the 8th October at 20:16, the electricity was restored. At 20:17 on the same evening the star was seen again.

The photographer and the artist attended my presentation and we had the privilege of meeting them properly afterwards. Both of them wish to remain anonymous, and we accept and respect their wishes.

The gentleman told Dr Bassinger about a conversation he had overheard about signals that had been picked up on the 21-centimetre wavelength, with noises that reminded the observer of the film *Contact*, based on Carl Sagan's book of the same name.

21 centimetres is the wavelength of a very important spectral line of hydrogen, the most abundant material in the universe; so our assumption is that if there's another civilization out there, and they are looking for other intelligences, they will look for signals at that wavelength, and they will broadcast signals there too.

Dr Bassinger immediately sent an internet message to the group of scientists, both amateur and professional, who were interested in this star. He got a quick response from Tom Hastings, a mathematics professor in Boise, Idaho. He said that he had been looking at the star before the Black-Out, but had noted nothing special.

by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

Prime Numbers

WHAT IS A PRIME NUMBER?
It's a whole number that can't be divided exactly by any whole number except 1 and itself.

Then he had a reply from monsieur Jean le Camp of the University of Paris. He had noticed the 'beeps' from this star, which were very fast; he found that their Fundamental Time Unit (FTU, every 'beep' being a multiple of this in length) was about 1/10 second (0.09848 of a second to be precise). After a long continuous sound, there was silence of 1 FTU, a beep of 2 FTU, silence of 1 FTU, a beep of 3 FTU, silence of 1 FTU, a beep of 5 FTU, and so on; he taped them and slowed the tape down to hear them more easily.

In other words, separated by 1 FTU silences, he heard beeps of 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59 and so on, all the ***prime numbers*** up to 71. Then after 1 FTU of silence, an 8 FTU beep, followed by the same sequence of prime numbers from 2 to 71. He had recorded them all on audio tape, which he sent us.

It seemed to us that the time unit of about one-tenth of a second was remarkably small, but perhaps our assumption that it would be longer – maybe two or three seconds – was because that's the sort of speed at which *our* minds work.

Below is a diagram representing the sequences of prime numbers. Note that the final part of the second list of prime numbers is not shown, as it repeats the first.

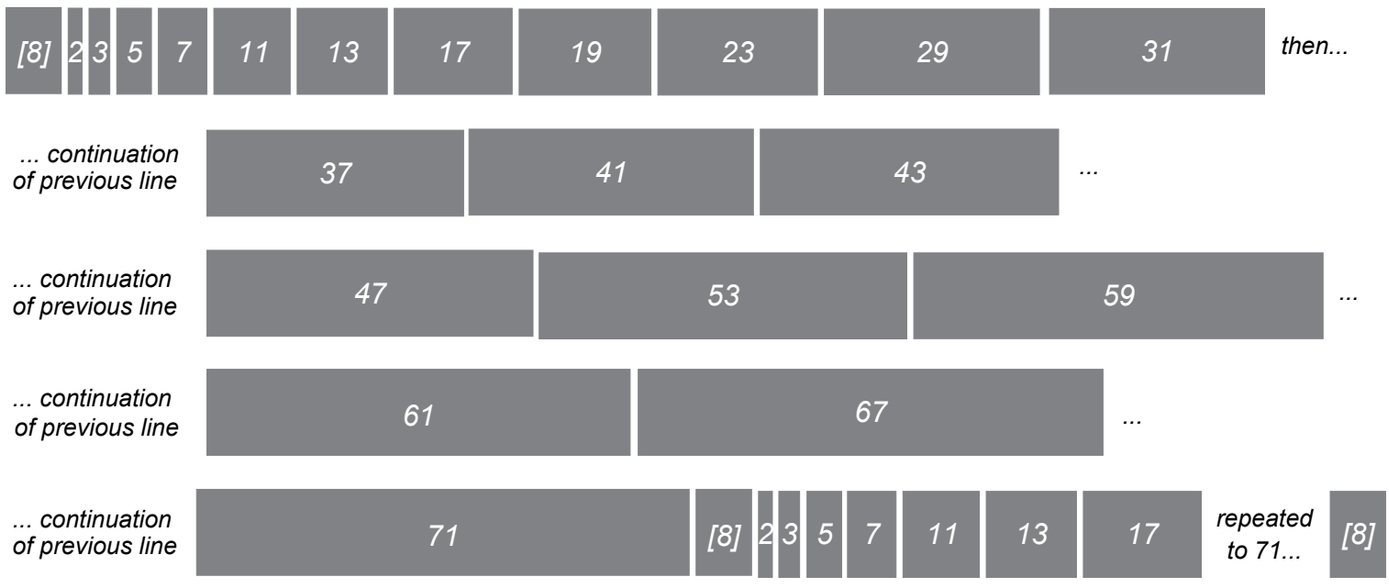
Why Are Prime Numbers Important?

Mathematics is a collection of statements about absolute universal truths. We believe that counting, that is, 1, 2, 3, 4 and so on, must exist in all possible civilizations, wherever they may be. We can't imagine any other universal 'language' (or way of communicating with others). So we look for features of numbers that cannot be generated by anything other than a race of intelligent creatures.

Regular sequences are out because, for example, a spinning star could emit a flash of light towards us at regular intervals. So could a star that is involved in an eclipse or is pulsating.

Regularity is *not* what we want; prime numbers *are* appropriate because they are ***irregular*** yet ***totally predictable*** (2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, and so on).

Prime numbers from 2 to 71 *(to be read as one continuous signal): In this diagram each prime number is represented by a dark bar of the appropriate length of time (in white) in FTUs, as indicated by the numbers; a single interval of time (again in white) separates the numbers; the entire set of prime numbers occurs twice; a signal of 8 FTUs occurs at the beginning and end and in the middle to separate the two sets of prime numbers. One FTU is about a tenth of a second.*



THE TRUE STORY OF THE GREAT BLACK-OUT

Interpreting the First Image

Once we had established that the data contained the two lists of beeps, each list containing the prime numbers from 2 to 71, each pair of numbers separated by a single beep of length 1, and each list delineated by beeps of length 8, we felt fairly confident that we could manage to decode whatever followed.

But we were wrong!

We printed out the data that followed, which was beeps and non-beeps, but they were not of the same unit length as the beeps we had seen in the lists of prime numbers. Eventually we deduced that the real time unit that they were using is one-half of an FTU, in other words about one-twentieth of a second. Each beep and each non-beep (or, if you prefer, binary 1 and 0) is a multiple of *that* time unit.

Then there were two questions that occurred to us:

- Why do the prime numbers go to 71? Is 71 significant in some way?
- Why do the prime numbers occur twice?

Perhaps broadcasting two sets was a clue that the data that described the primes was two time intervals long, so further data used a shorter time interval. This, indeed, was the case.

It also, perhaps, had another meaning: that the data to come was in two dimensions. (I think we would have been really stumped if the data had proved to have been three- or four-dimensional!)

And another: the images were (perhaps) square.

And the 71? A square image 71 pixels by 71 would be rather small, but 142 (twice 71) by 142 *could* contain some significant information.

We must explain that this interpretation did not occur to us in the logical progression of ideas that we have presented here. Hindsight can be a marvellous thing!

When we took the first 20,164 (142 × 142) pixels and looked at the image formed as if they represented a television picture (in other words, 142 pixels left-to-right, then another 142 left-to-right, and so on for 142 lines), the result was totally incomprehensible. We tried lines from right-to-left, upwards, and downwards, but with no success.

Then we tried one line left-to-right, one right-to-left, alternating for 142 lines, in other words zig-zagging back and forth. And this revealed a coherent image.

This first image is on the next page. Our interpretation of it is on the subsequent page.

As you can see from this image, the 142 × 142 pixel resolution is fairly crude. Ovals that presumably represent planetary and lunar orbits are rather indistinct in places, especially where they intersect or where a moon is possibly shown.

At the bottom of the page is what we deduced from the pixellated image; that is: their star is named '**Θ**' or something similar; the crude pixellation made its exact representation unclear – it could be a square with a central dot.

We had already been told that it was an ordinary brown dwarf, probably quite close to the solar system, possibly closer than Proxima Centauri. We found from the first image that it has three planets, the innermost with two satellites, the second with none, and the third (named '**φ**' or something like that) with one.

The fact that only one planet is named suggests to us that is theirs. Also, the number 3 immediately below that part of the image serves to confirm that theirs is the third planet from their star.

Their number system, which the aliens illustrate in the lower half of the first image, is explained in much more detail later.

The important thing for us was that **we had cracked their code!**

On the 2nd December we gave a news conference, which was picked up by the local BBC station and our local newspaper as well as, in particular, the Press Association. In it we told of the reception of signals from an extra-terrestrial life form, and we showed them the first image. The Press Association was the only news organization to treat the matter at all seriously, apart from GCHQ, the British government's communication centre. More about that later.

Their Home

The image on the next page is the first we received from the aliens and which we deciphered as we have described.

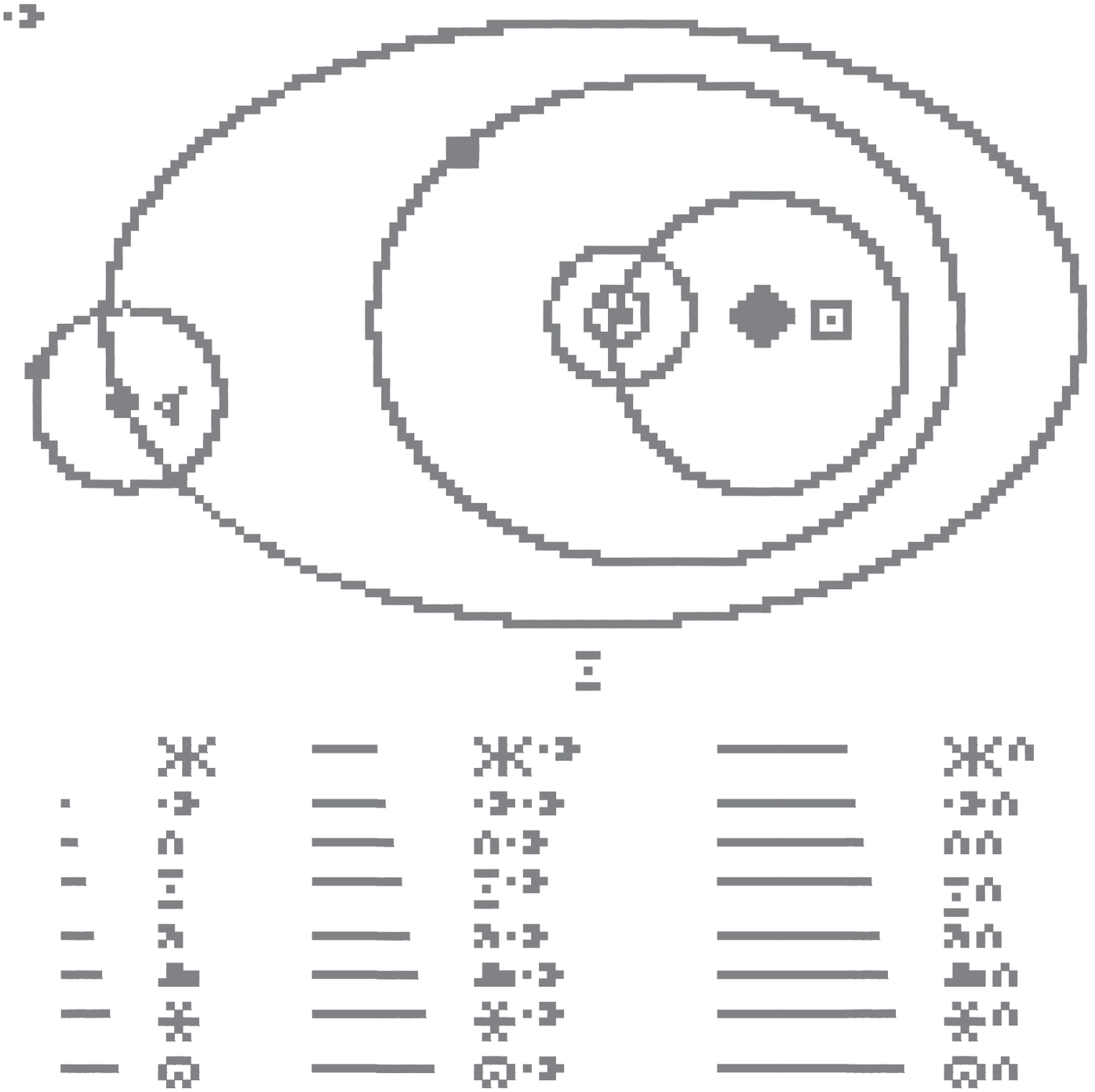
This first image is described by us in two sections, as it seems to us to contain two quite different sets of information; this is what we made of the first part of the diagram, their home stellar system.

The upper part seems to show a stellar system, presumably theirs, with a star, planets and moons; and the lower half has an apparent explanation of their number system.

Most of the strange symbols here are typical of the content of the aliens' transmissions.

Each image is, it seems, intended to lead us on to a better understanding of what they want to tell us. This is, we

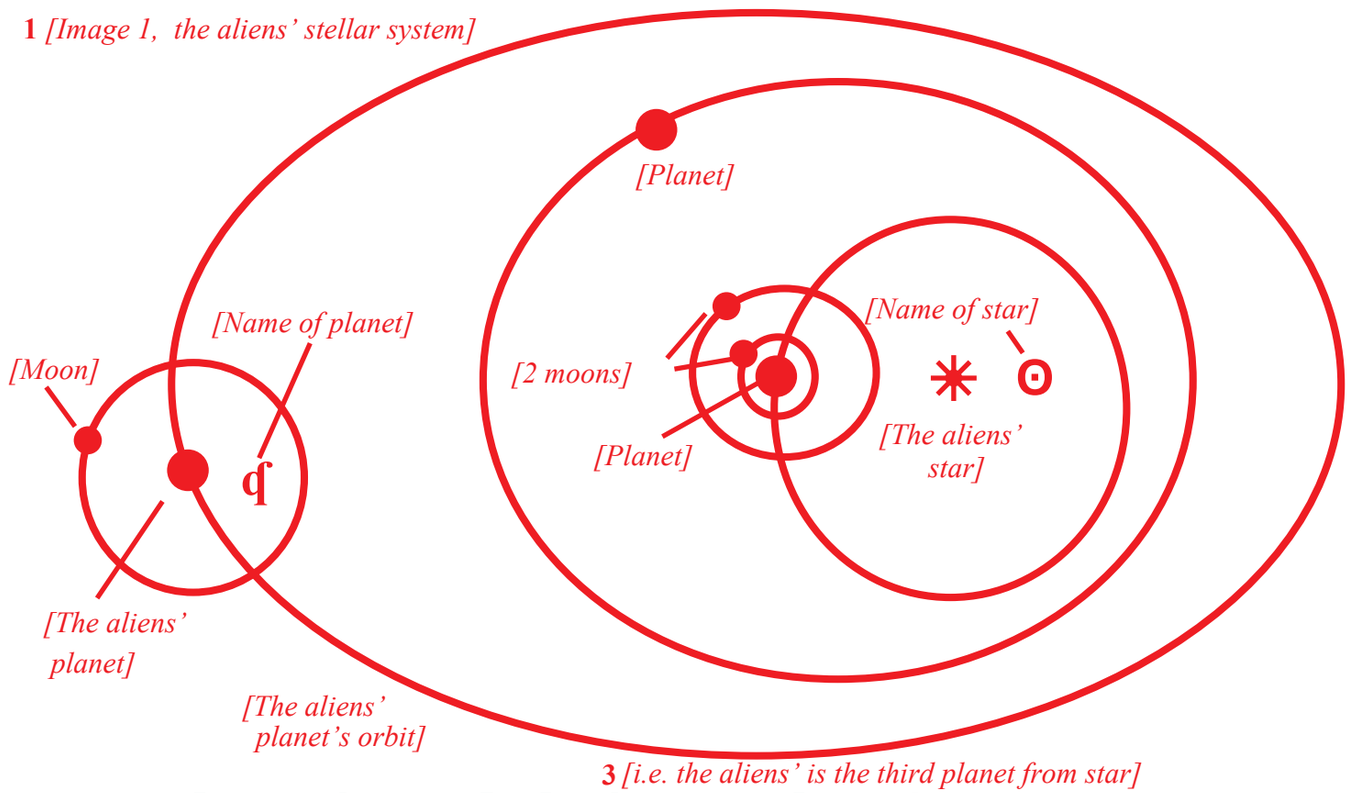
by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon



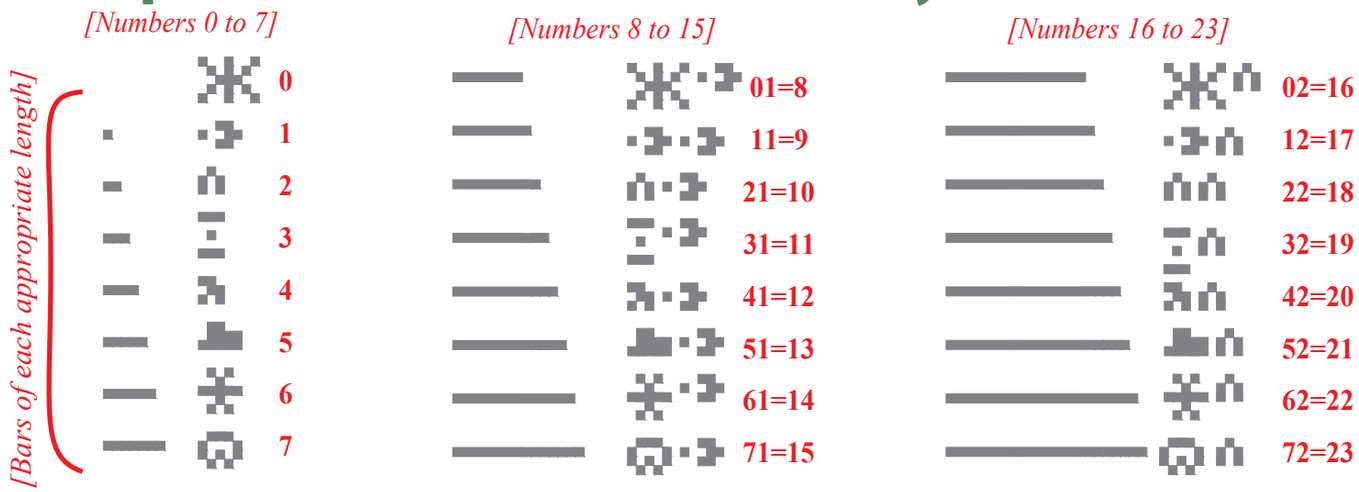
assume, why they have first shown us their home (important to them all), and then how they count, arithmetic being a fundamental 'language' and without which we wouldn't have discovered them in the first place.

Having shown us what their stellar system is like, the aliens lead us on to explain what their number system is like. This is in the second part of image 1.

THE TRUE STORY OF THE GREAT BLACK-OUT



An Explanation of Their Number System



Does counting in eights rather than tens mean that the aliens have four fingers on each hand, assuming that they have two hands like us? We don't know, but it's a possibility.

Does it mean that they are dyslexic? Not necessarily; writing numbers in the reverse order to us merely means that that was the way their civilization developed its representation of numbers. As we later discovered they write sentences from left-to-right, like our Western languages; but some languages on the Earth, the Semitic ones for instance, write right-to-left.

by members of the Department of Astrophysics
at the University of Exmoor, Tiverton, Devon

The bottom half of their first image (on page 8) shows what their number system is like.

The aliens' number diagram is clearly in three columns, each column having two parts. The left part is a bar whose length we can measure, and whose symbol is alongside (their list is interpreted by us alongside their symbols).

Once we had established the coding technique that the aliens were using to transmit their material, as already described, we looked at what it might all mean.

It seems that they use an octal (base 8) representation rather than our decimal one (base 10). This we deduced quite quickly from the horizontal bars in the image, and the rather strange symbols alongside them. Each horizontal bar clearly is intended to represent a number of the appropriate magnitude.

In decimal notation, the number twenty-three is written numerically by us as 23, which means $2 \times 10^1 + 3 \times 10^0$. In octal the same number is $2 \times 8^1 + 7 \times 8^0$ which we would write as 27, but they reverse the digits, so twenty three is 72. This is shown in our diagram below as 72=23.

Another example is 1359 (decimal) which is 2517 (octal) or 7152 (octal reversed) in the aliens' notation.

(Try it on your scientific calculator or computer)

After the First Image

However there were still many important things which we didn't understand about them or their language. But the images that followed the first were intended to help us, by telling us things that we supposedly already knew about the universe. That way we were introduced to their notation and, importantly, to their problems.

Image 2 (on page 10) is a quite recognizable chart of the Plough (in the constellation Ursa Major), and it pinpoints their location, confirming our assumption that that star, 2009UMa7, is their Sun. It also confirmed that they are quite close to our solar system; if they weren't that close, the appearance of the Plough would be quite different from their perspective (unless they are being *really* cunning and showing us what they believe would be our own view of the constellation).

Below the diagram of the Plough are quite a few arithmetic statements, like

which we interpret as:

3 + 6 = 9

using numbers from image 1.

The equations gave us the 'words' for *plus*, *minus*, *times*, *divided by*, *equals* and *raised to the power* (the last of which is quite common, suggesting that they might be going to send us some material that involved quite large numbers).

We prepared a dictionary in which we placed all these and other terms that we had deduced by their context.

The arranging of the aliens' words is rather complicated because many of the symbols seem to represent a complete word, others don't.

20 Images

Then, after image 4, come the two sequences of prime numbers and a repetition of page 1, identical except for the image number (5).

Clive scanned ahead in the data and found that the same thing happens every fourth image (so pages 5, 9, 13 and 17 are all the same as page 1, each being preceded by the two lists of prime numbers). He also found that the complete sequence is repeated after image 20, so 21 is exactly the same as image 1. This means that any recipient of the signals would, after a relatively short time, reach the beginning, after which everything should become clear.

Ursa Major and Base-8 Arithmetic

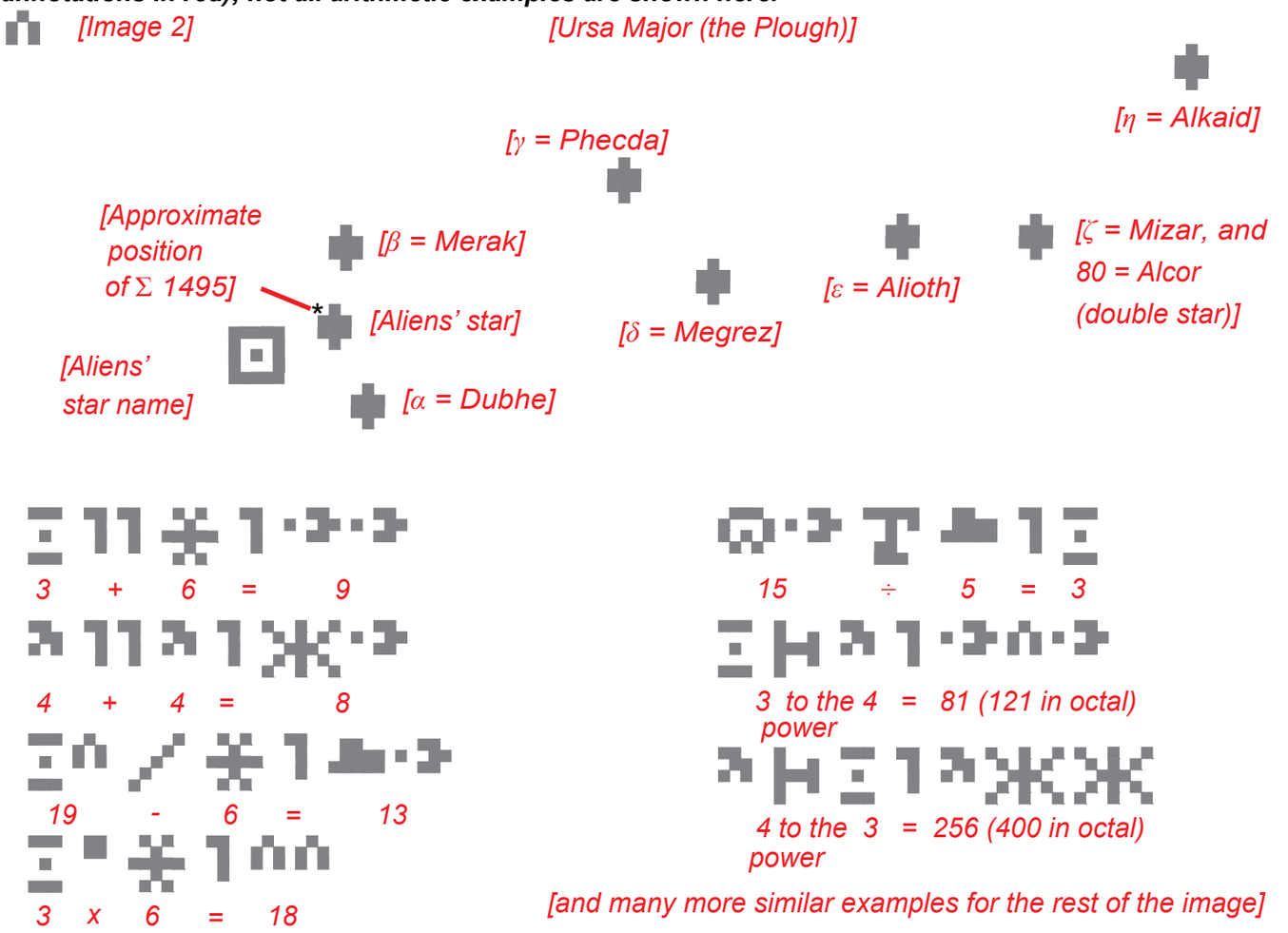
The aliens' second image (part of which is shown on the next page) clearly shows the Plough, and also uses the numbers (which are explained in image 1) to establish the aliens' terms for *plus*, *minus*, and so on.

The Plough's 'saucepan' consists of the stars Dubhe, Merak (which are the 'pointers' to the Pole Star), Phecda and Megrez; then come the stars of the 'handle' Alioth, Mizar and Alkaid.

Σ 1495 is a star which was also obscured by the cloud of dust, and is very close visually to it from here, though not at all near to the aliens.

THE TRUE STORY OF THE GREAT BLACK-OUT

Image 2: Ursa Major (the Plough) and the aliens' arithmetic (aliens' material in grey, our interpretation and annotations in red); not all arithmetic examples are shown here.



Atoms and Elementary Particles

Image 3 (part of which is shown on the next page) and image 4 (which is very similar to image 3 and is not illustrated) list the 32 elements from Hydrogen (atomic number 1) to Germanium (32); just three are shown here. So we know the 'words' for *proton*, *neutron* and *electron*. Again, the red annotations denote our interpretation of their symbols.

Images 3 and 4 list the number of protons, neutrons and electrons in their most common neutral isotopes.

Note how the numbers follow the nouns to which they refer (e.g. 'protons 9' rather than '9 protons'). We found other examples of how their adjectives follow the nouns, unlike the normal English usage, but familiar in many other languages.

Lithium-7

Image 6 (also shown on the next page) is quite interesting and initially was something of a puzzle to us. We finally concluded that it was describing the 'standard' picture of a Lithium-7 atom, that is, an atom of lithium with atomic weight 7.

Why? The element lithium is frequently found in the spectra of brown dwarf stars, so it may be quite familiar to them. Also, it has a small atomic weight so is easy to describe.

by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

Images 3 & 4: Composition of the first 32 elements, describing Protons, Neutrons and Electrons).

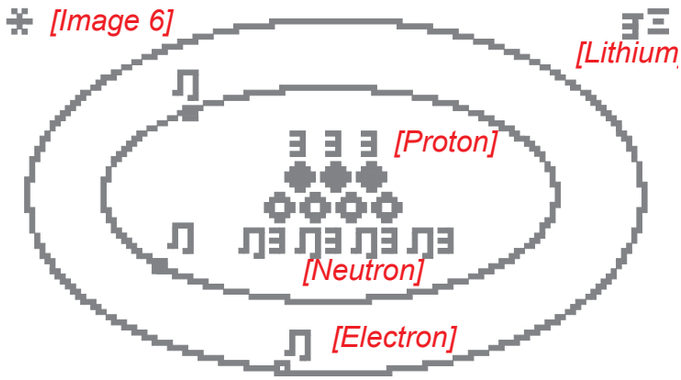
[Part of image 3; image 4 is a continuation of the list] [Image 3, lines 1, 9 and 12]

[1 is Hydrogen with mass 1 with proton 1 plus neutrons 0 plus electron 1]

[9 is Fluorine with mass 19 with protons 9 plus neutrons 10 plus electrons 9]

[12 is magnesium with mass 24 or 25 with protons 12 plus neutrons 12 or 13 plus electrons 12]

Image 6: a Lithium 7 atom



THE TRUE STORY OF THE GREAT BLACK-OUT

Hydrogen to Helium Fusion Reactions

Image 6 also, importantly, contains descriptions of the Hydrogen – Helium nuclear fusion cycle, and also the Carbon – Nitrogen cycle; the alien illustrations are not shown here, though the usual descriptions that we use are.

The main way that stars like the Sun produce their energy is by nuclear fusion, in brief by converting four Hydrogen atoms into one Helium atom. This process results in a Helium atom that is a tiny bit less massive than the sum of the four hydrogen atoms.

The outcome is that this small loss of mass results in a large amount of energy, according to Einstein's famous equation:

$$E = mc^2$$

where m is the mass lost, c is the speed of light and E is the energy produced.The process may involve several stages and requires enormously high pressures and temperatures.

So they know how 'normal' stars produce their energy. We imagine that they chose to illustrate a lithium atom because it is not too complex and contains all the main elementary particles. (Lithium also happens to be a fairly common element in the spectra of brown dwarf stars, as we discovered on the internet.)

The Proton – Proton Cycle

This proceeds as follows (and is described in image 6, giving us more for our vocabulary):

1. $^{1}H + {}^{1}H \rightarrow {}^{2}H + e^{+} + \nu$
2. $^{2}H + {}^{1}H \rightarrow {}^{3}He + \gamma$
3. $^{3}He + {}^{3}He \rightarrow {}^{4}He + {}^{1}H + {}^{1}H$

where:

- H is Hydrogen
- He is Helium
- e^- is a negative electron
- e^+ is a positive electron also called a positron
- ν is a neutrino
- γ is a photon or high-energy gamma ray
- The superscript number left of the symbol for the element is its atomic mass number, that is the total number of protons and neutrons in its nucleus.

The proton – proton reaction can also operate differently:

1. $^{1}H + {}^{1}H \rightarrow {}^{2}H + e^{+} + \nu$
2. $^{2}H + {}^{1}H \rightarrow {}^{3}He + \gamma$
3. $^{3}He + {}^{4}He \rightarrow {}^{7}Be + \gamma$

where:

- Be is Beryllium
- Li is Lithium
- B is Boron (which decays, see below)

then either:

4a. $^{7}Be + e^{-} \rightarrow {}^{7}Li + \nu$
5a. $^{7}Li + {}^{1}H \rightarrow {}^{4}He + {}^{4}He$

or:

4b. $^{7}Be + 1H \rightarrow {}^{8}B + \gamma$
5b. $^{8}B \rightarrow {}^{8}Be + e^{+} + \nu$
6b. $^{8}Be \rightarrow {}^{4}He + {}^{4}He$

Other elements are produced in further fusion reactions.

The Carbon – Nitrogen Cycle

In this cycle, Carbon (C) acts as a catalyst (that is, it helps the process on its way eventually returning to its original state), producing Oxygen (O) and Nitrogen (N) on the way.

The main part of the reaction is:

1. $^{12}C + {}^{1}H \rightarrow {}^{13}N + \gamma$
2. $^{13}N \rightarrow {}^{13}C + e^{+} + \nu$
3. $^{13}C + {}^{1}H \rightarrow {}^{14}N + \gamma$
4. $^{14}N + {}^{1}H \rightarrow {}^{15}O + \gamma$
5. $^{15}O \rightarrow {}^{15}N + e^{+} + \nu$
6. $^{15}N + {}^{1}H \rightarrow {}^{12}C + {}^{4}He$

Other variants can occur, but the net effect is to fuse four Hydrogen nuclei into one Helium nucleus, with a lower mass and the release of that mass as energy according to Einstein's equation, $E = mc^2$.

Oxygen and Nitrogen are also important elements in the production of other elements.

The Speed of Light?

Image 7 (on the next page) shows the now-familiar diagram of their stellar system, with the indication that something is the same between each component, between the star and each planet and between each pair of planets. Something (shown by the symbol ‡) is constant.

Is it gravity? No, all that would tell us was their word for 'gravity', but nothing more.

Below the image (shown here as we interpret it) is a statement that includes a very large number; this might be because the units are the radius of an atomic nucleus, or something similarly small, but we guessed that to be unlikely. So the likelihood was that the units are in some sense 'normal' in size.

Eventually we realized that

by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

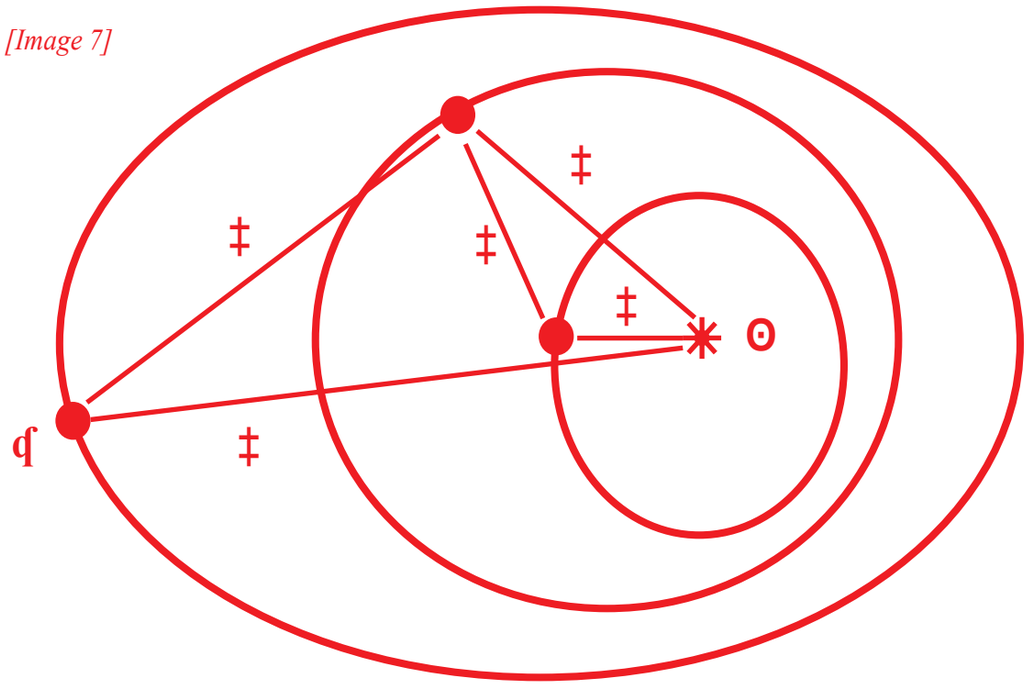
there were only two very large universal constants, the speed of light and Avogadro's number. We dismissed the latter as being outside the category of subjects already presented to us. So the number was assumed to be the speed of light; but that involved both time and distance, neither of whose units we had any information about.

So we mused over what units of time and distance we shared with the aliens. Eventually we hit upon their FTU (Fundamental Time Unit) or rather one half of it as being one, and 21 centimetres (the wavelength of the principal spectrum line of hydrogen, which was what they were using for the transmissions) the other. A quick calculation showed that the number they use, expressed in these units is indeed the speed of light, about 300,000 km / sec.

They also seem to say that their star is emitting no light, which we know to be untrue, though they use the same symbol as for 'photon' as in their description of nuclear fusion, so we assume they are referring to fusion energy.

Image 7: Something (marked ‡) is the same between all objects

[Image 7]



THE TRUE STORY OF THE GREAT BLACK-OUT

Our Own Solar System: Two Views

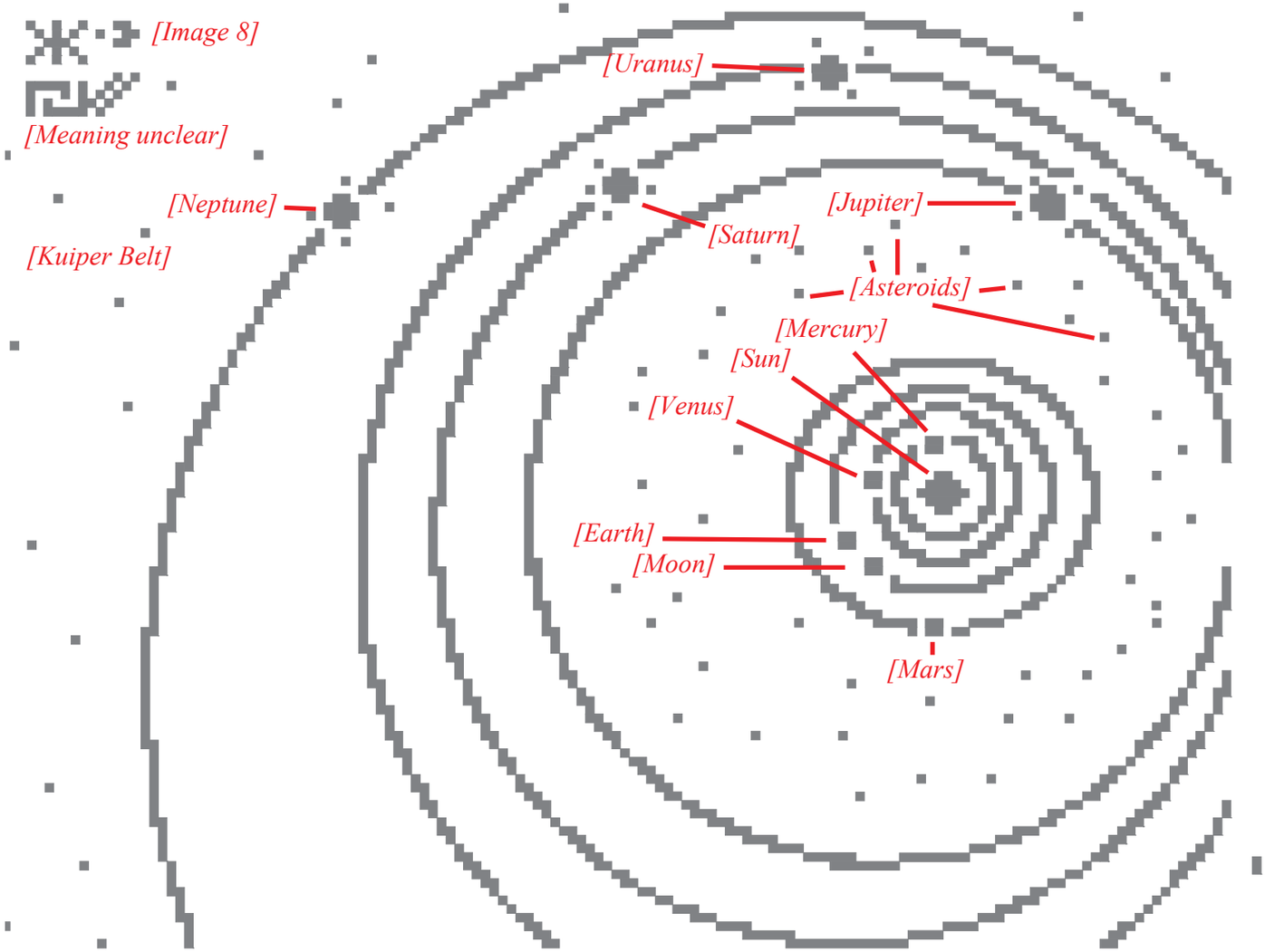
On the next page is image 8 from the aliens and it clearly shows *our* solar system.

It really took us by surprise. But after some discussion about its significance, there was in our minds absolutely no doubt about it:

They Were Deliberately Drawing Energy From Our Sun!

We haven't always printed here the complete images received from the aliens. The full set can be found on our web site at: www.exmoor.ac.uk/astrophysics/2009UMa7/images

1. The Aliens' View of Us



This image clearly shows our solar system with the Sun, its planetary system and some of the natural satellites of the planets, as well as dots that seem to indicate the asteroid belt, the Kuiper Belt, and the Oort Cloud.

The Oort Cloud

The Oort Cloud is much much bigger than the Kuiper Belt; it may contain a trillion, that is a million million (10^{12}) objects. Every now and then, the orbit of one of

by members of the Department of Astrophysics
at the University of Exmoor, Tiverton, Devon

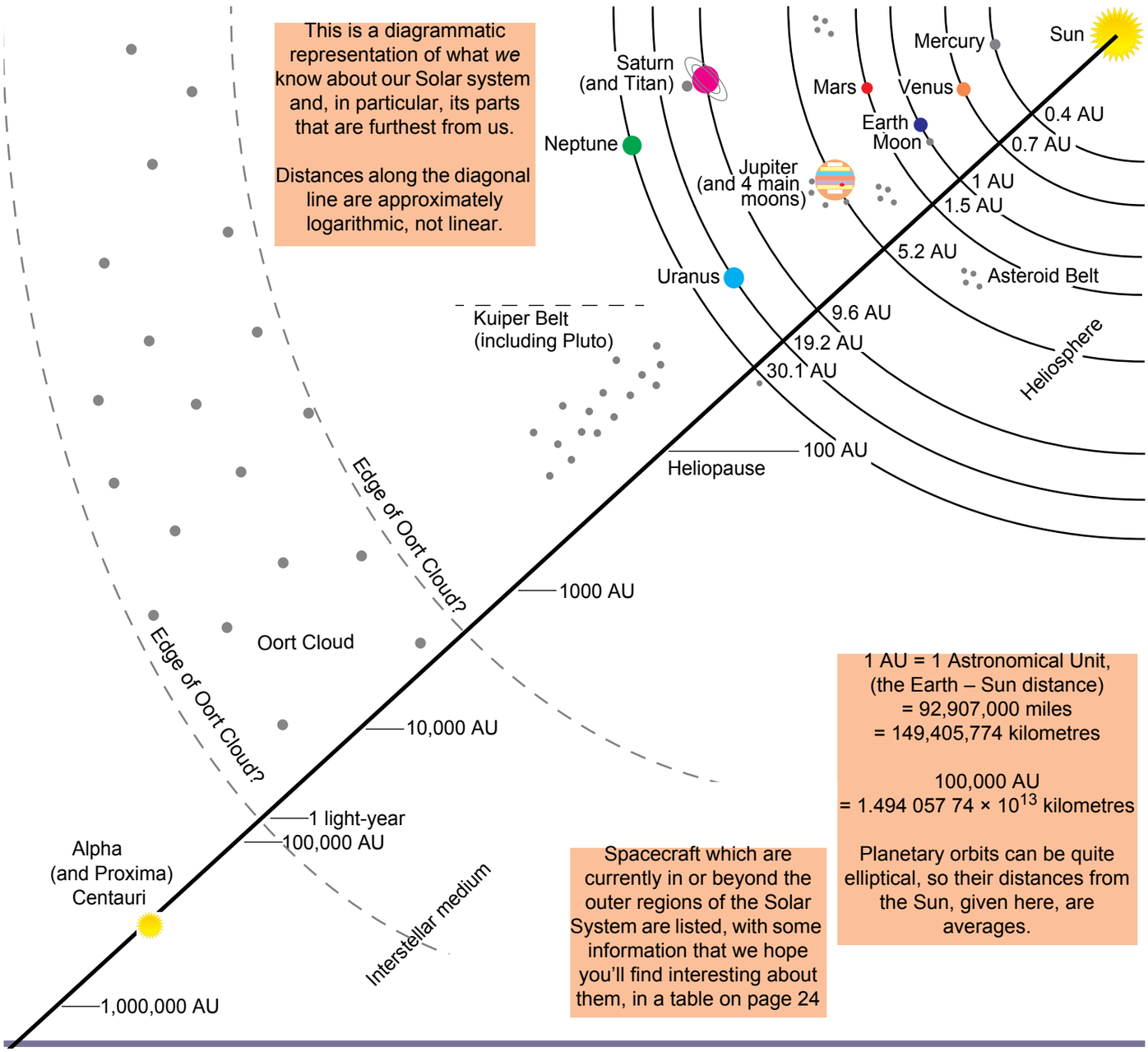
them is perturbed and it comes hurtling towards the Sun, goes once round as a comet and is usually never seen again.

The Oort Cloud starts about 50,000 astronomical units (AU) from the Sun, maybe up to 100,000; nobody knows for sure that it exists, but it explains a lot about the Solar System. One theory suggests that it is a spherical collection of potential comets; the Kuiper Belt is essentially flat, that is, in the same plane as most other objects in the Solar System.

The Oort Cloud may lie nearly a light-year from the Sun. Gravitational interaction with nearby stars and galactic tides modify cometary orbits to make the Cloud more circular. This explains the nearly spherical shape of the Oort cloud.

The Kuiper Belt is described later (page 17).

2. Our View of Ourselves



THE TRUE STORY OF THE GREAT BLACK-OUT

The Lesser-Known Solar System

The *Heliosphere* is a bubble in space 'blown' into the interstellar medium by the solar wind – plasma particles that stream from the Sun until they reach the *heliopause* (see also page 26). For the first ten billion kilometres of its radius, the solar wind travels at over a million km/hr. As it begins to drop out with the interstellar medium, it slows down before finally ceasing altogether.

(Also, Martin Smith insists that the Earth and the Moon should be treated as a binary planet, not a planet and satellite; but that is a discussion for another occasion.)

The *Asteroid Belt*, which is much more commonly known, is a cloud of objects consisting of rock and water ice. Some asteroids lie outside the Mars — Jupiter gap, and some can approach the Earth disturbingly closely.

Before we got to the bottom part of image 8, our work was interrupted by a political problem, which our Department Head describes in some detail (see right).

Our team was temporarily split up, with Anna, Clive and Louisa being relocated to two very convenient locations in the countryside (see below), while Martin and Assad remained in Tiverton at the University with Dr Bassinger.

Political Inter-ference

by Ivan Bassinger, PhD

As our researchers have already noted, we had to change our plans just after I had been told that the aliens had transmitted a diagram showing our own Solar System.

I had a meeting with a young gentleman from GCHQ, the centre of communications for the government located near Cheltenham. He asked about our 'conversations' with the aliens, which revealed that he knew little about how long it would take to transmit messages to and fro (two years assuming immediate replies), and also I told him that we had no means of sending such messages. He left apparently satisfied, but from his remarks he knew that I had another appointment after his. This confirmed my fears that we *were* being spied upon.

So from then on all conversations within our group were to be in 'safe' places, like the University's conference rooms, which couldn't be bugged. Nothing was to be said about our work over the phone.

I arranged for three of the team to work off-site, and organized laptop computers and DVDs for them containing everything of relevance to them, so that they did not need to access the Internet. Their hosts were asked to conform to these security requirements themselves, to which they readily agreed.

They continued their investigations off-site, but this was severely hampered by their inability to discuss matters with Martin or me.

After more investigations by Martin, in which Tom Hastings of Boise, Idaho supplied some important data, we agreed that the aliens had a long list of stars whose energy they planned to raid, and that a second raid on the Sun's energy was way down the list.

This is why we can say with real confidence that we will not be subjected to that same treatment for at least 10,000 years.

By that time, who knows what the state of interplanetary politics will be?

Following my meeting with the man from GCHQ, I had a very productive discussion with Ewan O'Donnell, Head of Science from the Press Association's London bureau. We agreed a plan for the publication of our work, which you are now reading, including *Assad Jamir's* inclusion in our team. Usually scientific discoveries of an important nature are published in learned journals, with peer-reviews of the material; but that takes many weeks, time we felt we did not have.

I decided to recall my three off-site students from exile and to put them in the picture, and told them that we hoped to publish our findings so far in this newspaper this weekend.

Freedom of Information?

Yesterday, lawyers for the British Government were granted an injunction, served on the Press Association; this prohibited publication of this material in any form. It was claimed that the information could cause the public to panic.

We immediately appealed against this decision, and we won.

That is why you are able to read this account now. What is the price of '*freedom of information*'?

by members of the Department of Astrophysics
at the University of Exmoor, Tiverton, Devon

More Images Analyzed (by the Two Groups of Us)

The previous account left off where we were deciphering image 8; we had seen that the diagram at the top was of our own Solar System, which was surprising enough to us.

But after we had spoken to our tutor and mentor, Dr Bassinger, we broke up as a group, because of the fear that our conversations and discoveries being intercepted, not that we were doing anything that we believed was wrong in any way. Martin and Assad remained at the University in Tiverton as did Dr Bassinger.

Anna and Louisa went to stay with a very nice lady in the countryside while Clive stayed at a gentleman's house nearby. And they both treated us with the maximum courtesy and interest in our work, which we were happy to share with them; they were even able to point out one or two things we had missed or misinterpreted.

The Kuiper Belt

(continuing from page 15)

The Kuiper Belt is outside the orbit of Neptune from roughly 30 to 50 astronomical units from the Sun – an AU is the distance between the Earth and the Sun, about 93 million miles or 150 million kilometres. The Kuiper Belt has up to 10^8 (that is a hundred million) small icy bodies and is where the short-period comets come from. They have remained essentially unchanged since the birth of the Solar System 4.5 billion years ago.

Short-period comets are typically those that return to the vicinity of the Sun every few tens or hundreds of years; *Halley's Comet* is one of these, and has an orbital period of about 76 years.

More research needs to be done on both the *Kuiper Belt* and the *Oort Cloud*.

Where Are the Aliens?

At the bottom of image 8 is a line that joined our Sun with theirs. By the line is a number and their word for 'length units'. We all independently calculated what the number was, in units meaningful to us.

It was 364 light-days!
One light-year.

We were all amazed at their closeness to us. So amazed, in fact, that Clive came along the lane where our temporary hosts live to check it with Anna and Louisa, and independently Martin asked Dr Bassinger and Assad to check his calculation back at base. None of us could really believe that the aliens are so close.

But unless we had all made a serious miscalculation along the way, the aliens are very near to us.

Why Hadn't We Seen the Aliens' Star Before?

The star first appeared in June 2009, never having been observed before. We assume that it had emerged from a dust cloud, many of which permeate interstellar space.

We had to accept the possibility that the aliens are very close, and we continued our examination of their transmissions.

As Clive had advised us earlier, after image 8 came the prime numbers again and another copy of image 1.

THE TRUE STORY OF THE GREAT BLACK-OUT

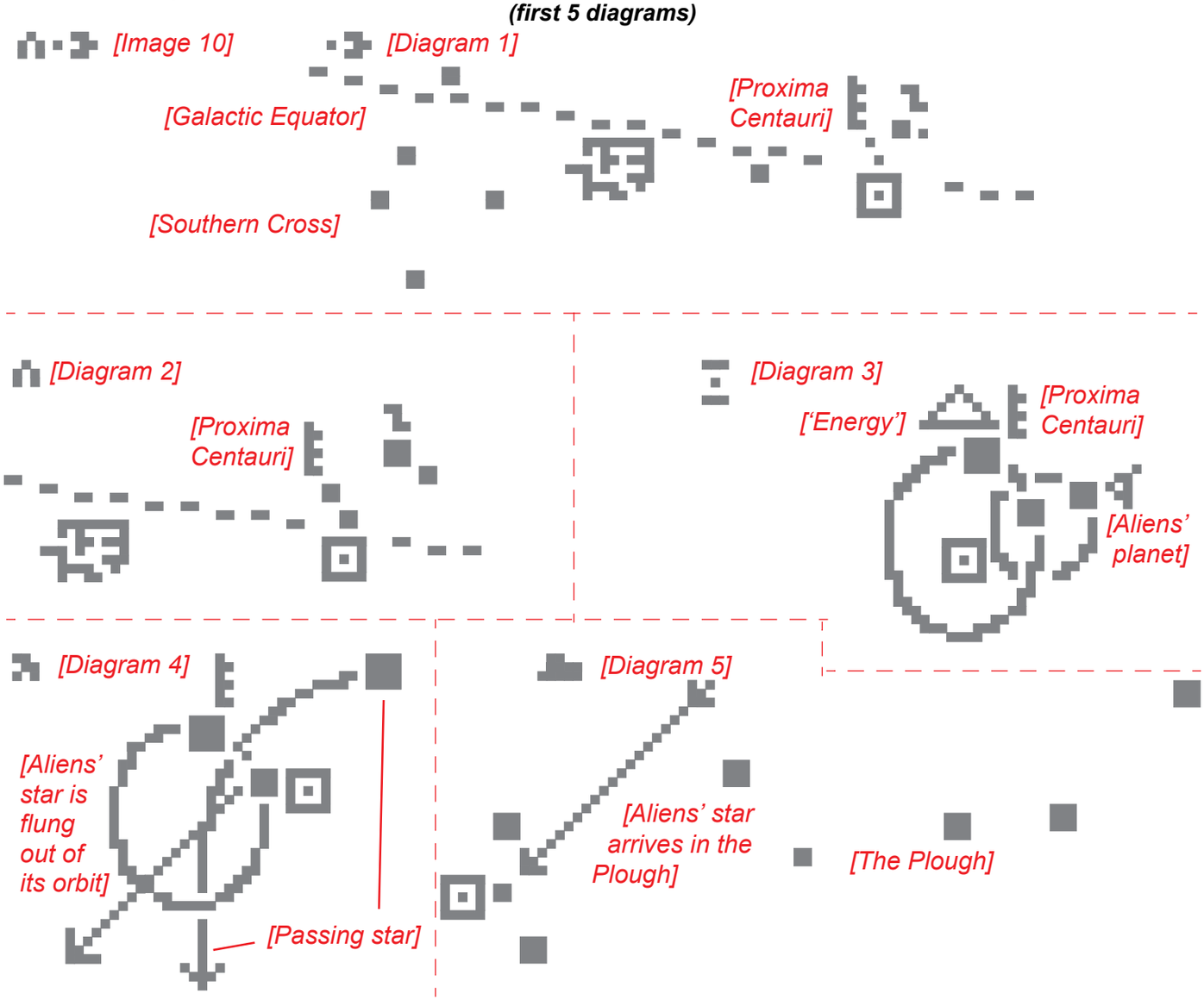
From Proxima Centauri to the Plough

Image 10 was rather confusing to us at first. It is divided up into five diagrams (see below).

The first we eventually realized show the Southern Cross and the stars Centaurus A and Proxima Centauri and indicate that the aliens' star was originally near the Galactic Equator (the plane in which most of our galaxy's stars are to be found and indicated by the line of dashes) in the constellation of Centaurus. Proxima has until now been recognized as the closest star to our Solar System. Centaurus, by the way, is in the southern hemisphere of the sky, and is always below the horizon as seen from the UK.

The second and third diagrams are enlargements of parts of the first, showing that the aliens' star was in orbit

Image 10: How the aliens were flung from Proxima Centauri to the environs of the Sun (first 5 diagrams)



by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

around Proxima, from which they received their energy to satisfy their requirements for life and their civilization, or so we interpreted them.

The third diagram indicates that their star was orbiting Proxima Centauri, and, although it had little energy from its own star, Proxima provided it with all its needs, just as the Sun ultimately provides the Earth with almost all its energy.

Diagram 4 shows a passing star entering the Proxima Centauri system and flinging, by gravity, the aliens' star (and their planet) out into space, after which it arrives in the Plough (diagram 5).

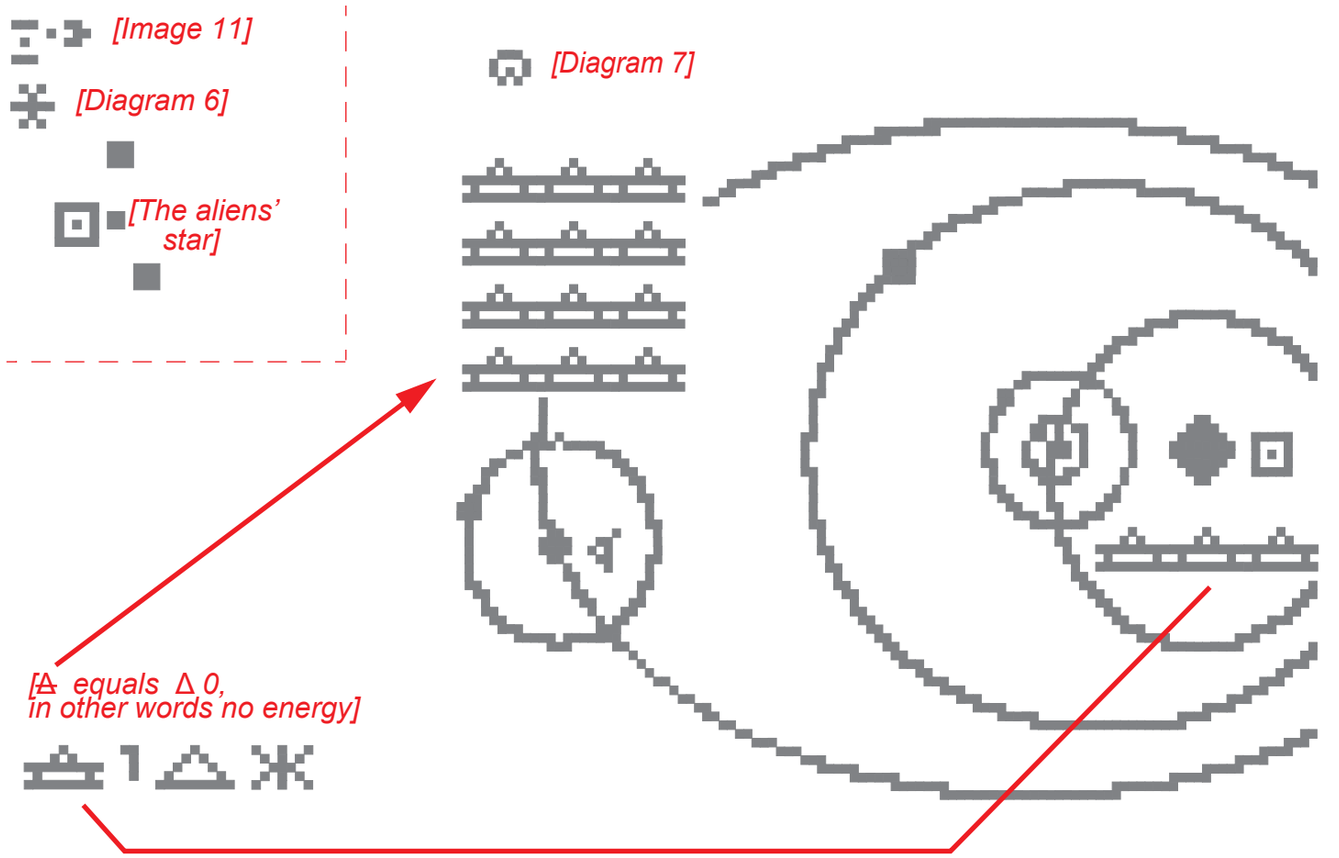
Image 11 (below) continues the sequence from image 10 with diagrams 6 and 7. Diagram 6 is a repeat of part of 5, confirming that the aliens' mini-stellar system lies in the direction of Ursa Major; diagram 7 is very similar to image 1, but emphasizes the lack of energy around this dying star; the words at the bottom left indicate no photons are reaching the planet, which we take to mean that it receives no usable energy.

Their journey through space stopped when they reached the gravitational influence of our Sun, or so we conjectured, and were in an area of space that contained a lot of dust.

It seems that their entire system, their star and its three planets, was torn out of the influence of Proxima Centauri and into that of the Sun.

Their dilemma, of course, was that their star was such a weak emitter of energy, that in order to survive, they had to find another source of energy.

Image 11: How the aliens were flung from Proxima Centauri to the environs of the Sun (diagrams 6 and 7)



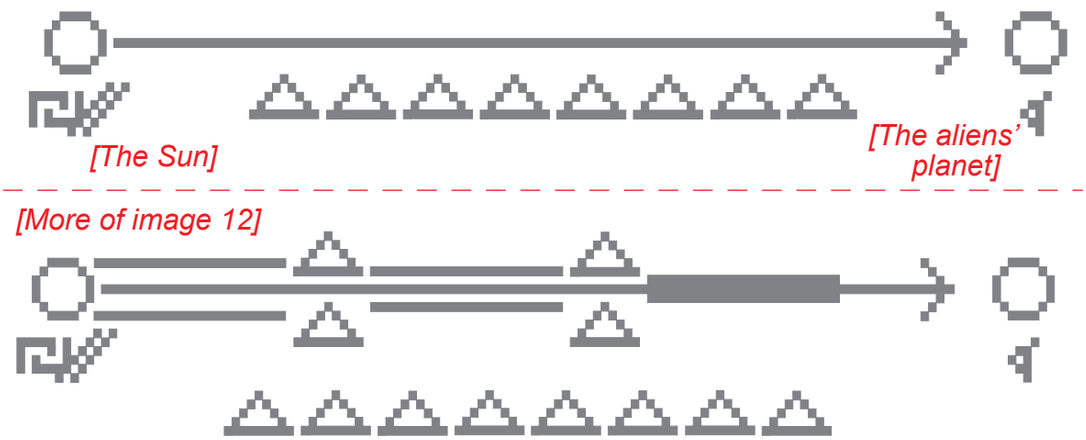
THE TRUE STORY OF THE GREAT BLACK-OUT

'Stealing' Energy

There are two diagrams in image 12: the first showing that light (we think they may use the same word for 'energy') is reaching them from our Sun. The second is similar but the line from our Sun to the aliens is more like an arrow and seems to suggest that somehow the Sun's energy is to be transferred to them. Both diagrams are shown below.

Image 12: Energy being taken from Our Sun

[Image 12]



☉ is their symbol for our Sun

Δ means 'photons' or 'energy'

♀ is the aliens' planet

Our interpretation of the lower diagram is that the aliens take energy from the Sun

Are We Safe?

Image 14 has some text which includes an enormous number followed by the 'time units' word. *The number is almost eleven thousand years.* Clive, Anna and Louisa, who are running more or less parallel to Martin and Assad in our studies, see that the cone of light streaming from the Sun to the alien planet, is repeated. Does this mean that we are safe from their 'energy stealing' for that amount of time?

We believe so.

(More prime numbers follow, and then another copy of image 1.)

My Eureka Moment

by Martin Smith

In case anyone was listening in on our conversations or monitoring our work while Anna, Clive and Louise were away from us, Dr Bassinger, Assad and I kept as low a profile as we could. I was to appear to be examining image 3, whereas we were all looking at image 8.

Then our head of Department asked me to see if I could find any recordings on 21 centimetres from before the Black-Out. I had to resort to an appeal on the internet, couched in obscure terms that the casual snooper would overlook.

Fortunately Tom Hastings from Boise, Idaho had been taking some observations

by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

since mid-May until the Black-Out came, and he sent them to me. I soon found that they had the same general structure and appearance as our data from after the catastrophe, so I began looking for differences.

The 364 light-days distance in image 7 was confirmed. There were some numbers in images 12 and 14 that were different, so I noted them and converted them to base 10. They were also accompanied by the symbol for 'time'. Tom's numbers were much, much smaller, and there was a small difference between those on images 12 and 14, the difference in Tom's images 12 and 14 being the same as the differences in our images 12 and 14.

In Tom's image 12 the number represented just over five weeks, and image 14 was exactly 35.302 minutes less; that difference is precisely the time taken to transmit two images plus one double set of prime numbers. Our values for the pair of numbers were huge in comparison: the number in image 12 is just under eleven thousand years! But the difference between that and the number in image 14 is again 35.302 minutes – two images and the primes. I could not see what this meant, so I called it a day.

Then next day it all came clear to me; it was my 'Eureka' moment. Mid-May plus just over five weeks brought us to June – maybe the 21st, Black-Out Day.

Tom's numbers looked like a count-down to the Black-Out. What's more, if our assumption is correct, we will be safe from their attention for **nearly eleven thousand years**. We might expect the same thing to occur then, but by then we'll have developed our science, our defences enormously, beyond belief. We'll be well prepared. And if the aliens are only one light-year away, we may well be in communication with them, or even have visited them or have been visited.

Dr Bassinger decided that at this point we should present our material to the Press Association, and do so as soon as possible.

So yesterday we came to London; what followed has already been told.

We are still working on interpreting the information received from the aliens. Watch this space...

Further Publication...

...This account is also syndicated with:

The New York Times
DER SPIEGEL
EL PAÍS
Le Monde

Further Developments...

...will be reported in future editions of this newspaper or our daily editions, *The Herald* and *The Scottish Daily Globe*.

THE TRUE STORY OF THE GREAT BLACK-OUT

Dust Clouds

Images 15 and 16 (on these two pages) clearly illustrate the problem of dust in interstellar space. It seems that when the aliens' star reached the gravitational influence of our Sun, it stopped (though it may still have been moving in orbit around the Sun).

The star was embedded in a cloud of dust or gas or something else quite impermeable to light.

Images 15 and 16 are a dozen diagrams showing their star initially inside a dust cloud and gradually emerging from it. At the same time their own star is becoming dimmer until, as they depict it, it vanishes altogether.

Although no time-scale is given, it is no wonder they are 'stealing' energy.

It cannot yet have reached complete invisibility, as shown in diagram 12, or we would be unable to see it here on Earth.

Its final stage may be something different, like an explosion with just a small core of matter remaining. Our knowledge of the final stages of evolution of brown dwarfs is not very complete at the moment.

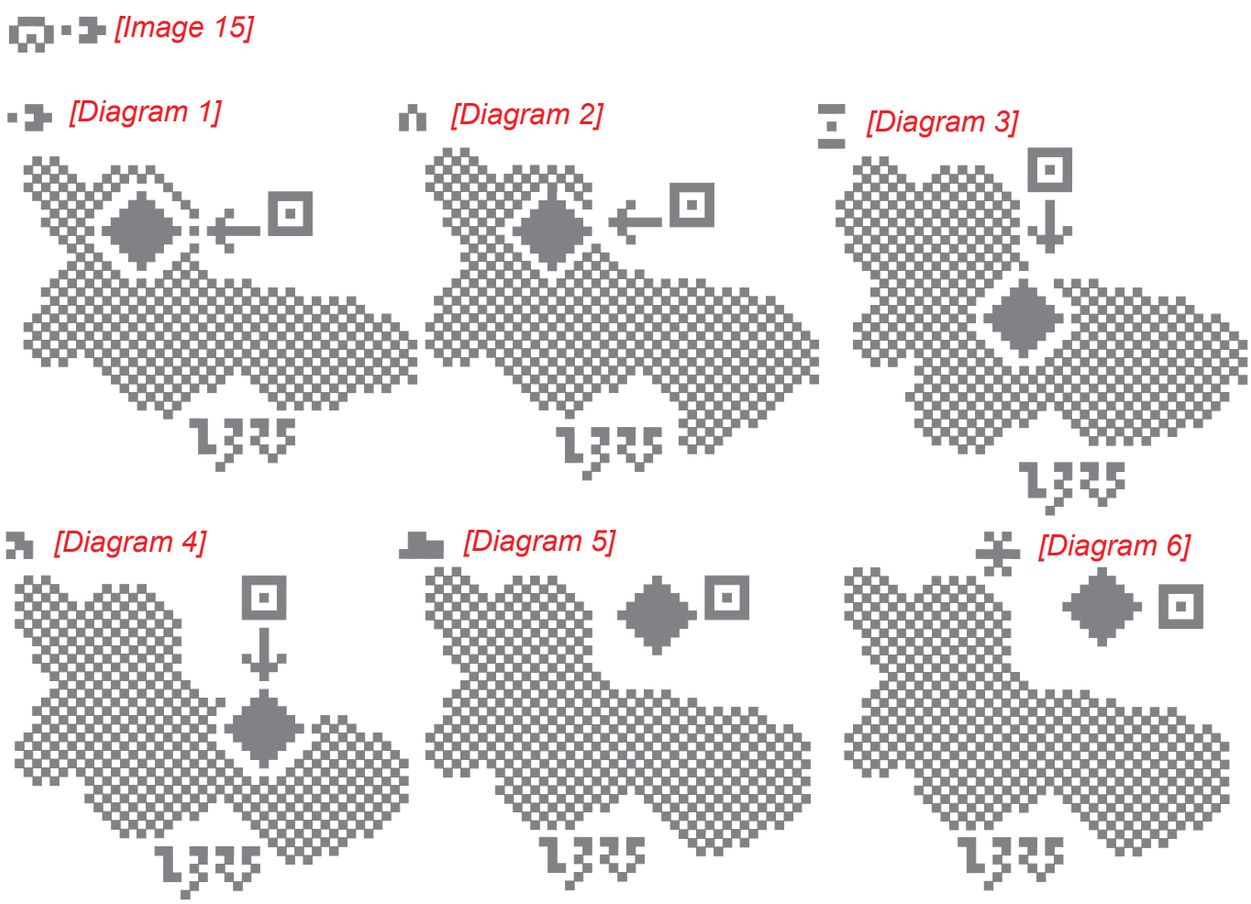
One thing we do know is that its brightness has been fluctuating since it was first seen last year, but that may have been because of intervening dust clouds.

Diagrams 1 to 4 show it meandering in the dust, or perhaps the dust was swirling around in its vicinity. By diagrams 5 and 6 it has emerged from the cloud, but 7 through 11 show the star fading until in diagram 12 it is emitting no light at all.

It cannot yet have reached complete invisibility, as shown in diagram 12 or, as we noted previously, we would be unable to see it here on Earth.

Its final stage may be something different, like an explosion with just a small core of matter remaining. Our

Image 15: The problems with the dust clouds (diagrams 1 to 6)



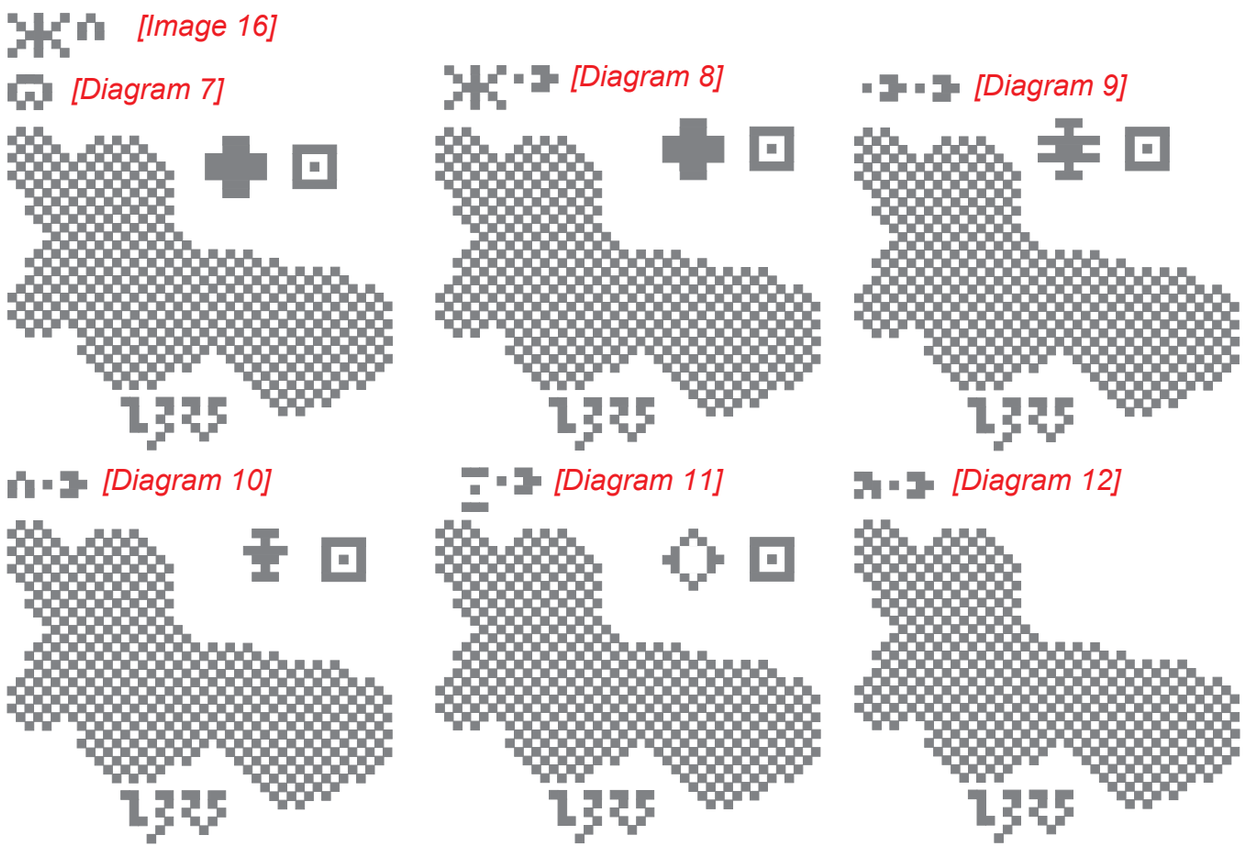
by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

knowledge of the final stages of evolution of brown dwarfs is not very complete at the moment.

Another thing we know is that its brightness has been fluctuating since it was first seen last year, but that may have been because of intervening dust clouds.

Then we received a message from Dr Bassinger that we were to return to Tiverton immediately. Clearly he and Martin had found out something, or something important had occurred.

Image 16: The problems with the dust clouds (diagrams 7 to 12)



10 Stars Closest to Our Solar System

These stars were, until now, those known to be nearest to us.

This list should give a good idea of how far apart stars are. We have no known way, at the moment of even envisaging travel to any of them, nor of how any aliens could reach us.

Current technology is totally unable to cope with distances measured in trillions of miles.

Most of them are very dim. It would take an enormously long voyage to reach them.

'LY' means light year, the distance light travels in one year, 9,460,730,472,580.8 km or about 6,000,000,000,000 miles.

1. Proxima Centauri: the closest star to our own solar system will not always be closest, but it will be a long time before that happens. It is the third star in the Alpha Centauri star system, and is also known as **Alpha Centauri C**. Distance: 4.2 LY.

2. Rigil Kentaurus: with Proxima Centauri, **Alpha Centauri A** and **B** make up the other two stars of the triple star system Alpha Centauri. Distance: 4.3 LY.

3. Barnard's Star: a faint red dwarf star, recent efforts

THE TRUE STORY OF THE GREAT BLACK-OUT

to discover planets around it have failed. Distance: 5.9 LY.

4. Wolf 359: known to many as the location of a famous battle on *Star Trek: the Next Generation*, it is a red dwarf, so small that if it were to replace our sun, an observer on Earth would need a telescope to see it clearly. Distance: 7.7 LY.

5. Lalande 21185: about three times too faint to be seen with the naked eye, despite its closeness to the sun. Distance: 8.26 LY.

6. Luyten 726-8A and B: both stars are red dwarfs and too faint to be seen with the naked eye. Distance: 8.73 LY.

7. Sirius A and B: the 'Dog Star', Sirius A, is the brightest star in the sky. Sirius B, its companion, is the first white dwarf with a spectrum to show a gravitational red shift as predicted by the general theory of relativity. Distance: 8.6 LY.

8. Ross 154: a flare star, its brightness can increase by a factor of 10 or more before reverting to its normal state, a process which takes only a few minutes. Distance: 9.693 LY.

9. Ross 248: now the 9th closest, around the year 38,000 AD this red dwarf will take the place of Proxima Centauri as the closest star to us. Distance: 10.32 LY.

10.Epsilon Eridani: the closest star known to have a planet, ε Eridani B. It is the third closest star that is viewable without a telescope. Distance: 10.5 LY.

Spacecraft Currently Escaping the Solar System

Just in case we ever contemplate visiting our alien neighbours, here is some data that shows the progress of five spacecraft that have already started a journey out of the Solar System. Likewise, if they wanted to visit us, their journeys would presumably have similar properties.

This table shows the current positions and other data of the five spacecraft which are currently leaving the Solar System on escape trajectories – our first emissaries to the stars.

	Pioneer 10	Pioneer 11	Voyager 2	Voyager 1	New Horizons
Launch date	3/03/1972	6/04/1973	20/08/1977	5/09/1977	19/01/2006
Distance from Earth (AU)	102.879	83.196	95.161	116.351	19.785
Distance from Sun (AU)	102.862	82.827	94.747	116.404	19.431
One-way light time	14.26 hours	11.53 hours	13.19 hours	16.13 hours	2.74 hours
Magnitude of Sun from spacecraft	-16.6	-17.1	-16.8	-16.4	-20.3
Speed relative to Sun (km/sec)	12.062	11.415	15.465	17.062	15.869
Speed relative to Sun (AU/year)	2.545	2.408	3.262	3.599	3.348
Ecliptic Latitude	3.0°	14.3°	-33.5°	34.9°	1.8°
Declination	25.84°	-8.72°	-54.94°	12.14°	-21.25°
Right Ascension	5.074 hours	18.760 hours	19.892 hours	17.184 hours	18.788 hours
Constellation	Taurus	Scutum	Telescopium	Ophiuchus	Sagittarius
Still functioning?	No	No	Yes	Yes	Yes

by members of the Department of Astrophysics at the University of Exmoor, Tiverton, Devon

Pioneers 10 and 11

After *Pioneer 10* was launched it reached a speed of 32,400 mph needed for the flight to Jupiter, making it the fastest human-made object to leave the Earth – fast enough to pass the moon in 11 hours and to cross Mars' orbit, some 50 million miles away, in just 12 weeks. After more than 30 years, its final, very weak signal was received on 22nd January 2003.

Pioneer 10 explored Jupiter, travelled twice as far as the most distant planet in our solar system, and, as Earth's first venture into deep space, is carrying a gold plaque that describes what we look like, where we are, and the date when the mission began. It will continue to coast silently into interstellar space, heading in the direction of the red star Aldebaran, about 68 LY away; it will take *Pioneer 10* more than two million years to reach it.

Its sister ship, *Pioneer 11*, was launched on 5th April 1973, and on 19th April 1974 its thrusters were fired to add another 63.7 m/sec to its velocity. This adjusted the aiming point at Jupiter to 43,000 km above the cloud-tops. The close approach also allowed the spacecraft to be accelerated by Jupiter to a velocity 55 times that of the muzzle velocity of a high speed rifle bullet – 173,000 kph – so that it would be carried across the Solar System some 2.4 billion km to Saturn.

Looping high above the ecliptic plane and across the Solar System, *Pioneer 11* raced toward its appointment with Saturn on 1st September 1979. *Pioneer 11* flew to within 21,000 km of Saturn and took the first close-up pictures of the planet. It continued its exploration of the outer regions of the Solar System, studying energetic particles from the Sun (the solar wind), and cosmic rays entering our portion of the Milky Way. In September 1995, *Pioneer 11* was at a distance of 6.5 billion km from Earth. At that distance, it takes over 6 hours for the radio signal (travelling at the speed of light) to reach Earth. At the end of 1995, *Pioneer 10* (the first man-made object to leave the solar system) was about 64 AU from the Sun and heading toward interstellar space at 2.6 AU/year. At the same time *Pioneer 11* was 44.7 AU from the Sun and heading outward at 2.5 AU/year.

By then, its power source was almost exhausted, and *Pioneer 11* could no longer make any observations; on 30th September 1995, its last data was received.

Voyagers 1 and 2

The only other man-made object now farther from Earth than *Pioneer 10* is *Voyager 1*. It is moving in the opposite direction relative to the sun at about 38,500 mph.

Voyager 1 was the first probe to leave the Solar System and is the farthest human-made object from Earth.

Currently in extended mission, the spacecraft is locating and studying the boundaries of the Solar System, including the Kuiper belt, the heliosphere and interstellar space.

Two weeks before, the twin *Voyager 2* probe had been launched. *Voyager 1* reached both Jupiter and Saturn sooner, having been launched into a shorter trajectory.

It is estimated that both *Voyager* craft have sufficient electrical power to operate their radio transmitters until at least 2025, over 48 years after launch.

On 17th November 1998, *Voyager 1* overtook *Pioneer 10* as the most distant man-made object from Earth, at a distance of 69.419 AU. It is currently the most distant functioning space probe to receive commands and transmit information to Earth. Provided *Voyager 1* does not collide with any stellar objects, the ***New Horizons*** space probe will never pass it, despite being launched from Earth at a faster speed than either of the *Voyager* spacecraft.

Voyager 1 is the farthest human-made object from Earth, travelling away from both the Earth and the Sun at a relatively faster speed than any other probe.

Radio signals from *Voyager 1* take over 16 hours to each the Earth. Its current relative velocity is 17.063 km/s, about 10% faster than *Voyager 2*. At this velocity, 73,600 years would pass before reaching **Proxima Centauri**, were the spacecraft travelling in the direction of that star.

If *Voyager 1* were heading towards our aliens' planet, it would take some 20,000 years to reach them.

Voyager 1 is not heading towards any particular star, but in about 40,000 years it will pass within 1.6 LY of the star AC+79 3888 in the constellation Ophiuchus, which is moving towards the solar system at about 119 km/sec.

On 13th December 2010, it was confirmed that *Voyager 1* passed the reach of the solar wind emanating from the Sun. It is suspected that solar wind at this distance turns sideways due to interstellar wind pushing against the heliosphere.

On 19th November, 2015, *Voyager 1* is projected to be approximately 133.15 AU from the Sun.

New Horizons

The current speed of *New Horizons* is slightly greater than *Voyager 1* but when it reaches the same distance from the sun as *Voyager 1* is now, its speed will be about 13 km/s (8 miles/sec) compared to *Voyager's* 17 km/sec (10.5 miles/sec).

THE TRUE STORY OF THE GREAT BLACK-OUT

What Spacecraft Told Us about the Heliopause

***Voyager 1* is currently within the *heliosheath* and approaching interstellar space. As *Voyager 1* heads for interstellar space, its instruments continue to study the solar system; *Jet Propulsion Laboratory* scientists in the United States are using experiments aboard *Voyagers 1* and *2* to look for the *heliopause*, the boundary at which the solar wind makes its transition into the interstellar medium.**

Scientists at the *Johns Hopkins University Applied Physics Laboratory* believe that *Voyager 1* entered the termination shock in February 2003. Some other scientists have expressed doubt, discussed in the journal *Nature* of 6th November, 2003. In a scientific session at the *American Geophysical Union* meeting in New Orleans on the morning of 25th May 2005, Dr. Ed Stone presented evidence that *Voyager 1* crossed the termination shock in December 2004.

The issue will not be resolved until other data becomes available, since *Voyager 1*'s solar-wind detector ceased functioning in 1990. This failure has meant that termination shock detection must be inferred from the data from the other instruments on board.

However, in May 2005 a NASA press release said that consensus was that *Voyager 1* was now in the *heliosheath*. Scientists anticipate that the craft will reach the *heliopause* in 2015.

The Future

It appears that there is no way, given our current understanding of physics that interstellar travel will be possible. But our understanding and grasp of technology is always changing. It wasn't so long ago that the thought of landing on the Moon was only a dream. Who knows what the future may hold?

by members of the Department of Astrophysics
at the University of Exmoor, Tiverton, Devon

A Final Comment by the Editor-in-Chief

Scientists to be Proud of

You have just read an amazing account of the innovative way in which young scientists in this country can work.

It is clear that four postgraduate research students with no previous experience of any sort of scientific investigation have managed to unravel (and are still working on unravelling) one of the most serious catastrophes in human history.

Their Head of Department, who, in a new University has enough on his plate organizing courses and tending to the needs of his undergraduate students, most of whom have never left home before, has guided these intelligent young people into deciphering encoded signals from space.

As luck would have it, this group of research students is the first (we hope of many) that Dr Bassinger has taken on.

This work would have done credit to the Bletchley Park team who unearthed the Enigma machine used by the Germans during the Second World War. These people are truly the bearers of Alan Turing's torch.

That said, we look forward eagerly to any further revelations that they can discover about the aliens and their science.

As Martin Smith has said: Watch this space.

Solutions to Alien Problems

There is of course a step missing that has only been alluded to by our scientists, and that is the 'humanitarian' aspects of what they have discovered.

These aliens appear to be in some sort of desperate situation, but have found a solution, the science of which is not understood by us. However, taking their words at face value, they do not plan to treat us in the way they just have for another ten thousand years.

This, if nothing else, is reassuring.

If they are true to their word, and do not 'attack' us for another ten millennia, there is no doubt that we will have contacted them and, perhaps, will have helped them find a solution to their problem of finding energy to satisfy their requirements.

The Political Aspect

Another more important matter for us on planet Earth, is what we do in the immediate future to deal with the political and diplomatic issues that are associated with the existence, relatively near to us, of an alien race, of whom we know very little, except that their Astronomy is well developed and their technology can do things that we do not understand.

It seems rather surprising that the aliens were not aware of our existence. For most of the past century we have been transmitting rather random radio and television signals into space, not intentionally but in order to communicate with each other and to inform our people of what is happening, and what is thought of around the world.

These signals were not intended for use by other civilizations, but they must surely have been detected by them. If so, why did they continue with their actions?

William van Neumann

The Sunday Herald and Globe | 12 December 2010
EXCLUSIVE - NEWS SPECIAL | 28

THE TRUE STORY OF THE GREAT BLACK-OUT

by members of the Department of Astrophysics
at the University of Exmoor, Tiverton, Devon