Myth or Mystery?

БИБЛИОТЕКА
ДЛЯ ДОМАШНЕГО ЧТЕНИЯ

МИФ ИЛИ ЗАГАДКА?

КНИГА ДЛЯ ЧТЕНИЯ НА АНГЛИЙСКОМ ЯЗЫКЕ

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Статьи и очерки книги объединены общей темой – загадочные, волнующие воображение факты, события, гипотезы, научные концепции (Тунгусский метеорит, Бермудский треугольник, НЛО, легендарная Несси, снежный человек и др.). Известные читателю факты преподнесены с привлечением малоизвестных подробностей и необычных точек зрения.

Книга включает обширный комментарий.

Для широкого круга лиц, совершенствующих свои знания по английскому языку.

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ПРЕДИСЛОВИЕ

Чтение – естественная потребность современного человека. Чтение же на иностранном языке в наш просвещенный век не просто желательно, а совершенно необходимо для того, кто хочет шагать в ногу со временем.

Предлагаемая книга нацелена на то, чтобы приобщить к чтению каждого, кто овладел азами английского языка, т.е. усвоил основные структуры нормативной грамматики и имеет словарный запас в пределах 800 – 1000 единиц.

Следует заметить, что даже на родном языке чтение требует определенных навыков и умений, которые сами по себе не формируются. Это тем более верно в отношении иностранного языка. Однако и в том и другом случае цель одна – понять форму и осмыслить содержание.

Великий математик древности Евклид сказал: «Нет царского пути к геометрии». Так и здесь, чтобы научиться читать на иностранном языке, придется и лишний раз в словарь заглянуть, и попрактиковаться в опознании слов по их производным, научиться догадываться о значении слова по контексту и т.д.

Памятуя о препятствиях, подстерегающих неискушенного читателя, составитель пытался, насколько это возможно, помочь ему сделать первые шаги на пути к свободному беспереводному чтению.

С этой целью были отобраны очерки и статьи, объединенные общей темой. Устойчивый интерес читателей всех поколений к научно-популярной тематике предопределил выбор. Предпочтение отдавалось фактам и событиям, концепциям и гипотезам, которые как бы вошли в мифологию XX века. Вы сможете прочитать о Тунгусском диве, снежном человеке, НЛО, легендарной Несси, Туринской плащанице, причудах климата, «озонной дыре» и многом другом, а также познакомиться с рядом научных и околонаучных, или откровенно ненаучных, концепций и гипотез. Много загадочного, волнующего воображение таят в себе также и памятники древности – Стоунхендж, Паленке египетские пирамиды, долина Наска ...

Выбор именно данной тематики был обусловлен не только желанием удовлетворить любознательного читателя. Сыграло роль и то, что многие из вышеперечисленных

тем активно обсуждаются на страницах наших газет, журналов и других массовых изданий уже на протяжении нескольких десятков лет, ибо человек не может, да и не хочет, мириться с незнанием и настойчиво ищет объяснение разного рода «таинственным случаям».

Поэтому, открыв книгу, читатель не испытает стресса от встречи с чем-то ему совершенно неизвестным. Однако следует сразу же оговориться, что очерки и статьи, включенные в сборник, хотя и содержат в большинстве своем знакомые читателю факты, но освещаются они, как правило, в ином ракурсе, с привлечением малоизвестных подробностей, или, порой, в такой интерпретации, что остается лишь руками развести.

При выборе материала для сборника составитель руководствовался и некоторыми другими соображениями. Известно, что жанр научно-популярной литературы, как и любой другой, имеет свои, только ему присущие особенности, которые делают произведения именно этого жанра особенно привлекательными для начинающего читателя. Из них главная заключается в том, что авторы научно-популярных книг, очерков, статей изначально ставят себе целью объяснить или порассуждать о факте, явлении или гипотезе в форме легкой и доступной для самого широкого круга читателей, не забывая при этом и о занимательности сюжета. Недаром великий физик Резерфорд говорил: «Если ученый не может объяснить, чем он занимается, уборщице, моющей пол в его лаборатории, значит он сам не понимает, чем он занимается».

При чтении иностранного текста случается и так, что его содержание воспринимается неопытным читателем либо дискретно, либо в самом общем виде. В первом случае причина кроется в неотработанных механизмах чтения, во втором – в ограниченности словарного запаса.

С учетом преодоления именно этих трудностей с наименьшей затратой сил и наибольшей отдачей материал сборника расположен по степени возрастания трудности.

Сборник открывают пятнадцать очерков, принадлежащих перу одного автора (F. Edwards). В серии небольших по объему очерков, написанных в простой и доступной манере, он охватывает широкий круг сюжетов, что, как надеется составитель, послужит стимулом для начинающего

читателя не только обрести прочные умения, необходимые для чтения с целью получения информации, но и выработать алгоритм восприятия иностранного текста как законченного смыслового целого. Если внимательно прочитать первые два-три очерка, то чтение остальных потребует обращения к словарю лишь в исключительных случаях. Дело в том, что уже в первых текстах найдут отражение весь, или почти весь, «рабочий» словарь автора, а также наиболее характерные для жанра грамматические обороты и конструкции. В результате, возникнет как бы «переходной мостик» к более сложным материалам.

Книга состоит из двух разделов. Первый раздел предлагает материалы, отражающие, в основном, популярную, часто произвольную, трактовку вполне достоверных фактов и явлений.

Второй раздел строится на материалах из английских и американских журналов и газет, а также книг. Среди авторов данного раздела английский астроном Эдриан Берри, американский писатель Ирвинг Уоллес и др. Весь текстовой материал сборника взят из оригинальных источников без какой бы то ни было адаптации.

Сборник включает также комментарий, где дается перевод трудных для понимания оборотов речи, объяснение слов, сокращений и научных терминов, которых нет в силу их специфики в обычных англо-русских словарях. Содержатся в нем и пояснения более общего характера, которые помогут читателю сориентироваться как в проблемах, так и в обстановке отдаленных от нас эпох.

Составитель надеется, что вдумчивый читатель найдет в книге и пищу для ума, и информацию к размышлению, и материал для критического осмысления, и предмет для беседы или дискуссии, а закрыв книгу, с радостным изумлением обнаружит, что может читать по-английски любые научно-популярные статьи и журналы.

Хотя книга рассчитана на самостоятельное чтение, но, как показывает опыт, сборник можно с успехом использовать на занятиях в аудитории в группах с самым разным уровнем подготовки для развития навыка чтения, речи (подготовленной и неподготовленной) и письма.

С. Шевцова

PART ONE

STORIES IN STONE

Did the Vikings* penetrate to Minnesota? Did they leave a graven record of their trip and its tragic finale? ... What was the unusual inscription on the stone?

Historians are well aware that the Vikings reached the shores of the new world centuries before Columbus. There is ample evidence that they settled briefly as far south as Massachusetts. But did they also penetrate the St Lawrence river and eventually enter the Great Lakes?*

A farmer near Kensington, Minnesota, Olaf Ohman, and his small son, Edward, dug up a slab of soft calcite on Ohman's farm in 1898 and were surprised, so they said, to discover that it was covered with some sort of inscription. For a while the stone remained little more than a local curiosity.

A few of the better-educated members of that predominantly Scandinavian community noted that the writing on the stone appeared to be similar to the old rune writing* of their own ancestors.

Mr Ohman sent the stone to Professor George Ohrme of Northwestern University, who examined it at length and informed the owner that it was spurious, a deliberate attempt by some unknown party to falsify history. Mr Ohman, a practical man, put the stone to use as a doorstep for a feed bin.

Scholars are generally agreed that the inscription reads: "Eight Goths* and 22 Norwegians on an exploring journey from Vinland* very far west. We had camp by two skerries, one day's journey north from this stone. We were fishing one day when we returned home and found ten men red with blood and dead. A V M (Ava Virgin Mary) save us from this evil. We have ten men by the sea to look after our vessel forty-one (or fourteen) days' journey from this island. Year 1362."

The stone was purchased by Hjalmar Holand of Ephraim, Wisconsin, who then embarked upon a career of lecturing and writing on the subject; and his works converted a former sceptic,

Professor Sigurdus Nordhal of the University of Iceland, to the belief that the story told by the stone is genuine.

Most other authorities on the subject are convinced that the carving on the soft calcite is of recent vintage, probably the work of two neighbours of Olaf Ohman, men who were known to have produced similar writings as practical jokes.

The weakness in the carving on the Kensington stone lies in the use of runic characters and expressions which were not a part of the language used by the Fourteenth Century Vikings. Holand based his case largely on the record of a Viking expedition which left Norway in 1348 and did not return until 1364, plus the story of a small vessel which crept into the harbour of Straumfiord, Iceland, in 1347. If Holand is correct and the Kensington stone is indeed a record of Vikings in Minnesota in 1362, history would need some extensive rewriting.

From time to time these strangely inscribed stones crop up to plague the scholars. Such an incident occurred in the spring of 1937 in County Cork, Ireland, when a schoolboy cutting across fields on his way home picked up a stone to shy at a bird. The bird didn't move, so the lad searched about for another rock. He spied what appeared to be a small stone projecting from the sod ... but as he attempted to pick it up it resisted ... evidently it was larger and deeper than he had expected.

The lad kicked the stone, worked it loose and discovered that it was fully as large as his hand ... and smooth on one side. Lo and behold! There was writing on the smooth side of the stone. Devil's writing, no doubt – he dropped the stone and fairly flew across the fields to the little village where he lived ... Straight to the home of the schoolmaster he went, and told his story. The schoolmaster laughed and told the boy not to worry ... tomorrow they would have a look at it.

If the old teacher thought the boy was exaggerating, he had a surprise coming. There *was* writing on the stone, something that had been scratched into it a long time before. It had been buried so long that the age of the writing was going to be a matter for study by the experts, so the teacher took the stone to the University.

Then the fun began. One expert studied the markings for two months and said they were an ancient Hebrew warning of an invasion by sea. Another declared that they were unmistakably early Norse,* telling of a hopeless fight against wild tribesmen after they

had been shipwrecked on the nearby coast. Other experts read other interpretations into the same inscriptions.

It remained for an humble student to solve the mystery. One day as he came into the classroom he glanced at the stone as it lay on a table in the late afternoon sun. At an acute angle, from the side, the message stood out clearly. It read: "June 1788. Am very drunk again this day."

WYOMING'S MYSTERY MUMMY

One of the world's tiniest mummies, and one of archaeology's biggest mysteries is the mummy of a man only fourteen inches tall – so ancient that no counterpart has ever been found.

Scientists from far and near have examined this tiny fellow and have gone away amazed. He is unlike anything they ever saw before. Sitting there on the shelf in Casper, Wyoming, visible, disturbing evidence that science may have overlooked him and his kind much too long.

In October of 1932 a couple of gold prospectors were working a gulch at the base of the Pedro Mountains about sixty miles west of Casper. They had found some "colour" in the solid stone wall of the gulch; they set an extra heavy charge to rip deeper into the stone.

The powerful blast exposed a small natural cave in the solid granite, a cave not more than four feet wide, four feet high and possibly fifteen feet deep.

When the smoke and dust had settled, the miners got down and peered into the opening, and got the shock of their lives; for there, peering right back at them, was a tiny mummy of a man-like creature.

He was on a tiny ledge, legs crossed, sitting on his feet, arms folded in his lap. He was dark brown, deeply wrinkled, with a face that was almost monkey-like in some respects. One eye had a definite droop as though this strange little fellow might be winking at those who found him.

The prospectors carefully picked him up, wrapped him in a blanket and headed back for Casper, where the news of their discovery attracted considerable attention. Scientists were sceptical, but interested; for according to conventional archaeology it would be impossible for a living being to be entombed in solid granite. But there it was, in defiance of orthodoxy.

Perhaps it wasn't a living creature ... a hoax perhaps ... the X-ray would tell, of course. And an X-ray did tell. It showed unmistakably that here was a creature that had been a man, or man-like. Its tiny skull, the vertebrae of its spine, the rib cage, the bones of the arms and legs were readily discernible.

The little fellow had been about fourteen inches tall in life. Mummified, he weighs about twelve ounces. His features have developed an overall bronze-like hue. The forehead is very low, the nose flat with widespread nostrils, the mouth very wide with thin twisted lips set in a sardonic half grin.

The X-rays show a full set of teeth. Biologists who have examined it declare that the creature was about sixty-five years old at time of death. And when did that occur? Nobody knows, and no scientist thus far has ventured an opinion.

The Anthropological Department of Harvard* says there is no doubt of the genuineness of the mummy. Dr Henry Shapiro, head of the Anthropology Department of the American Museum of Natural History, said that the X-rays revealed a very small skeletal structure covered by dried skin, obviously of extremely great age, historically speaking, and of unknown type and origin. The mystery mummy, said Dr Shapiro, is much smaller than any human types now known to man.

Is it the body of a mummified infant? Anthropologists who have examined it are of the opinion that, whatever it is, it was full grown at the time of death. The curator of the Boston Museum Egyptian Department examined the creature and declared that it had the appearance of Egyptian mummies which had not been wrapped to prevent exposure to the air. Still another expert, Dr Henry Fairfield, ventured the supposition that the mystery mummy of the Pedro Mountains might be a form of anthropoid which roamed the North American continent about the middle of the Pliocene Age.*

It was natural that the cave itself should be subjected to careful investigation. Scientists found no traces of any human residence there, no artifacts, no carvings or writings – nothing but the tiny stone ledge on which this mummy had been sitting for countless ages. Possibly he was a remarkable curiosity even in his own time and among his own kind, whatever that may have been.

Nature occasionally turns out some very small specimens and this creature may have been one – an early human in unbelievable miniature, possibly held in awe by his fellows for that reason. This

might account for his unusual internment by a race that ordinarily treated its dead with less attention.

The only other mummified midget discovered in this country was a red-haired mummy found on a ledge in Mammoth Cave, Kentucky, in the 1920s, a runt about three feet tall who showed signs of being only a few hundred years dead, at most.

The mystery mummy of the Pedro Mountains has never been explained, and may never be; for he presents the experts with some possibilities at variance with their accepted theories.

They are quite content to leave him on display in Casper, Wyoming, an unexplained relic of the dawn of man.

THE ABOMINABLE SNOWMAN

Sneering at natives' tales of incredible monsters isn't wise ... for sometimes the natives know whereof they speak. This was clearly demonstrated in the latter half of the nineteenth century when an American explorer, Paul du Chailliu, brought home the skin and skeleton of a giant gorilla to confound his critics.

Thus far no one has brought in hide nor hair of the Abominable Snowman of the Himalayas but there are scientists who expect this to happen at any time.

The natives who live in that stark, forbidding region call these creatures yeti ... which we have translated into Abominable. That isn't the real meaning of the word, but it's the nearest thing we can use for general distribution in mixed company. The yeti, or Abominable Snowmen, according to the natives, live high in the craggy fastnesses of the Himalayas ... a reservation which no one covets. But the trouble is that they come down into the valleys where the natives live, upon occasion. And according to the stories told by the pop-eyed Sherpas, the yeti do not confine themselves to eating frogs from the valley ponds ... and tender shoots from the trees and rice patches. They also indulge themselves in a craving for fresh meat ... sometimes stealing a goat ... sometimes stealing a pet yak ... and sometimes making off with a child or an isolated herdsman who made the fatal error of sleeping in the sun.

As the British occupation of India spread to the foothills of the awesome Himalayas, they encountered their first reports of these strange creatures ... and dismissed them as figments of overwrought native imaginations. The first tiny crack in the wall of doubt came in 1913 when a group of Chinese hunters wounded and captured a strange manlike creature which the Tibetans called a snowman.

The Chinese said that it was kept captive at Patang in Sinkiang province* for months, a creature with a black monkey-like face, covered with silvery yellow hair several inches long. It had exceptionally powerful hands and had feet much like those of a human, rather than an ape. It grunted and made guttural sounds but spent most of its time pursing its lips and making loud whistling noises. After about five months, it sickened and died.

The outbreak of World War I stifled any scientific ventures into that area. In 1937, a British explorer, Frank Smythe, came out of Tibet with reports of manlike wild creatures of an unknown type which frequented the upper reaches of the Himalayas, living on grubs and rodents and on larger animals when they could get them.

Smythe had found their tracks at the 14,000-foot level; his Sherpa* guides took one look and refused to go on.

Measurement of the prints showed that they were remarkably human in shape ... but the stride was such that one foot imprinted

its toes in the heel mark of the other. ... Size: about thirteen inches long by five inches wide.

Since that time many expeditions have reported finding evidence that the Abominable Snowman is a living creature which may some day be brought into camp.

Some have seen no more than a British Major, Alan Cameron, who was with the Everest Expedition of 1923. He and his party were working their way towards the peak of Everest* when one of the guides spotted a line of living creatures moving slowly along a cliff face well above the snow line. Two days later, when Cameron's group reached a point near that cliff face they found giant, manlike footprints in the snow. ...

In late 1936, the first Shipton Expedition to Everest encountered more of the strange tracks where there should have been no tracks ... around the fringes of the snow line on the bleak slopes of the approaches to Everest. A member of the Shipton expedition who followed the tracks for several miles noted that they ran one behind the other in a manner no four-footed creature uses. He finally lost them on a long stretch of barren rock.

In 1958 an American scientist, Dr Norman Dyrenfurth, reported from Katmandu, Nepal, that he had found evidence which convinced him that the Abominable Snowmen were in reality a very low grade of human or near human creatures. By seeking out caves in which they had lived without fire, he collected hair, both silvery-grey and reddish-brown, food scraps, plastercasts of footprints and other odds and ends to show that the elusive snowmen are real ... and that they are of two species ... the large one about eight feet tall at maturity ... the other about four feet tall.

Also in 1958 an anthropologist at Johns Hopkins* declared that the Abominable Snowman footprints were prints made by natives whose toes stuck through their worn out sandals ... to which the *Chicago Tribune* replied, "It's a good explanation for one who has never been there ... and who lives far enough away to be disinterested!"

ODDEST SPOT ON EARTH

The moment you see the place, something tells you that nature has gone mad. If you are on horseback the horse will instinctively shy dart away from it. Birds suddenly swing about in flight and dart away to less disturbing scenes. Even the trees give the impression that they, too, are under the influence of a power they

cannot escape; for *within* that strange circle of gravitational insanity, the tree limbs droop noticeably and the trees themselves lean towards the magnetic north, although the trees around them point straight up.

This is the world-famed "Oregon Vortex*." It lies along the banks of Sardine Creek about thirty miles from Grant's Pass, Oregon. What it *does* is well known but *why* and *how* are questions unanswered.

The vortex is approximately 165 feet in diameter. It is roughly circular in shape, but instruments indicate that the exact size of the tormented zone varies slightly from time to time at ninety-day intervals. Within this circle is an old wooden shed, once an assay office* but abandoned back about 1890 when the scales began to play tricks. At that time the building was uphill, about forty feet outside the limits of the vortex. After the shack was abandoned, that portion of the hill slid down to its present position.

The building itself is warped and twisted; whether by the unknown forces of the vortex or from the strain of sliding down the hill is a matter of conjecture.

When you step inside the old building you're in another world of sorts. You feel a tremendous pull downward, as though gravity had suddenly been intensified. You instinctively lean at an angle of about ten degrees towards the centre of the circle. If you lean backwards, that is, towards the outside of the circle, you have a creepy feeling of being pulled towards its centre – as instruments indicate that you are.

Many scientists have conducted lengthy experiments at the vortex, trying to unravel its riddle. They hung a 28-pound steel ball on a chain from a beam in the old shack. Visitors see this ball apparently hanging at an angle, defying the laws of gravity. It dangles perceptibly towards the centre of the circle. You can easily push it in *that* direction, but it is more difficult to shove it towards the *rim* of the circle.

Even cigarette smoke is affected by the weird forces within the vortex. A puff of smoke blown into the still air within the shack will begin to spiral, faster and faster, until it vanishes.

Some of the uncanny antics that startle the tourists include such experiments as placing an empty glass jar on a sloping board, and watching it roll uphill. A ball, even a child's sponge rubber ball, placed on a level spot on the earth near the *edge* of the circle will invariably roll slowly towards the centre of the vortex. A

handful of tiny paper scraps tossed into the air will spiral madly about as though stirred in mid air by some unseen hand. It is a creepy sensation in an eerie setting.

This remote woodland glade where nature seems to have gone mad was known to the Indians, who solemnly assured the early white settlers that the place was cursed. The palefaces had to be shown, and having been shown, they had to investigate; as they are still doing to this very day.

Is it merely an optical illusion accompanied by vivid imagination?

Instruments have been used which measured the outer limits of the disturbance and determined the size of the circle as roughly 165 feet. Other instruments were carefully set up, beyond the influence of the vortex itself. By sighting through the planes of these devices it was easy to establish that the feeling of standing at an angle *within* the circle was *not* imaginary.

By the same method it was easy to prove that the 28-pound steel ball suspended from the chain inside the shack actually *DOES* hang at an angle towards the centre of the vortex. Golf clubs, brooms and other odds and ends of that general configuration are easy to stand on end inside the confines of the freakish circle; and, in order to be balanced, they must be leaned at a measurable angle away from the centre of the vortex.

The phenomenon which accompanies the vortex forces is demonstrably electro-magnetic in character.

An ordinary photographer's light meter, which converts light into electricity and registers it on a dial, will show wide variation between the daylight inside the circle and that beyond its limits. Compasses simply refuse to function.

The world famed Oregon Vortex is similar in some respects to another spot about forty-five miles away in the Siskiyou Mountains, although the phenomenon at the Vortex is much more profound. At Camp Burch, Colorado, still another magnetic sink seems to operate, again less powerful than the Vortex.

The force is there. It is measurable, but *what* it is or *why* it is nobody knows. The Oregon Vortex is indeed the oddest – and perhaps the "craziest" spot on earth.

MIDNIGHT AT NOON

Time after time, history records instances where sudden darkness blanketed cities and nations in midday.

What happened – and why?

According to the complex calculations of astronomers, the earth is swinging along through space at the rate of about 18,000 miles an hour. And according to many of these same astronomers, space is by no means empty. Billions of tiny particles are swept up in the Earth's atmosphere each day as we speed through space. Those astronomers who speak of the emptiness of space are contradicted by other savants who speak of the great masses of dust and gases which are sometimes so dense they are opaque.

If there are large masses of opaque and semi-opaque materials drifting in space, then it is conceivable that the earth may slice through them from time to time, with unusual results for those on hand to witness the event.

A thin layer of cosmic dust, obstructing the sun at a low angle, would cause a sharp decrease in light, even at midday. There are instances on record where sudden darkness has fallen briefly on sunshiny days, at times when no eclipse was recorded.

On 26 April 1884, Preston, England, was the scene of a dramatic darkness at midday. News reports indicate that the sky simply turned black, as though a great curtain had been pulled over it. Alarmed citizens fumbled their way around the streets, animals went to bed, and the devout turned to prayer. Then, as suddenly as it began, the darkness was dissipated and daylight returned. The occurrence was never explained, although there were the customary official guesses until the subject had been replaced in the public mind.

There was at Aitkin, Minnesota, 2 April 1889, a sudden and intense darkness during which sand streamed down from the blackness. It, too, went unexplained. London was blacked out suddenly in mid morning on 19 August 1763. This was an intense, paralysing blackness which seemed impervious to candles and lanterns. Astronomers admitted there was no eclipse.

Oshkosh, Wisconsin, had a daytime blackout of unknown origin on 19 March 1886, which began at three o'clock in the afternoon and in five minutes plunged the city into pitch darkness. It lasted not more than ten minutes, according to officials, the blot of darkness moving from west to east in a sky that was thickly covered with clouds.

After the badly shaken city had regained its daylight, it learned that cities to the west of it had undergone similar experiences. Something had caused a relatively small spot of intense darkness

to move from coast to coast in three hours or less; either a sol body of unknown type between the earth and the sun, or as seen less likely in this instance, a small but dense band of cosmic debr that blotted out the light as we sped through or near it.

Memphis, Tennessee, was going about its affairs as usual a ten o'clock in the morning of 2 December 1904 when for no ap parent reason the sun vanished and darkness fell. The ensuin fifteen minutes were a time of terror for many. In some quarter of the city there was shouting and screaming and anguished praye by those who feared that the end of the world had come.

For psychological reasons, perhaps, these infrequent but dis turbing periods of unscheduled darkness in daytime are explained away* variously as forest fire smoke, unusual cloud formations, or dust clouds from distant deserts.

There are occasions when such explanations are doubtless justified. There are other incidents when such explanations are debatable to say the least, and one such instance occurred in September of 1950, when a large part of the United States experienced a weird blue sun that appeared to be shining weakly through a heavy filter. The phenomenon was noted in the United States on 24 September. On the twenty-sixth, Scotland and England found that the sun had turned blue-green for them. In Denmark the blue sun lasted only two hours, but that was long enough for lines of depositors to form at the banks, eager to draw out their savings in case the end of the world had come.

Again, the ever ready official explanations were promptly made available. The American public was told that the peculiar appearance of the sun was due to smoke from a vast forest fire in Alberta, Canada. The smoke, so it was explained, rose to high level and acted as a dense filter which screened the sunlight to its unnatural hue.

There was one serious flaw in that explanation; for at the same time the alleged smoke was said to be riding the winds eastward across the United States, it was also moving westward across the state of Washington and obscuring the sun. It is an odd wind indeed that blows smoke in two opposite directions at the same time!

THE KILLER COMETS

In late 1958, the news services quoted several top government meteorologists as saying that their research has led them to be-

lieve that the world's weather was subject to influence by cosmic dust, the clouds of microscopic particles through which the earth passes from time to time in its mad rush through space.

We know that rain and snow both require triggering action; in other words, tiny particles around which the droplets of moisture can first form before they evolve into rain or snow. We also know that billions of tiny particles enter our atmosphere on any average day, while on those occasions when the earth spins through a cloud or even a thin layer of cosmic dust, the conditions are then right for rainfall of unpredictable quantity, provided the moisture is in the air when the dust arrives.

Astronomers have learned that the spectacular tails of comets are extremely tenuous bodies, composed of such minute particles that the pressure of light can bend them. From time to time the earth passes through such masses of space material – through comet tails – and sometimes with unpleasant results, which may or may not be mere coincidence.

In 1665, a spectacular comet made its appearance, sweeping in regal splendour through the heavens and leaving a trail through which the earth also passed. Again, perhaps by sheer coincidence, a pestilence ravished the world ... the infamous Black Plague which killed millions and which decimated the populations of cities and continents.

Modern science has identified many diseases as being air-borne, the work of tiny creatures, some of which are so small that they can be detected only by the fantastic magnification of an electron microscope. It is also known that many of the germs can survive freezing without apparent harm to themselves.

If these things are present in the dust of space, including the dust of comet trails, it is by no means illogical to suspect that they not only trigger weather, but epidemics, as the ancients believed. And since some races are more resistant to certain diseases than other races, the epidemics would not ravage all alike. An example of this racial immunity is evidenced by the bubonic plague which killed hundreds of thousands of people in India in 1896 and 1897, while Europeans there moved freely through the plague areas with almost no difficulty.

But from time to time, diseases appear with dramatic suddenness and sweep around the world, sparing neither race nor colour. Such a killer was the Black Death* of 1347 which followed soon after a comet and seemed to have struck the whole earth at the

same time, killing about half of all the inhabitants of the earth in three terrible years.

Daniel Webster* survived an influenza epidemic that took a heavy toll of life, here and abroad, and it was he who called attention to the appearance of the disease following the near approach of a comet. He may have been misinterpreting the facts – and then again, he may not.

Spectroscopic analysis of comet tails discloses that they contain great quantities of gases, including some that are deadly to human beings. From time to time we pass through the tails of comets without knowing it, and admittedly at such times our atmosphere absorbs some of the gases as well as some of the dust.

Research has been conducted relative to the long-range effects of small amounts of lethal gases on the tissues of living creatures. Does it condition them to such an extent that they fall prey to common diseases which they would otherwise be able to resist? Does the slow seepage of cosmic dust and cosmic gases through our atmosphere play a part in preparing the human race for epidemics?

The history of the human race is replete with epidemics and with comets. Whether they are related, no man can say, but man has long feared both of them – perhaps with good reason!

POST-MORTEM EXPLORER

For centuries men sought a passage around the Arctic Ocean between the Atlantic and the Pacific, the famed Northwest Passage. But the man who finally found it – never knew it! ...

Many a career was wrecked and many a fortune lost, in the search for a deepwater passage between the North American continent and the Arctic Ocean – "the Northwest Passage" – as it was called, which would be a short cut between Europe and the riches of the Orient. It was worth the gamble, of course, since it promised undying fame for the explorer who discovered the route, and great wealth for the nation that backed him.

But strangely enough, history does not mention the first man who made the trip from ocean to ocean north of land, and perhaps not so strangely, he made no claim to the honour. It's a most unusual story; it would be quite incredible if it were not so well documented.

On the morning of 12 August 1775, the American whaling ship

Herald was cruising off the west coast of Greenland, well above the Arctic Circle. Whaling was poor and a double lookout had been posted to prevent any possible oversight of such quarry as might be in the area. Hour after hour the *Herald* slipped along through an empty sea. But not quite empty; for from among the towering icebergs that dotted the frigid waters the lookouts spied a three masted schooner, apparently drifting aimlessly. What few sails were visible were tattered rags; the coating of ice on the spars glistened pinkly in the morning sun.

When she first appeared, the strange ship was three or four miles away, drifting before a light breeze. Captain Warren ordered the *Herald* hove-to until the eerie visitor should come close enough to hail. But the hail produced no reply. There were no signs of life on the other vessel. Captain Warren took eight men and a longboat and rowed over to the stranger. Time and the elements had almost erased her name but Warren was still able to make it out, the *Octavius*. He had never heard of her.

Pulling alongside, Warren hailed her again, and again he was greeted with a deep and abiding silence. It was spooky. When none of the men would agree to board the vessel with him, Warren selected four men and ordered them to come along. Leading the way himself, the five of them scrambled up the rotten ropes that dangled overside, rigging that had fallen long before. Once aboard the *Octavius* they had to proceed with caution for the decks were rotten and covered with slimy green moss. The ship's wheel was unattended. Below decks the boarding party recoiled in horror. In the crew's quarters they found the bodies of twenty-eight men, all heavily bundled in their bunks ... and all perfectly preserved by the Arctic cold.

Fumbling their way aft to the Captain's cabin they found the body of the vessel's master slumped in his chair at his work table, head bent forward, his pen lying beside his hand as though he had gone to sleep at his work. His face and hands were covered with a thin greenish mould but otherwise the body was well preserved. Behind the Captain in his cabin, a woman had frozen to death in the bed, her body heavily wrapped in blankets.

In the corner of the room a sailor sat cross-legged, leaning back slightly into the corner, flint and steel still clutched in his hands ... the little pile of shavings before him mute evidence of the task he had attempted and failed. Beside him, face buried in the folds of the sailor's jacket was a small boy, huddling for the

warmth that wasn't there. Captain Warren and his men removed their hats, offered a prayer for the dead and crept up the rickety companionway, taking the log-book with them.

Back aboard his own vessel Captain Warren watched the derelict drift on out of sight among the icebergs. Turning to the log-book of the *Octavius*, he found the final entry dated 11 November 1762. It told how the ship had been frozen in for seventeen days ... the fire had gone out ... the Captain had tried to rekindle it and failed ... so he had given the flint and steel to the first mate. The crew, said the log-book, was anxiously awaiting the kindling of the fire, for the cold was sheer agony. The location of the ship ... Longitude 160 W, Latitude 75 N. Captain Warren read it again to make sure he was seeing it correctly and checked it with his own officers. They agreed with him. The *Octavius*, on its day of doom, had been frozen in the Arctic Ocean at a point north of Point Barrow, Alaska* – thousands of miles from where Captain Warren had found it!

Somehow, miraculously, the ship had survived the onslaught of the elements and had crept, year by year, eastward through the vast ice-field until it eventually entered the North Atlantic, where Captain Warren found it. The *Octavius* had been the first ship to negotiate the historic Northwest Passage, with a captain and a crew that had been dead for thirteen years!

THE CASE OF THE VERY STRANGE SHIPWRECK

Twenty-two men fought the raging sea for their lives; but every time they won, they had to fight again.

In the records of Lloyd's* of London is the case of the schooner *Mermaid* and her twenty-two men. Lloyd's has many strange stories in its voluminous files, but nothing to compare with this.

It all began pleasantly enough on the morning of 16 October 1829, when the *Mermaid* slipped out of the bay at Sydney, bound for Collier Bay, on the west coast of Australia. There was a fair breeze, a bright sun that sparkled from the wave tops, as the *Mermaid* sliced through them. Aboard ship were eighteen able seamen, three passengers, and Captain Samuel Nolbrow, who had the wheel. Without realizing it, they had all embarked on a voyage that is probably unmatched in the history of the sea.

On the fourth day out of Sydney, the Captain turned the wheel

over to the first mate and went below for a wee nip of the stimulants he had thoughtfully provided for himself. The crew lolled about the deck, for they had little to do under the circumstances. The barometer gave no hint of what was to come. It looked like fair weather and smooth sailing, until shortly before two o'clock in the afternoon. Then the vessel found herself becalmed. Thick, grey clouds scudded over the face of the sun.

Alerted by the lack of motion, Captain Nolbrow put away his bottle and stumbled up to the deck again – to find the barometer falling rapidly. Shortly before dark the calm ended with great gusts of wind that soon became a raging gale. The *Mermaid* fought for her life, for she was in the tortuous Straits of Torres,* a narrow channel that had claimed many a ship and many a crew.

The great waves smashed over the bow and boiled around the helmsman, who was lashed to the mast for safety. By the spasmodic flashes of lightning, Captain Nolbrow could see enough to realize that he was fighting a losing battle against the roaring tempest. All hands were on deck when a great wave flung the *Mermaid* atop a reef that cut her open like a ripe melon. Moments later the twenty-two persons were floundering in the howling darkness.

In all that boiling sea there was but one hope for them, a rocky peak that jutted from the waters about a hundred yards from the sinking vessel. And miracle of miracles, when daylight came there were twenty-two persons clinging to the rock. Not a life had been lost!

For three cold, wet days they were marooned there – then the bark *Swiftsure* came pounding through the straits, sighted them and took them aboard.

All went well for the next five days, until the *Swiftsure* neared the coast of New Guinea. Then she too fell victim to the jinx that rode her refugee passengers. Without warning, the *Swiftsure* found herself caught up in a powerful current that did not show on the maps. She was swept broadside into the rocks along the barren coast, and everyone had to abandon ship. And once again, all hands were saved.

Less than eight hours after they had crawled out on the beach they were rescued – this time by the schooner *Governor Ready*. She carried thirty-two persons itself, but it managed to make room for the survivors of both the *Mermaid* and the *Swiftsure* before it clapped on sail – and sped away down the coast to rendezvous

with disaster. Only three hours after the rescue, the *Governor Ready* caught fire.

Loaded with lumber, the blaze spread rapidly, and the order to abandon ship was given. All aboard piled into the frail longboats with little preparation. Around them lay hundreds of miles of open water, off the regular shipping lanes. Prospects were poor, but their luck was wonderful, for the Australian Government cutter *Comet* came along and picked them up, again without loss of life!

Aboard the *Comet* there was grumbling, for the crew of the rescue ship regarded the shipwrecked crowd as bearers of a jinx, in spite of their remarkable good fortune which had saved them from death time after time. For exactly one week all went well, and then the *Comet* ran into a sudden squall that snapped off her mast, ripped away her rails, left her rudderless and at the mercy of the elements. The crew of the *Comet* got into the only longboat that was still serviceable and pulled away from the doomed vessel, leaving their unwelcome guests to fend for themselves.

For eighteen hours they clung to the wreckage and fought off the sharks; until the packet *Jupiter* came along and once again snatched them from the jaws of the sea. The Captains called the roll and, for the fourth time, they discovered that throughout the four shipwrecks not a single life had been lost among the entire company!

The amazing chronicle has still another odd twist to it. One of the passengers on the *Jupiter* was an elderly lady, Sarah Richey, of Yorkshire, who was on her way to Australia to search for her son, Peter, who had been missing for fifteen years. She found him, too; for he was among the crewmen of the *Mermaid*, whom the *Jupiter* had saved from the sea.

THE RIDDLE OF THE RAINMAKER

In two blazing hot years only two inches of rain had fallen on the parched earth around San Diego. By January of 1916, the city was on the brink of disaster for want of water. It had been three months since the last feeble shower. The reservoirs were virtually dry. Something had to be done, and done quickly.

At the risk of being regarded as idiots, the beleaguered city council voted to employ the services of a professional rainmaker. They had been bombarded with proposals from one Charles Mallory Hatfield, a former sewing machine salesman who claimed he could induce rain, for a fee. He got the job.

With Hatfield, the rains came COD.*

He had noticed, he said, that after great battles there were often great storms. He had also noticed that during great battles clouds of cannon smoke rose into the skies; and, to Hatfield, this constituted evidence that the burnt powder had, as he put it, upset the balance of nature in the air. Once upset, clouds formed and rain fell, said Hatfield.

For several years he had experimented on his father's farm in Kansas, setting up huge wooden tubs on towers ... tubs from which clouds of chemical vapours drifted aloft. Rains came ... torrential rains sometimes ... and Hatfield found there were those who would pay him for his services.

For example, the farmers of the San Joaquin valley* hired him year after year to provide them with bountiful rains. They paid him ten thousand dollars a year and were happy with the results. The miners of Dawson City, Alaska, paid him $21,000 to torment the skies into providing water for their dry sluiceboxes; and his efforts were followed by four inches of rain.

So, when San Diego finally turned to him in its hour of trial in January of 1916, it was not dealing with an unknown. On the day they hired him, he was dismantling his towers in a valley in northern California where eighteen inches of rain had followed his efforts to "upset the balance of nature".

If he could do half as well for San Diego, the city would be saved. And if he failed, it would be no worse off than before – just thirstier.

San Diego's main source of supply was Lake Morena, a man-made reservoir which had never been more than one-third full in its twenty years' existence. When Hatfield arrived on the scene, the lake level was below the danger point ... a hot, stinking mudhole and no more. He had made the city two offers: One thousand dollars an inch for each inch of rain that followed his efforts; or for ten thousand dollars, he would fill the lake that had never been filled – fill it with eighteen billion gallons of water – enough to last the city two years if it never rained another drop.

For several days the city council stalled, vainly hoping that nature would provide the water and get them out of their predicament. But when the fourth day dawned as hot and cloudless as its predecessors, they hired Hatfield; and he put the workmen to setting up his tall wooden towers.

Within twenty-four hours after those towers began sending

their evil smelling vapours into the skies, rain began to fall. Crowds stood in the streets to cheer Hatfield. Farmers drove in the rain to the edge of Lake Morena to shake his hand. But the rejoicing didn't last long. On the third consecutive day of rain, the San Diego Exposition was washed out; the Tia Juana race track was flooded.

The city council called Hatfield to see if he couldn't taper off the torrents. On the following day, sixteen dogs drowned in the city pound; ranchers were being rescued in lifeboats; and the weatherman admitted that for the first time in the history of the city he was unable to make a forecast. Telegraph and telephone lines were down ... railroad bridges were swept away ... and still the rains came.

Otay and Sweetwater reservoirs filled ... overflowed ... and finally burst their earthen dams and thundered down the valley ... a fifty-foot wall of water that carried fifty persons to their deaths.

Troops were called in for emergency duty ... Lake Morena filled and overflowed for the first time in its history ... just as Hatfield had predicted. Then he turned off his towers and went to collect his money. The city, busy digging out of the flood, refused to pay him, and years later his lawsuit was finally dismissed.

Scientists declared that he was a fraud and that his method was worthless and ineffective. But before Hatfield died in 1958, he lived to see scientists making rain by sending chemical vapours into the air, just as he had done forty years before.

THE TREASURE IN THE WELL

Electronic instruments tell us there are tons of gold there and it's yours for the taking; but getting it may take a bit of doing. ...

If it's gold you want – real gold that is yours for the taking – then Oak Island may be the end of the rainbow for you. Like the proverbial pot of gold at the rainbow's end, you may find it a bit elusive – but on Oak Island it is there – no mistake about that! The lucky ones have touched some of it – the better-equipped seekers have watched the indicator needles on their electronic gear flutter to match their own hearts, but one and all they have had to admit defeat! For the treasure of Oak Island was so cunningly concealed that it has defied the best efforts of all comers for almost a century and a half.

Oak Island is a tiny rock knoll that sticks up from the cool blue

waters of Mahone Bay, in Southern Nova Scotia.* Nobody paid much attention to this insignificant speck of land until 1795. On a bright Sunday morning in April of that year three young men rowed out to the island ... and spent the rest of their lives wishing they hadn't.

Tony Vaughn, Danny McGinnis, and Jack Smith knew that Oak Island had been used as a haven of refuge and repair by the freebooters who infested the seas in those days. The pirates could anchor in one of the convenient deep coves on the north end of Oak Island, post a lookout in one of the several tall trees, and go about their business of removing the barnacles from the ships' bottoms in comparative safety.

Teach* came there, according to local gossip, and Morgan* and Steve Bonney, and other notorious scum of the seas. They came there and traded with the canny Nova Scotians, and they paid handsomely to the local authorities who looked the other way while the pirates camped out on Oak Island.

One by one the pirates had been hanged or driven from the seas, and when Smith, Vaughn, and McGinnis rowed over to the island in 1795 they knew that no pirates had been there, openly or otherwise, for at least seven years. But they knew too that the roistering freebooters had left a lot of evidence of their visits; pistols, knives, sometimes a gold coin or two could be scraped from the sand of the little beach where they gambled and fought and drank.

It was Tony Vaughn who called the attention of his companions to the worn place on the limb of the huge oak tree and to the depression in the soil directly beneath the same limb. They agreed that it looked very much like heavy ropes had been looped over the limb to lower something into a hole that had been later carefully filled in.

Working quietly in their spare time for several years, the boys dug down thirty-five feet. Then, in 1803, Smith told Dr John Lynds of their strange find, and of the thick layers of coconut fibres they had discovered at the thirty-five-foot level. It was a fateful day for Dr Lynds when he first stood there beside that pit; for in the ensuing years he spent his entire fortune probing its depths for the treasure he was so confident that it contained.

Workmen paid by the doctor pulled out, at successive ten-foot levels, layers of heavy oak planks, a layer of ship's putty, and more thick tough layers of coconut fibre, presumably hauled there by pi-

rates who had loaded it in the West Indies, two thousand miles away. Beneath a layer of oaken planks at the eighty-foot level, the workmen found a flat stone covered with unintelligible hieroglyphics.

As a last resort, when his funds were virtually gone, Dr Lynds brought in a large hand-powdered drill. With it he probed to a depth of a hundred feet from the surface. The drill cut its way through brittle plaster and more hardwood, then it seemed to drop into some sort of subterranean room. The next effort with the drill, racing against the water that was rising rapidly in the pit, brought up a few scraps of gold, and a bit of paper, and moments later ... disaster. Water broke into the pit in such a rush that three workmen drowned.

Dr Lynds was bankrupt.

If he had established nothing else, he had given his fortune and nine years of his life to show that there was gold in some sort of a man-made vault about one hundred feet below the scarred old oak tree.

It was forty-six years before Dr Lynds was able to try again. In the gold rush madness of 1849, old and rheumy-eyed, he gathered about him a small group of financial backers. Their workmen reopened the crumbled pit, sank it ten feet deeper than ever before, until they came to a layer of cement. Their drill broke through into that room again ... brought up a bit of gold chain ... and again, just as success seemed inevitable, the water came pouring in and ruined them.

Other treasure seekers have spent lavishly of their time and money there. They have confirmed that the gold is there, that it is cunningly protected by sea water brought in through ingenious tunnels ... and that the gold is likely to stay there ... for in 1957 the engineers found it as real ... and as unattainable as ever.

A GUEST FROM THE UNIVERSE?

The stage was being set for a world-shaking drama that was rushing to its fiery climax near the cold and sluggish Yenesei River of Siberia.

The date: 30 June 1908.

Out in space, miles from the earth, a gigantic object was rushing to destruction, headed for a thinly populated area near the Yenesei. Its speed was probably in excess of thirty thousand miles

[illegible] It was only seconds from destruction, trailing long [illegible] of fire behind it as it entered the atmosphere.

On the river a fisherman tugged at the ropes leading to his [illegible]. He paused in his work long enough to return the wave of a [illegible] who sat on the shore, sheltered fortunately by a steep over[illegible]. His friend on the bank was the last thing the fisherman [illegible] ever see.

He had less than five seconds to live.

A few miles from the river a herdsman, driving several hun[illegible] reindeer across the grassy flats, paused to fill his leather wa[illegible] bag at a shallow well. The bag fell into the water and he [illegible] bent down to retrieve it.

It was the luckiest move of his life.

A[illegible] the river, at the edge of a small grove of trees, a wood[illegible]-[illegible] and his two grown sons took time out from their labours [illegible] their pipes, their axes leaning against the log on which [illegible] sitting.

[illegible] stage was set.

The gigantic thing that was plunging to earth exploded with a [illegible] that was recorded around the globe. Of those in the immedi[illegible]a, only the herdsman in the well and the man sheltered by [illegible] river bank survived. The fisherman was swept away. The [illegible] choppers were never found; but one of their axes was finally [illegible] up a mile and a half from where they had been smoking [illegible] pipes. The herd of reindeer vanished in the twinkling of an [illegible]. When the bewildered herdsman climbed out of the shallow [illegible] that had saved his life, he found himself in the midst of a [illegible]d and smoking world; he was scorched and penniless, but

[illegible]e had been within three miles of one of the mightiest ex[illegible]ons ever recorded on earth. Something weighing thousands of [illegible] had exploded into a great ball of seething fire that climbed [illegible] the clouds in a matter of minutes, leaving below it a stunned [illegible] that sent its quivers to seismographs in many lands.

World War I spread even greater havoc of a different sort and [illegible]ists almost forgot the strange explosion in Siberia, which had assumed to be some sort of huge meteorite. It was not [illegible] 1927 that a scientific study group reached the scene. They [illegible]nd a scorched and barren spot that showed plainly the effects [illegible]n alculable heat and pressure; trees brushed flat to earth for [illegible]les around the centre of the blast, their trunks charred by its

remarkable temperature. They found a few witnesses, including the herdsman and the man on the river bank, and some villagers who had seen the catastrophe from a vantage point miles away. After examining the scene and interviewing the witnesses, the scientists went away. They had determined that something from outer space had struck in those lonely reaches of the Yenesei, something that scorched and blasted – but something that left no craters in the earth to mark its collision. For want of a better name it went down in the records as the Tunguska Meteorite, and there it remained for more than thirty years.

A Russian scientist, Dr Alexander Kazentsev, was a member of the Soviet team that spent considerable time investigating the scene of the Tunguska explosion. Like their predecessors, they were puzzled by what they found and puzzled even more by what they did not find. No craters. No logical, acceptable explanation for the recorded fury of the explosion.

Fortunately for science, Dr Kazentsev was also a member of the Russian team that went to Hiroshima to study the effects of the atomic bomb which had obliterated that hapless city and most of its people.

Dr Kazentsev was particularly impressed by a peculiarity of the blast; directly beneath the centre of the airborne explosion the tops of the trees had been snapped off, while the trees remained standing. Somewhere, he had seen something like that before – but where?

Suddenly he remembered. At the scene of the "Tunguska Meteorite" in Siberia! Tree tops snapped off in one area, while for miles around the trees were brushed flat to earth, known to be a characteristic of only nuclear devices. Did it mean that a nuclear explosion had taken place over that lonely Siberian terrain almost half a century before?

There was a relatively simple way to check the suspicion. If the explosion had been nuclear, there would be radioactivity in measurable quantities in the earth. And Kazentsev knew that when Professor Kulik had made the original investigation of the Tunguska blast in 1927, no check had been made for radioactivity; he also knew that Kulik had been disturbed by the complete absence of meteoric fragments.

A new expedition, headed by Professor Liapunov and including Dr Kazentsev, was dispatched to the scene of the so-called Tunguska meteorite. They spent months tracking out the radioac-

...n in the soil that sent their Geiger counters chattering; ...viewed an eye witness who still recalled vividly the great ...e that rolled into the heavens and the strange mushroom ...from which it stemmed. They dug up tons of soil to collect a ...handful of metal fragments. Then they went home to evalu...and study what they had found.

...Kazentsev and most of his colleagues came to the conclu... that some sort of atomic-powered device of tremendous size ...exploded over the earth at an altitude of 1.2 miles on the ...ning of 30 June 1908. He calls it a space-ship.

...his official report filed with the Soviet Government agency ...directed the expedition, Dr Kazentsev says that the blast ...ge and the radioactivity charts enabled the scientists to locate ...point directly beneath the blast and to trace out the familiar ...one. Sifting the soil around the edges of this "cone" pro... bits of metal, some of which were not of any known ...nature and some of which seemed to be alloyed. The ...ness accounts all agreed on the seething fireball and the ...shroom cloud, which we now know to be characteristic of nu... explosions. And exhumation of some of the long-dead resi... of the area indicated that they had died of a "strange mal... indeed, for they were victims of excessive radioactivity.

... Kazentsev, "The weight of evidence clearly places the ex... slightly more than (a mile) above the centre of the de... The damage is identical to that produced by man-made ...devices under similar conditions. The lingering radioactiv... the mixed metals, the descriptions of the explosion itself all ...ide with an atomic explosion.

"Whether we approve or disapprove, we must admit that the ...g which was long known as the Tunguska Meteorite was in ...ity some very large artificial construction, weighing in excess ...ity thousand tons, which was being directed towards a landing ... its atomic engines exploded.

"This evidence is to me indisputable proof that on that distant ...we were visited by intelligent beings from some unidentified ...in space. That their trip ended in tragedy was incidental; for ...loration is only deterred by tragedy, not stopped. Having come ..., we must expect them again, perhaps under happier circum...ces.

"In the catastrophe along the Yenesei River in 1908 we lost a ...d from the universe."

Modern medical science is still seeking clues to a puzzle that has baffled historians for more than a century ... the riddle of Napoleon's death.

In the village of Baleycourt, on the Meuse River in France, a faded page of the town records may hold part of the key to the strange death of Napoleon Bonaparte. On that page is inscribed the name of Francois Eugene Robeaud, "born in this village 1771 ... died on St Helena ..." The date of his alleged death on that sandy sunbaked island is illegible ... obliterated long ago ... and perhaps with good reason; for, in view of the existing evidence, it is not improbable that he died on St Helena on 5 May 1821 under the name of Napoleon Bonaparte, whom he so closely resembled.

Bonaparte took great pains to secure doubles for himself, four of them in all, and one of that number was Francois Robeaud. One double died of poison just prior to Waterloo; another was crippled in a riding accident; still another was killed by a stray bullet; and only Robeaud was left when Napoleon's fortunes collapsed. He went back to live with his homely spinster sister in their cottage at Baleycourt.

Napoleon was banished to St Helena, off the coast of Africa. The British and French were agreed that he must not escape again, as he had done from Elba. The French guarded him on the island itself, while the British furnished vessels to patrol the waters around the island.

Napoleon had friends, he had money, and he had patience. Working together, quietly, they could constitute the forces that would free him. Now see what happened.

In 1818 the French General Gourgard resigned his post of command at St Helena, and was replaced by General Bertrand. Gourgard returned to Paris, presumably in retirement. About two months after Gourgard reached Paris, a fine coach arrived in Baleycourt. The coachman inquired the way to the home of Francois Robeaud. Who was in the coach, and why they were seeking Napoleon's double was never explained. Robeaud and his sister went about their customary routines for another month. The coach? Oh, just a physician who wanted to buy some rabbits for a friend. Nothing, really!

Both Robeaud and his sister vanished one night in the autumn of 1818, and neither was ever seen again in Baleycourt. The sister

found living very comfortably in Tours, where she
that a physician was paying her bills, a purely platonic ar-
nt handled entirely by mail; in fact, by courier. And what
brother ...? She explained that Francois had gone away to
had failed to tell her where or how or when. Very close-
d fellow, you see.

escape from St Helena, Napoleon needed four things ... a
a ship, some friends, and some money. Now, he had all of

the winter of 1818, about a month after Robeaud's disap-
e, General Bertrand's wife wrote to a friend, "Success is
apoleon has left the island!"

those same closing days of 1818, a well-dressed stranger
led himself Revard, came to the city of Verona, Italy. A
nt from the north of France, he said – a widower who
to open a small business; in his case, that of an optician
lit in diamonds. He acquired a partner, Mr Petrucci, who
run the business and who jokingly referred to Revard as
mperor, because of Revard's remarkable resemblance to
om

ording to subsequent sworn testimony of Petrucci and
Revard received a courier on the afternoon of 23 August
After reading the sealed message which was handed to him,
med greatly disturbed. He told Petrucci that he had to leave
most important mission; and two hours later, as he got into
h, he gave Petrucci a sealed letter with instructions to de-
r to the King of France if he, Revard, failed to return within
months.

welve nights later, shortly after eleven o'clock on 4 Septem-
r 1818, lights were blazing brightly in Schonbrunn castle in
Austria, where the son of Napoleon was critically ill with scarlet
. A guard heard a rustling in the vines; he saw a shadowy fig-
e drop to earth and run towards the castle. The guard fired – the
intruder fell dying – shot through the abdomen.

The Captain of the guards took one look at the body and
alled the Colonel. Eventually the French Embassy took
charge until Napoleon's wife demanded that the stranger be
buried in her own family plot, as was done.

Revard never returned to Verona. Petrucci delivered the
aled letter to the King of France, and was paid handsomely for
his service and his silence. On Helena, death came at last to the

prisoner known as Napoleon – a man who did not write like Napoleon – nor did he talk like Napoleon.

In 1821 – the man on St Helena died of cancer of the stomach. But in 1956 the British Government revealed that they have in their possession a section of Napoleon's intestines. And this specimen shows clearly that its owner had died – not of cancer, as the man on St Helena – but from a bullet wound ... as the stranger in the garden of Schonbrunn castle!

THE MAN FROM NOWHERE

He was a strange one all right ... just as the authorities said ... this young man who acted as though he had just dropped in from another world. ...

He was just outside the new gate entrance to the city of Nuremberg, Germany, when an inquisitive policeman first noticed him. He was clean, but so poorly dressed that he was almost ragged. The policeman later told his superiors that he had first been attracted to the young man by the difficulty with which he seemed to walk ... as though suffering from some deformity which caused him to stumble. His feet were badly swollen; his eyes were squinted against the light. ...

The inquisitive policeman tried to question the lad but he learned nothing ... over and over the stranger kept repeating. ...

"I want to be a soldier like my father was!"

It did not sound like an expression of determination ... but more like a chant ... as though the strange young man who uttered it was merely reciting words he did not understand.

The policeman led him to the station, where the Mayor and other local dignitaries gathered to observe and question this unusual visitor. In a monotone the young man continued to repeat his assertion that he wished to be a soldier like his father.

His name? He evidently did not understand what they were saying and he stared blankly. But when a pen was placed in his hand he giggled nervously and wrote in a slow, legible hand ... KASPER HAUSER. He could not ... or would not ... write anything else. But on that quiet Whit-Monday* afternoon in 1828, the young man had inscribed on the records the name that was to mark the beginning of a puzzle which remains unsolved to this day.

When food was placed before him, he seized it in his hands

...ed it into his mouth as though he were famished. A ...d milk was evidently something he had never encoun... he recoiled from it. Water he drank, but not until ...t with a forefinger.

...nightfall, while the baffled city fathers of Nurem... to decide what to do with their enigmatic visitor, ...hem with two more pieces to the puzzle ... two let... rags which he carried inside his tattered vest. One ...d to be from his mother. Dated sixteen years be... anyone who found the boy to send him to Nurem... he was seventeen so he could enlist in the Sixth Cav... his father had been a member, according to the let...

...ther missive was badly written and purported to be from ...who had found the boy and cared for him but who could ...support him.

...both letters were written on some sort of thin leather ...ment which was not familiar to the officials at Nurem...

...per Hauser, if that was indeed his name, spent that first ...with the city's most learned man, Dr Daumer, where the ...man promptly astonished his host by trying to pick the ...off a candle. Further tests brought out that he had no depth ...ption whatever and, although he seemed to be in full posses... his faculties, they were as undeveloped as those of a baby. Although the condition of his feet and legs indicated that he ...walked a considerable distance, no one could be found who ...seen him on the road. A reward was offered for anyone who ...identify him. Pictures were distributed throughout Europe, ...to avail. The more the officials probed, the deeper the ...of Kasper Hauser became.

...the kind and patient tutelage of Dr Daumer, Kasper ...learned quickly ... first to speak ... and then to write. He ...newfound friends that he had been raised since infancy in ...darkness in a cellar ... had never tasted anything except black ...and water ... had never seen the man who brought his food ...the darkness. He had seldom heard speech ... and then only a ...words. But how, or why, or where he had spent those years he ...no idea.

In October of 1829, Kasper came stumbling out of Dr ...mer's basement, bleeding from a deep gash on the head which

he said had been inflicted by a masked man wielding a long kn
The city officials assigned two policemen to guard him after that
but while they dozed on the afternoon of 14 December
Kasper Hauser went for a stroll in the park across the street
stroll from which he came staggering back a few minutes later
dying from a stab wound which surgeons said could not have been
self-inflicted.

The snow in the park revealed no footprints other than
Kasper's ... and no trace of the weapon.

The well-documented facts in the enigma of Kasper Hauser
entitle it to a place in the records as one of the strangest cases of
its kind.

Von Feuerbach* wrote of him ... "Kasper Hauser showed such
ignorance of the simplest facts of life ... and such horror of the ne
cessities of civilization ... that one feels driven to believe that he
was a native of another planet ... transferred by some miracle to
our own."

WHO PLANNED THE MURDER OF ABRAHAM LINCOLN?

The five persons who were killed in connection with Lincoln's as
sassination were not alone in the plot. Was a member of Lincoln's
own cabinet involved?

When the shocked nation recovered from the impact of Lin
coln's murder, it cried for vengeance on the perpetrators of the
infamy. Eventually four persons were hanged as conspirators in
the plot, after a trial that was marked by callous disregard of any
evidence that did not fit the preconceived sentence. And the vain
bombastic trigger man, John Wilkes Booth,* died, according to the
general understanding, as the result of being shot by a religious
fanatic named Boston Corbett, although Corbett's claim is subject
to question.

It is important to note that with Booth dead (killed before he
could make any public statements –) and with the execution of
the four co-conspirators from Booth's boarding house, any higher
ups who might have been involved were reasonably safe from ex
posure.

On the night of Lincoln's murder, Secretary of War Edwin M
Stanton hurried to the house where the President was dying and
took charge of the investigation. For five hours Stanton refused to
identify Booth as the killer. Booth was using those five hours to

And he left Washington over the only bridge which had closed by official order an hour before the murder.

was surrounded in a barn by a contingent of troops under command of Lt Luther Baker, who had been assigned to by his uncle, Lafayette Baker, a slippery character who the Secret Service. The Secret Service was under the of Secretary Stanton. Lafayette Baker was an intimate and Baker was detested by President Lincoln.

Corbett, who was permitted to claim he shot Booth was thirty feet from Booth when the assassin was paid own coin. Only Lt Baker was in the barn with Booth. armed with a rifle. Booth was killed by a pistol bullet of the neck, fired from such short range that Booth burned. Only one man could have fired that shot – Lt with was silenced.

ding to his own testimony, when Lafayette Baker told that Booth had been found, Stanton dropped into his chair ed his face with his hands. When Baker added that as dead, Baker says, Stanton dropped his hands and the first time in days.

trial, Stanton first testified that he did not have Booth's but, he was permitted to change his testimony to say that ave the diary, but when he produced it in court, the ll pages covering the critical period preceding Lincoln's were missing. Baker testified that the diary had been when he turned it over to Stanton. The military court effort to require Stanton, the Secretary of War, to explain on and his contradictory testimony.

of the damning testimony which sent Mary Suratt and companions to the gallows came from a trio of dissolute whose veracity was the least of their virtues, if any.

was Louis Weichmann, an employee of Mr Stanton's Department, and a roomer at Mary Suratt's where the plotted. Weichmann talked about the plot openly for before the murder, but no one in the War Department ny interest in him, until his testimony was needed to As long as Stanton remained in government service, Weloaded on government jobs. After Stanton was ousted, mn was discharged.

he tavern keeper, John Lloyd, who testified that Mary Suratt him as a supply depot for the assassin, during his testimony

quoted her at length, word for word, yet at the time of their talk he had admittedly been falling-down drunk.

John Parker was a man who had a police record himself when Mrs Lincoln had him appointed White House guard in April of 64. It was John Parker who left his post in Ford's theatre, walked into a nearby bar where Booth was waiting, an indication to Booth that the way to the President was unguarded. Yet Parker was never prosecuted for his incredible dereliction to duty. It may be coincidence, but only as long as Stanton held power, Parker remained on the police force. Why?

There are many unanswered questions in the events that followed the murder of Abraham Lincoln, questions which could be answered best only by Edwin M. Stanton, who was in charge during those crucial hours.

Why he refused for hours to identify the killer; why he finally sent out the wrong picture for that of John Booth; why he perjured himself on the witness stand about the killer's diary; why he refused to let Mr Lincoln be guarded that fateful night by the men whom the President requested; why he failed to investigate the fact that detailed stories of the assassination were published in two newspapers many hours before the deed; why Lt Baker was not identified as the killer of Booth, whom he had been ordered to bring back alive!

If we knew the answers to those questions, we might know what prompted Robert Todd Lincoln to burn some of his father's letters. Teddy Roosevelt* asked why he was burning letters that might have historical significance. Robert Lincoln replied, "It would serve no purpose to make them public. They deal with a man who played a part in my father's death, a member of father's cabinet."

A DREAM THAT SHOOK THE WORLD

It was a little after three in the morning according to the big clock in the corner of the *Boston Globe* newsroom. Reporter Byron Some sat up on the couch where he had been sleeping off his binge.

He shook his head to clear his mind of that terrible dream he had been having – and thanked his lucky stars it had been nothing more than a dream. He could still hear the screams of those doomed mortals as they plunged into a seething ocean that was boiling hot.

the whole thing as clearly as if he had been suspended
The streams of molten rock pouring down the moun-
farms and villages and people; the great explosion
the island up in one incredibly vast column of fire and
mud and the boiling sea waters that rushed into the
the island had been a moment before.
sat there in the *Globe* office, all alone, head in hands,
his nightmare. Might be a little feature yarn in it for
day, he reasoned, so he picked up a pencil and wrote
details of his dream, while they were fresh in his mind.
the fear crazed natives of Pralape, a little island near
and themselves trapped between the molten lava and
the island quivered with the fury of the pent-up vol-
that were rolled over by walls of water – and fi-
of the climax to the cataclysm, the last great explo-
blew the island of Pralape off the face of the earth, leav-
fire spouting crater to mark its passing.
scrawled one word ... *important* ... across the top of his
left it lying on the desk.
the editor found it next morning. He assumed that it
that had come in by wire during the night and that
titled it down for his attention. He ran it as a two-col-
story on the front page ... a real scoop apparently,
of the other Boston papers had it. The editor gleefully
on the Associated Press wire which fed it to other
all over the nation. It was the big story on 29 August 1883.
the editor of the *Boston Globe* it was also the big
but when other papers began asking for more details, he
gped. There were no communications with Java – and the
who had written the story could not be found.
night the publisher of the *Globe* found Some, who
ly admitted it was all based on a horrible dream.
the library informed the paper that there was no such
ape, in Java or anywhere else. Some was fired.
barrassed Associated Press called a top-flight confer-
ss some way out of the predicament for themselves
cores of big newspapers that had published the report.
Globe decided to take its medicine. It planned to print
on the front page and to take the humiliating laughter
petitors could be expected to provide.
nature stepped in. Along the west coast of the United

States unusually high waves began pounding the beaches. I[illegible] scattered points came cabled reports that a great catastroph[illegible] occurred near the Indian Ocean. Tidal waves had killed th[illegible] sands – many ships were unreported.

While the *Boston Globe* ate humble pie, other newspa[illegible] printed the fragmentary reports and waited for the new story [illegible] develop. From Australia came word that the air had vibrated w[illegible] the sound of heavy aerial cannonading ... great swells hammer[illegible] the coasts of the United States and Mexico and South Americ[illegible] the waves circled the world – an experience without parallel [illegible] human history.

A few days later and ships which limped into port brough[illegible] with them the terrible story of Krakatoa, the island that had v[illegible] ished in one world-shaking explosion in the Straits of Sunda,' [illegible] ting off barometric oscillations that were recorded all over th[illegible] world and producing an atmospheric shock which had circled th[illegible] earth three times, to the bewilderment of scientists.

Newspapers realized that it was one of the greatest news s[illegible] ries of all time, the mightiest convulsion ever recorded. As the story unfolded, the *Boston Globe* scuttled its retraction and ran Byron Some's picture on page one ... but without revealing HOW he had learned of the catastrophe.

Krakatoa began writhing on 27 August and blew itself to bit on the following day, sinking beneath the waves on the 29th. The terrible sights Byron Some was seeing in his dream in Boston were actually taking place at this instant half-way round the world.

But he had called the doomed island Pralape, when it was act ally Krakatoa – a discrepancy which went unexplained for many years, until the Dutch Historical Society sent him an old map which listed Krakatoa by its native name of Pralape – a name which had not been used for more than a hundred and fifty years.

THE RIDDLE OF LOCH NESS

Whatever it is that stirs in Loch Ness, it is no newcomer. An inscription on a 14th-century map of the loch tells vaguely but chillingly of "waves without wind, fish without fins, islands that float". The description has seldom been bettered by the hundreds of witnesses who have testified to the creature's existence.

"Monster" sightings are not limited to Loch Ness: Lochs Awe, Rannoch, Lomond and Morar have all been said to contain spec[illegible]

The Ness Monster owes its greater fame to the open-road along the north shore of the loch in 1933. Since ... was of "four shining black humps", "brownish-grey ... that shoots across the loch at 20 mph, have kept ... to the loch.

... have seen the phenomenon more closely say that ... "eel like", with a head resembling a seal's or a gi-... while the long neck is embellished with a horse's

... depth has been estimated at anything between 25 ft and ... skin texture is "warty" and "slimy". Close observers ... Mr George Spicer and his wife who saw it jerking ... lochside road in 1933, have declared it "fearful" and "an ...thon"

... the creature has presented itself only in tantalising ... To believers it has been an unknown fish, a giant slug ... plesiosaurus,* which was (or is) a fish-eating dinosaur.* Un-... are equally imaginative. They suggest that the "monster"

is really a mat of rotting vegetation propelling itself by rele[illegible] gases; waterfowl such as red-throated divers swimming in [illegible] ahead; a group of otters playing "follow my leader"; even th[illegible] mains of a First World War Zeppelin that appears periodicall[illegible] the surface of the loch. In Gaelic* folklore there is no mystery [illegible] animal is an *Each Uisge*, one of the fearsome water-horses whi[illegible] *haunt almost every sheet of dark water in the Highlands.*

It is not surprising that such waters, cupped in savage hill[illegible] should produce legends. Loch Ness is part of the Great Glen [illegible] geological fault that slashes across Scotland like a sword-cut. Th[illegible] loch itself is 24 miles long, about a mile broad and has an aver[illegible] depth of 400 ft.

Loch Ness has one direct outlet to the sea, the shallow Riv[illegible] Ness, and it is fed by eight rivers and innumerable streams, [illegible] of which pours the peaty soil of the hills into the loch. Conse[illegible] quently, the water is dark. Divers working with powerful [illegible] lamps 50 ft below the surface have been unable to see for mor[illegible] than 10 ft around them. Legends of caves said to be the home of [illegible] colony of monsters have yet to be disproved; these are supposed to be situated beneath the rocky ruins of Urquhart Castle.

Stories of a "beast" in Loch Ness date back at least to the 6th century. It is recorded in Adamnan's* biography of St Columba that in A.D. 565 the saint prevented a River Ness water monster from eating a Pict.* According to another legend, the beast towed St Columba's boat across the water, and was granted perpetual freedom of the loch.*

Such benevolence does not sound like the normal behaviour of the Gaelic water-horses. Sometimes these would appear on lochsides in the guise of milk-white Shetland ponies, bridled and saddled; and if a child attempted to ride one of them, it would carry him into the water.

Over the past 40 years, sightings have been claimed by more than 1000 people. Most of the sightings were in bright sunlight in conditions of flat calm, and several of the witnesses were trained observers – soldiers, doctors, seamen and water-bailiffs. Though many of the sightings were from a distance, witnesses have been convinced they were looking at a large animal, most of whose body was hidden beneath the water.

If it exists, it is most unlikely that the Loch Ness monster is a single animal. A prehistoric creature, living alone in Loch Ness cut off from others of its kind, would have to be millions of years

to survive there must be quite a large colony; reported sizes could be accounted for by the pres- and young. The colony theory is also supported by sightings in different parts of the loch.

naturalists, the chances of the creature being a Though Loch Ness never freezes, its tempera- ove 6°C (42°F) and this would be too cold for Also, reptiles breathe air, and would have to ently than the monster appears to. Fish, too, ruled out, if legends and accounts of the ani- activities this century are to be believed. This brates, and certainly many of the descriptions mous worm or slug. But there is no evidence that a creature of such bulk has ever existed on this

most zoologists deny the possibility that a large and animal might be living in Loch Ness, it is remarkable creatures in other Scottish lochs, and in lakes in and British Columbia, should be so similar in tale, the mystery continues; and it is perhaps more any final scientific solution.

WEST COUNTRY LEGENDS

gift for story-telling has left the West Country with a of legends, some of them dating back to pre-Christian demon dogs which are said to chase across Dartmoor the Devil on horseback are a relic of the pre-Christian hounds chased across the sky accompanied by the god The stories have survived because of their vividness, or the conditions which prompted them still exist. Stone cir- the prehistoric relics, which in the Celtic imagination points to a world of giants and demons, still brood over the landscape. The mists that swirl over the western coasts can still people them in imagination with these supernatural beings.

The Ancient West

the legends of the ancient West are linked with the stone and standing stones scattered over the region, dating from the Bronze Age some 4000 years ago.

A stone circle called the Merry Maidens, near St Buryan, Cornwall, is one of the best-known sites associated with a legend common to many of the West's prehistoric relics. There are 19 stones in the circle, with two menhirs (single standing stones) near by. It is said that 19 maidens were dancing on the Sabbath to the music of two pipers. The Devil appeared among them and turned them to stone. The early Christian church may have encouraged this legend, in order to persuade the villagers to keep away from the stones as being "evil", and so to break the influence of older beliefs.

Perhaps the strangest prehistoric relics in the West are the tolmens – huge stones with a hole cut through the centre. The Men-an-Tol, near Morvah, is one of the best examples. No one knows for certain what its purpose was, though it may be all that remains of the entrance to a tomb. Until about the 18th century, parents passed their children through the hole as a cure for rickets.

The great size of the prehistoric relics in the West forms the basis of widespread tales of giants and other supernaturally strong people. St Just is said to have visited St Keverne one day and stolen his host's chalice. St Keverne, in his anger, hurled three great boulders at St Just. The boulders still stand in a field near Germoe, on the road from Helston to Marazion.

Moorland Legends

The West Country's high and windswept moors are a perfect setting for eerie tales of the supernatural.

When Sir Arthur Conan Doyle wrote *The Hound of the Baskervilles* he was drawing on one of the West's oldest stories. Demon dogs, known as wish hounds, yeth hounds or yell hounds, are said to chase along Dartmoor's Abbot's Way in search of unbaptised children. Sheep and ponies are said to flee from the hounds in terror, and any domestic dog hearing the hounds' baying is supposed to die of fear.

On the edge of Bodmin Moor, in an unmarked grave in St Breoc churchyard, lies the body of Jan Tregeagle, a steward to Lord Robartes at Lanhydrock in the 17th century. Tregeagle is said to have sold his soul to the Devil. But because he did one good deed during his life, the saints postponed his fate by setting his spirit endless tasks, such as emptying Dozmary Pool with a

holed limpet shell or weaving a rope of sand. Demons are said to hunt Tregeagle over the moor, and Cornishmen have long said that the sighing of the wind is Tregeagle's moaning.

Sedgemoor in Somerset was the site of one of the last battles fought on English soil. The Duke of Monmouth* and his rebels were defeated there in 1685. Ghosts are said to haunt the battlefield — vague, shadowy creatures which loom up over the marsh and quickly vanish again. At night, green blobs are said to glow over the battlefield, representing the unquiet spirits of Monmouth's slaughtered army.

Legends of the Sea

According to tradition, a land called Lyonesse* once stretched between Land's End* and the Isles of Scilly. The Scillies were part of it, as was St Michael's Mount near Penzance. Lyonesse had many cities and some 140 churches, whose bells, it is said, can sometimes be heard tolling beneath the sea. Arthur's* knights had many adventures in Lyonesse: Tristram,* whose love affair with Iseult is part of the Arthurian legend, was born there.

Historically, it is quite possible that there was once a land beyond Land's End. In the Isles of Scilly, there is evidence that a single island has split into several islands at some time since the Bronze Age. Walls can still be seen in the sea between the islands.

Belief in mermaids was once widespread in the West Country, and reflected the reverence seafaring people felt for the imaginary gods and goddesses of the sea. Between Downderry and Looe in Cornwall is a small beach called Seaton Sands, said to be all that remains of a once-prosperous town. Some local sailors are reported to have insulted a mermaid, who put a curse on the town. The sea swept in, and buried it under sand.

Other legends date back to the time when smuggling was part of many West Country men's way of life. Until the late 18th century, the sea near Gwennap Head in Cornwall was reputedly haunted by a ghost ship. Cornish smugglers bringing contraband from Brittany may have given rise to this story, by painting their boats with luminous paint as a ruse to scare off intruders.

Saints and Holy Wells

There are some 100 holy wells in Cornwall, most of them named after Cornish saints. Many are reputed to have strange powers. According to legend, the holy well at St Cleer, on the south edge of

Bodmin Moor, cures madness; the water from Ludgvan well north-west of Marazion, ensures that children will never commit murder; showers of rain follow a wash in the water of St Constantine's well, near Trevose Head. St Keyne endowed the waters of her well, 5 miles north of Looe, with the power to make one partner in a marriage dominate the other, depending on who drank first.

The early saints made such an impression on the Celtic people whom they converted, that their very coming to the West Country was surrounded by tales of the miraculous. St Piran is said to have sailed from Ireland on a millstone, St Feock on a granite boulder and St Decuman on a bundle of twigs. St Decuman's teachings thrived in Devon until the saint met a martyr's death and was beheaded. According to legend, St Decuman retrieved his own severed head and walked away with it.*

YESTERDAY

IS THE SEA SERPENT FOR REAL? CAN SO MANY SOBER BAY STATERS BE WRONG?

It was 2 p.m. on the fourth of September 1947, and the summer crowds were gone from Nahant, a beach eight miles northeast of Boston. A Medford, Mass., piano tuner named John Ruhl was standing on the walk above the beach on this bright, sunny afternoon when suddenly he shouted and pointed toward Egg Rock, two miles offshore. The next day he was quoted in all the Boston papers:

"I know nobody will believe me, but I saw a sea serpent, and my daughters saw it, and I'm no fool. Its back showed above the surface ... every six feet, and it was 50 feet long, or even longer."

Ruhl received little more than good-natured ribbing for his troubles, but up to the day he died in 1966 he never backed off his story.* Today, 30 years after the sighting at Nahant, his daughter Edris, 56, says, "It wasn't a whale or a shark. I'd seen them. It went up and down like a great big snake, and it had to be big, because Egg Rock is so far away."

Ruhl's experience was quickly forgotten in Boston. No one pointed out that what he had seen – or thought he had seen – constituted the latest chapter in an old Massachusetts story. In 1641, for example, Obadiah Turner wrote in his journal of another sighting at Nahant, of "... a most wonderful serpent a

[illegible] way off from ye shore. He was as big round in ye thickest part as a [illegible] pipe, and ... fifteen fathoms (90 feet) or more in length."

In [illegible] sea captain named Eleazar Crabtree wrote to the [illegible] that, while six miles off Maine's Mount Desert Island, he [illegible] a serpent of enormous size, swimming on the surface of the [illegible] sea, its head elevated about six or eight feet ... I estimated [illegible] to 60 feet in length, perhaps longer. I was within [illegible] about an hour. ... Myself and the whole crew observed it [illegible] minutest of attention; nor was its attention less fixed on [illegible] ... eyes perfectly black, sharp and piercing."

[illegible] observations attracted no more believers than did Ruhl [illegible] such creatures exist, why isn't at least one specimen [illegible] somewhere? Nevertheless, there were similar reports [illegible] North Atlantic in at least 28 of the 154 years between [illegible] and Ruhl's sightings. Eighteen of them occurred along the [illegible] Massachusetts.

[illegible] in sea serpents, the testimonies of Turner, Ruhl and [illegible] evidence enough. But they are nowhere near as convincing [illegible] that happened in 1817, which was truly the Year of the Sea [illegible]. Its haunt then was the city of Gloucester, a great fishing [illegible] Gloucester was the home of sea captains and sailors who had [illegible] all the world's oceans and who, presumably, had seen all [illegible] to see in them. It does not seem that the citizens [illegible] would have been fooled by optical illusions, by logs or bales [illegible] ... in single file, by the kinds of things that observers [illegible] serpents have always been accused of seeing. In fact, [illegible] it was a hard sell.*

[illegible] 1817, shortly after a Maine coasting vessel had docked [illegible] Gloucester Harbor, the ship's skipper burst excitedly into [illegible] Reflection Room, a social center of the time, and told [illegible] inside the port he and his crew had seen a terrible-looking [illegible] a "sea serpent". Its head was at their bow, and its tail [illegible] beyond the stern of their ship, which was more than [illegible] long. The immediate reaction was laughter and [illegible] but the tale quickly became a familiar one – and the laughter [illegible] ceased.

The first Gloucester man to tell it was Amos Story, who was sitting [illegible] the harborside on Aug. 10 and saw, as he put it, a "head [illegible] ten or twelve inches above the surface ... longer than the head of any dog." The second Gloucester observer was Solomon Allen, III

a man of the sea, a shipmaster. Allen claimed to have sighted th serpent on three consecutive days (he said he had the creature i view for the entire third day), and he testified in a sworn depo tion: "I have seen a strange marine animal, that I believe to be serpent, in the harbor of Gloucester. I should judge him to b between eighty and ninety feet in length, and about the size of half-barrel, apparently having joints from his head to his tail: m view (was from) about one hundred and fifty yards. When h moved on the surface of the water his motion slow, at times play ing about in circles ... His color was a dark brown. ..."

Accounts of the time claim that the serpent had been seen i Gloucester Harbor by hundreds of people by Aug. 16. It stretche lazily at the surface or splashed after herring, which were unusu ally plentiful that summer. And the descriptions were growin more detailed. Some observers said that the snakelike body ha "bunches" on its back, that its color was dark brown or blue, that had a white patch under its chin, that its movement, in and out of the water, was like that of a "caterpillar".

A Gloucester fisherman named John Low wrote to the *Salem Gazette*: "Our small craft is fearful of venturing out fishing." A five thousand dollars reward was offered for the capture of whatever was out there. A group of men began weaving a huge net to trap the creature. Shark hooks were baited and trailed from buoys all over the harbor, which bobbed with all sorts of boats, carrying men with harpoons, nets and muskets. A crack shot named Matthew Gaffney reportedly fired at the sea serpent from 30 yards, and witnesses said he did not miss. The creature reacted, said one observer, by appearing "more shy". It was concluded that its flesh was impervious to musket balls. Killing it, the *Gazette* wrote, "... requires not merely the club of a Hercules, but the cunning contrivance of a Vulcan."*

Gloucester was in a tizzy, but in Boston, 40 miles south, there was fear. That seems incredible now, but it was a less sophisticated time, and Boston was almost an island then, because Back Bay had not yet been filled in. Even more than Gloucester, it was a city of the sea. Gloucester heard the news as it happened, but Boston had to wait for days for each new report, which tended to be exaggerated when it finally filtered south. The serpent grew to 150 feet. It exhaled flames. Along the Boston waterfront old people were afraid to leave their homes. When an artist drew a 20-foot by 11-foot likeness that was supposedly derived from his per-

sighting of the creature, crowds paid 25 cents apiece to view Merchants Hall. As expeditions set out from most north town in capture it, a large shed was built near Faneuil Hall* the "Ill Majesty", as the newspapers began calling the ser-

In Au[illegible] Linnaean Society* of New England formed a [illegible] committee of prominent men to investigate the matter. One [illegible] was Dr. Bigelow, Rumford Professor of Materia Med[illegible] at the [illegible] Medical School and Boston's leading natural [illegible]ist. [illegible] to interrogate witnesses and to receive their [illegible]dep[illegible] was the Honorable Lonson Nash of Gloucester, [illegible]ce of the [illegible], a former state senator and the town's only [illegible]ney, who [illegible] all testified to having seen the object of his in[illegible]gation. He [illegible]ged it to be 100 feet long and said that at a dis[illegible] of 250 [illegible] with a glass I could not take in, with one view, [illegible] the animal, that were visible".

Hundreds [illegible] coastal residents offered to testify, but only 10 [illegible] chosen. The witnesses included Story and Allen; most of the [illegible]s were mariners. They agreed on many points: on the crea[illegible]s length, 90 to 100 feet; on the circumference of its body, [illegible] that of a half barrel; and on its speed, up to 30 miles per [illegible]. "Faster than a whale," was how more than one of the ob[illegible]ers measured the serpent's speed. All agreed that the creature [illegible]de no sound, that it appeared jointed and that its head was much bigger around than its body. It was, they estimated, somewhere between the size of a four-gallon and a ten-gallon keg. One witness said the serpent had a horn of between nine to 12 inches in length; a few others claimed it had a forked tongue two feet long.

Story made the last Gloucester sighting on Aug. 23, 13 days after he had made the first one. On Aug. 28 the schooner *Laura* was two miles east of Gloucester, heading to Boston, when a crewman shouted, "What is this coming towards us?" The last sighting of 1817 ensued, at a distance of 30 feet. The captain and crew reported their observations to Boston Judge Joseph May. Crewman William Somersby said, "I saw one of his eyes as he passed; it appeared very bright, and about the size of the eye of an ox."

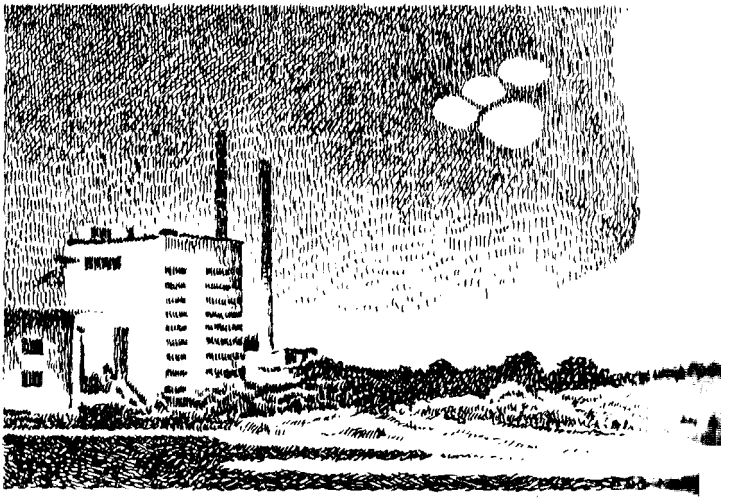
In October the Linnaean Society announced that it was classifying the serpent as a new marine animal—*Scoliophis atlanticus*. (The word *scoliophis* was used to denote the creature's unusually

flexible spine.) Thereafter Boston and Gloucester ret
normal, and though *Scoliophis* came to Nahant two ye
the visit was relatively brief and its effect on the popul
profound. The same has been true of all the other sightin
then. There has never been another Year of the Sea Ser
1817.

In 1849 the eminent Harvard zoologist Louis Agass
lecture during which he said: "... if a naturalist had to sk
outlines of an *Ichthyosaurus** or a *Plesiosaurus* from the
we have seen of them, he would make a drawing very
the sea serpent as it has been described. ... I still consider
ble that it will be the good fortune of some person on the
Norway or North America to find a living representativ
type of reptile, which is thought to have died out."

But no one has ever captured a creature like *Scoli*
lanticus, and there are those who believe in sea serpents wh
no one ever will.

UFOs*



On 24th June, 1947, Kenneth Arnold, a young American
nessman, was flying his private aeroplane above the C
Mountains in Washington. As he drew near Mount Rain
saw nine circular objects moving at high speed pass twen

[illegible] a Douglas DC-4 airliner in the sky at the [illegible] thought that each of the objects was [illegible] this aircraft. The objects flew "as if they were [illegible] in and out of the high peaks of the [illegible] erratic movements".

[illegible] described what he had seen. He told a [illegible] that the objects "flew like a saucer would if [illegible] the water." His words provided a name for [illegible] Kenneth Arnold was the first observer re[illegible] flying saucers."

[illegible] of the report of what Arnold had seen, re[illegible] sightings came from various parts of the [illegible] Australia, England and Iran.

[illegible] was a great deal of guessing about what [illegible] might be. An American newspaper reporter [illegible] were, in fact, a new secret type of aircraft, [illegible] helicopter and fast jet plane". This proved to be [illegible] so-called "cold war" was in progress between [illegible] and the Soviet Union and one famous newspa[illegible] stated that the saucers were a new type of spy air[illegible] from Russia. Another idea was that the flying [illegible] from outer space, sent by beings from another

[illegible] of newspapers, they tended to carry stories of [illegible] the next few months, and many of the stories [illegible] mistaken. But some of the stories were gen[illegible] seriously in the minds of people in authority [illegible] flying saucers exist? In time, the term "flying [illegible] way to the more scientific one "unidentified fly[illegible] over two decades from 1947 a great deal of in[illegible] carried out into UFOs in the United States.

[illegible] of the US Army Air Force soon called to ques[illegible] Arnold about what he had seen. The young man [illegible] quite clearly. At about three o'clock in the afternoon, [illegible] saw a flash of light in the sky. Then he saw the nine [illegible] and I could see their outline quite plainly against the [illegible] approached the mountain. They flew very close to [illegible] tops, flying like geese in a diagonal chainlike line, as [illegible] linked together. They were flat like a pie pan and so [illegible] reflected the sun like a mirror." Arnold estimated [illegible] objects were flying at 9,500 feet and travelling at some-

thing like 1,700 miles an hour – three times faster than any craft known in 1947.

The expert returned from seeing Arnold and handed in hi port. He believed that Arnold was telling the truth. He said, "I made up that story, he is in the wrong business. He should writing science fiction for a living."

On the other hand, it was possible to pick holes in Arno story. Arnold had estimated the size of the objects he saw at ab fifty feet long. "At a distance of twenty-five miles," said some perts, "he wouldn't have seen something that size." Experts a questioned his estimate of the speed. "If the objects were trav ling that fast, he wouldn't have seen them," they said.

In the end, the experts provided an explanation of wh Arnold had seen. It was a mirage caused by "unusual atmospher conditions". This was an explanation that Arnold would not a cept. He said, "I'm absolutely certain of what I saw."

By this time, it was widely known that sightings of unident fied flying objects were not new. Reports of such objects date bad three thousand years. Some people include among these reports o fiery chariots, glowing lights and strange clouds which are men tioned in the Bible.

In the early days of the Roman Empire, a round object tha looked like a globe or a shield was said to have been seen movin across the sky. On another occasion a fiery globe, brighter tha the sun, was reported to have been seen, first falling towards th earth and then rising again.

In A.D. 80, Roman soldiers in Scotland said that they saw bright flames in the sky one winter's night and something tha looked like a ship moving across the sky on several occasions Eighteen years later, something that looked like a burning shiel was seen to pass across the sky in Rome.

Similar stories were told in the Middle Ages. Matthew o Paris* recorded that what appeared to be a very bright star passed over England one evening and vanished in the north. A few years later, he stated, monks at St. Albans saw a large vessel in the sky like one of the ships of their time.

Robert of Reading recorded that, in 1323, a fiery shape wa seen crossing the sky over England and observers noted that when a bright red flame burst from it, it travelled faster.

Other Medieval writers described bright lights, balls, discs and strange shapes that were seen in the sky.

[illegible] a Spanish merchant ship saw several glow-
[illegible]ky. For a time the objects broke formation
[illegible] and fashion. Then they fell into formation
[illegible]ght.

[illegible] famous diarist, described a "shining cloud" [illegible] March 1643. He wrote: "I must not forget [illegible]dingly the night before, namely, a shining [illegible] shape resembling a sword, the point reaching to [illegible] bright as the moon, the rest of the sky being [illegible]out eleven at night, and vanished not till about [illegible]ll the south of England."

[illegible]brightly lighted object shaped like a cylinder [illegible] been seen over London.

[illegible]ly lighted hooklike shape was seen over Ohio [illegible] and that same year a large glowing object was [illegible] people living in Niagara Falls, New York. In [illegible] seen flying over Lowell, Massachusetts.

[illegible] 1871, an astronomer named Coggia saw a [illegible] the sky over Marseilles, France.

[illegible]ober, 1882, an astronomer named E.W. Maun-[illegible] heavens from the Royal Observatory, Green-[illegible]cular disc of greenish light. Other people saw [illegible] night. They described it as being cigar-shaped, [illegible] a spindle. The object was in plain sight of Mr [illegible] minutes.

[illegible] newspapers in the United States reported [illegible] unidentified flying objects being seen. People in [illegible]ka, saw a brightly-lighted object that was too big to [illegible] balloon. A day later a farmer in Sioux City, Iowa, claimed to [illegible] been caught by a hook dangling from a similar object and [illegible]ed along the ground. A week later people in Omaha once [illegible] saw a brightly lighted object in the sky and this time it [illegible]ced to have a steel body and be twelve to fifteen feet long. [illegible] some of the objects seen were said to be cigar-shaped and to have [illegible] flashed red, green and white lights.

In January and February 1913, "unknown airships" were seen at various times over many different places in Britain. Whatever they were, they gave out a great deal of light. Some people later believed these UFOs had a simple explanation. Zeppelins were used to bomb Britain in World War One and it is thought that they might have been sent to spy on Britain just before the war.

In July 1938 a UFO flew over New York. It shone brilliant and gave forth a sound described as "a great swish", "a persistent hiss" and "a faraway roar". It was lost to sight when it fell below the horizon, possibly falling into the sea. Experts declared that the object was a large meteorite but not everyone who saw it agreed. A lecturer at the Planetarium in New York said it was like a rocket with a brilliant exhaust". Another witness said it was like a giant Roman Candle".*

In the years before World War Two there were frequent reports of aircraft crashing into the sea without leaving a trace and without any known aircraft being missing.

Study of the files of newspapers and magazines indicates a considerable amount of interest in UFOs for over a century.

Not all reports of flying saucers are genuine; not all are worthy of serious study – the stories are too vague. But some reports stand out from all the rest and defy an explanation. Such a report occurred on 7th January, 1948. People living in Maysville, Kentucky, saw what seemed to be a curious aircraft pass over the town, and reports of what they had seen were passed to the state Highway Patrol. The Highway Patrol got in touch with a US Air Force base at Godman, near Louisville, to see if they knew anything about the aircraft. The answer was, "No," but the men in the control tower at the airfield said that they would watch out for it.

Some time afterwards, an aircraft control officer saw something above the airfield. It was a large object and it looked metallic. It appeared to be hovering over the airfield.

At this time, four F-51 fighter aircraft of the National Guard were approaching the airfield. The control tower at Godman called their leader, Captain Thomas Mantell. They asked if he would help to identify the strange aircraft.

One of the F-51s was short of fuel but the other three set out to investigate. At first, they saw nothing but, at 15,000 feet, Mantell saw something above him. The control tower asked him what it looked like and he replied, "It looks metallic and tremendous in size. Now it's starting to climb." Seconds later Mantell said, "I'm climbing to 20,000 feet." After that nothing more was heard from him.

The other two F-51s returned to base but Captain Mantell's aircraft vanished. The wreckage of it was later found forty miles from Godman. Captain Mantell was dead.

Mantell's death gave rise to all kinds of wild rumours. It was suggested that his aircraft had been blown to pieces when it drew [illegible] the UFO. Investigators of the US Air Force told another story. The F-51 had originally set out on a low-level mission and was not carrying oxygen tanks. But at 20,000 feet, the pilot would have needed oxygen. Presumably Captain Mantell flew too high and blacked out leaving his plane out of control.

The question remained: What was the object seen over Godman that day? The most likely explanation seemed to be a huge high level balloon called a Skyhook. These balloons were being used on research by the US Navy. But it was never proved that a Skyhook balloon could have been in the area of Godman on 7th of January, 1948.

On the night of 24th July, 1948, Clarence S. Chiles and John B. Whitted were flying a Douglas DC-3 of Eastern Airlines from Houston, Texas to Atlanta, Georgia. Near Montgomery, Alabama, a brilliantly glowing object flew towards them, and then pulled up and disappeared into the clouds. The two men described the object later as a cigar-shaped, wingless aircraft about 100 feet long. It had a smooth surface and two rows of lighted windows. The bottom of it was lit by a dark-blue glow and flames came out of it at the rear for a distance of about fifty feet.

It was 2.45 a.m. and most of the passengers were asleep; so they did not see the UFO. But at 1.45 a.m. a bright light was seen to pass over Robbins Air Force Base at Macon, Georgia, and at 1.45 a.m. two military pilots flying some miles from Montgomery saw what appeared to be a bright shooting star in the distance.

These sightings were investigated by the US Air Force. They checked aircraft in the area and found that none had been flying near the DC-3. But they discovered that, that week, a large number of meteors had been seen over the South-East of the United States. The bright light seen at Macon and that seen by the two military pilots were probably meteors and it seemed as if what Chiles and Whitted had seen was probably one, too.

Not everyone was ready to accept this explanation. This was because Chiles and Whitted were reliable witnesses and both agreed upon what they saw. Their case is regarded as a UFO classic – a sighting which has not been explained away.

Another classic sighting occurred in the evening of 1st October, 1948. Lieutenant George F. Gorman was coming in to land his F-51 on the airfield at Fargo. The control tower told him that a

Piper Cub was to land before him. Gorman picked out the light
the Piper Cub below him. But he also saw another moving
At once he called the tower and asked if there was another
in the landing pattern. The tower said that there wasn't. T
the ground control officers looked through the window and
clear white light moving towards the north.

At this point, Gorman called again. He said that he was
to follow the light to find out what it was. Watched, at
through binoculars from the tower, Gorman chased the
light from 1,000 up to 14,000 feet. During this time
sometimes changed direction and flew towards Gorman
Twenty-five miles from Fargo it suddenly shot upward
appeared.

The US Air Force investigated. Four people beside
had seen the light, two ground control officers, the pilot
Piper Cub and a passenger in it. In spite of his nearness
Gorman had only seen a round white light measuring
inches across. But he was convinced that the light
guided by someone.

The explanation put forward by the investigators
A lighted weather balloon had been set free from
evening. The wind would have carried it over the airfield
they did not explain was why Gorman, an experienced pilot
knew about weather balloons, had not recognised what
chasing. Nor did they explain the balloon's abrupt change
rection.

On 3rd September, 1965, Norman Muscarello, a young
living in Exeter, New Hampshire, was walking home at about
o'clock in the morning. A few miles from the town he saw,
a field, what appeared to be a round object about eighty to
feet in diameter. Around the rim of the object were bright,
ering red lights. Muscarello's reaction was immediate. He
into a ditch at the roadside. He watched the strange object
away and then ran into the roadway to stop a passing car. He
given a lift to the police station in Exeter.

He told his story at the police station. The officer in
thought that the young man might be having a joke but he decided
to call in a patrol car. The officer who drove in, Eugene Bertrand,
had a strange story of his own to tell. An hour earlier he had found
a terrified woman in a parked car. She said she had been followed
by a large flying object with flashing red lights.

Muscarello back to the field, and there both of
[illegible] object. It appeared to hover about one
the ground. Bertrand called in over his radio,
and a second patrol car driven by David Hunt
He, too, saw the UFO.

[illegible] followed, many other people reported seeing
[illegible] of Exeter. The sighting by Muscarello was in-
[illegible] Air Force. They put forward two possible ex-
[illegible] of Strategic Air Command were carrying
[illegible] in the area that night; perhaps the UFO was
[illegible] A trick of the atmosphere caused by layers of
[illegible] made stars and planets appear to move in

[illegible]tion covered all the facts in the case, and the
[illegible]ly classified as unidentified. Students of UFO

[illegible]s first came into the news, many people in
[illegible] reported making contact with beings from
[illegible]igators have never treated such stories seri-
[illegible] of them has ever been forthcoming.

[illegible] astronomer named George Adamski claimed to
[illegible] from other planets many times in the 1950s.
[illegible] that he talked with them using sign language and
[illegible] their spacecraft – including a trip around the
[illegible] photographs to support his stories but he was
[illegible] that the photographs were genuine.

[illegible] many photographs of objects said to be flying
[illegible] produced by various people. Some of them
[illegible] to be fakes. The others have not been accepted
[illegible] of UFOs beyond a reasonable doubt.

[illegible] of seeing men from outer space came in April
[illegible] Lonnie Zamora of the Socorro (New Mexico)
[illegible]mora was on patrol outside the city when he
[illegible] saw flames in the sky. He set out to investigate.
[illegible] road and began driving across country along a
[illegible] took him up a steep hill. By the time he reached
[illegible] hill, the flames had vanished. On the other side he
[illegible] shiny about one hundred and fifty to two hundred
[illegible] appeared to be an upturned car. Zamora stopped.
[illegible] figures in white overalls standing close to the shiny

Zamora moved nearer and got out of his car. As he did so, there came a loud roar like the one he had heard before. Blue and orange flames sprouted from under the shiny object. It rose from the ground and sped away into the distance.

Soon afterwards Sergeant Sam Chavez joined Zamora. The two men found charred brush near where the object had been standing and then Chavez noticed four shallow holes in the ground. They were twelve to fourteen inches long and one-two inches deep. Such marks could have been made by the landing pads of a flying machine.

The Deputy Sheriff of Socorro, an FBI* agent and an Army captain from a nearby post arrived on the scene. They inspected it closely. Photographs were taken. Later experts from the US Air Force carried out an investigation. Their aim was to show what the unidentified flying object might be.

They were unable to put forward any likely explanation. Sergeant Zamora's UFO remained unidentified and the mystery remains of the two figures he saw. He described them later as being "normal in shape, but possibly they were small adults or large kids". Were these beings from outer space?

From the time Kenneth Arnold saw the first flying object, there was concern in the United States, and in February 1948 the US Air Force opened Project Sign. The object of this operation was to investigate serious reports of UFOs. In the following year two hundred and forty-three sightings were investigated. At the end of that time, the Air Force announced that they were unable to prove or disprove that UFOs were unknown types of aircraft.

In 1949, two hundred and forty-four UFO sightings were investigated. Explanations were found for seventy-seven per cent of them. As a result, the project was dropped. But UFOs were still being seen over the United States and another project had to be started. This was Project Blue Book. It ran from 1950 to 1969 and investigated around 12,000 UFOs. All but a small percentage of them were explained.

What kind of things cause people to report UFOs? More than 2,000 of the UFO sightings turned out to be planets, bright stars, shooting stars and similar things. 1,500 proved to be high-flying aircraft. About eight hundred were man-made satellites. Five hundred were balloons of various kinds. Other sighting reports were caused by hoaxes, flocks of birds, and even clouds.

In the year that Project Blue Book ended, the "Condon Re-

[illegible] appeared from the University of Colorado – a 1,465 page book entitled *Scientific Study of Flying Objects*. Scientists at the University had been studying UFOs since 1966 under Dr Edward U. Condon. Money for their work amounting to half a million dollars was provided by the United States Air Force and they were able to use information from Project Blue Book. The Report concluded "Nothing has come from the study of UFOs in the past twenty-one years that has added to scientific knowledge."

The Condon Report was soon followed by a book by Dr David Saunders, "UFOs? Yes! Where the Condon Committee Went Wrong." But neither Project Blue Book nor the Condon Report denied that UFOs exist. There remain that small percentage of sightings that are unexplained.

What are these UFOs? Are they sent from outer space? Do they contain beings from other worlds? Some people think so. Adamski Green, president of the Amalgamated Flying Saucer Clubs of America is one of them. He has said: "Inhabitants of other worlds are holding off their visitation to the troubled earth because they feel that they would either be worshipped as gods or treated as conquerors."

Perhaps we will have to wait for an explanation of UFOs until we receive it from someone from another world.

THE IMPROBABLE WORLD OF THE UNEXPLAINED

At the beginning of the eighteenth century ancient maps which had belonged to an officer in the Turkish navy, Admiral Piri Reis, were found in the Topkapi Palace. Two atlases preserved in the Berlin State Library which contain exact reproductions of the Mediterranean and the region around the Dead Sea also came from Piri Reis.

All these maps were handed over to American cartographer Charlton H. Mallerey for examination. Mallerey confirmed the remarkable fact that all the geographical data were present but not always in the right places. He sought the help of Mr Walters, cartographer in the US Navy Hydrographic Bureau. Mallerey and Walters constructed a grid and transferred the maps to a modern chart. They made a sensational discovery. The maps were absolutely accurate – and not only as regards the Mediterranean and the Dead Sea. The coasts of North and South America and even the contours of the Antarctic were also precisely delineated on Piri

Reis' maps. The maps not only reproduced the outlines of the continents but also showed the topography of the interior. Mountain ranges, mountain peaks, islands, rivers, and plateaus were drawn in with extreme accuracy.

In 1957, the Geophysical Year, the maps were handed over to Jesuit Father Lineham, who is both director of the Weston Observatory and a cartographer in the US Navy. After scrupulous tests Father Lineham, too, could but confirm that the maps were fantastically accurate – even about regions which we have scarcely explored today. What is more, the mountain ranges in the Antarctic, which already figure on Reis' maps, were not discovered until 1952. They have been covered in ice for hundreds of years, and our present-day maps have been drawn with the aid of echo sounding apparatus.

The latest studies of Professor Charles H. Hapgood and mathematician Richard W. Strachan give us some more shattering information. Comparison with modern photographs of our globe taken from satellites showed that the originals of Piri Reis' maps must have been aerial photographs taken from a very great height. How can that be explained?

Admittedly the Turkish admiral's maps are not originals. They are copies of copies of copies. Yet even if the maps dated from only the eighteenth century, when they were found, these facts are just as unexplainable. Whoever made them must have been able to fly and also to take photographs!

* * *

Not far from the sea, in the Peruvian spurs of the Andes, lies the ancient city of Nazca. The Palpa Valley contains a strip of level ground some 37 miles long and 1 mile wide that is scattered with bits of stone resembling pieces of rusty iron. The inhabitants call this region pampa, although any vegetation is out of the question there. If you fly over this territory – the plain of Nazca* – you can make out gigantic lines, laid out geometrically, some of which run parallel to each other, while others intersect or are surrounded by large trapezoidal areas.

The archaeologists say that they are Inca roads.*

A preposterous idea! Of what use to the Incas were roads that ran parallel to each other? That intersected? That were laid out in a plain and came to a sudden end?

Naturally typical Nazca pottery and ceramics are found here, but it is surely oversimplifying things to attribute the geometrically arranged lines to the Nazca culture for that reason alone.

No serious excavations were carried out in this area until 1952. ... is no established chronology for all the things that were ... Only now have the lines and geometrical figures been mea- ... The results clearly confirm the hypothesis that the lines ... out according to astronomical plans. Professor Alden ... specialist in Peruvian antiquities, suspects signs of a kind ... in the alignments, and perhaps a calendar as well.

... mous drawings that were undoubtedly meant as signals ... floating in the air are found on mountainsides in many ... Peru. What other purpose could they have served?

... of the most peculiar drawings is carved on the high red ... the cliffs in the Bay of Pisco. If you arrive by sea, you can ... out a figure nearly 820 feet high from a distance of more ... miles. If you play at "It looks like ...," your immediate re- ... is that this sculptor's work looks like a gigantic trident or a ... three-branched candlestick. And a long rope was found ... central column of this stone sign. Did it serve as a pendu- ... in the past?

To be honest, we must admit that we are groping in the dark ... we try to explain it. It cannot be meaningfully included in ... dogmas, which does not mean to say that there may not ... trick by which scholars could conjure this phenomenon ... the great mosaic of accepted archaeological thinking.

But what can have induced the pre-Inca peoples to build the ... lines, the landing strips, at Nazca? What madness could ... driven them to create the 820-foot-high stone signs on the ... cliffs south of Lima?

These tasks would have taken decades without modern ma- ... and appliances. Their whole activity would have been ... less if the end product of their efforts had not been meant as ... to beings approaching them from great heights. The stimu- ... question still has to be answered: Why did they do all this if ... had no idea that flying beings actually existed?

... IMAGINATION AND LEGENDS, OR ANCIENT FACTS?

... Mayas were intelligent; they had a highly developed culture. ... left behind not only a fabulous calendar but also incredible ... ulations. They knew the Venusian year of 584 days and esti-

mated the duration of the terrestrial year at 365.2420 days. (The exact calculation today: 365.2422!) The Mayas left behind their calculations to last for 64,000,000 years. Later inscriptions dealt in units which probably approach 400,000,000 years. The famous Venusian formula could quite plausibly have been calculated by an electronic brain. At any rate, it is difficult to believe that it originated from a jungle people. The Venusian formula of the Mayas runs as follows:

The Tzolkin* has 260 days, the terrestrial year 365 days, and the Venusian year 584 days. These figures conceal the possibility of an astonishing division sum. 365 is divisible by 73 five times, and 584 eight times. So the incredible formula takes this form:

(Moon) $20 \times 13 = 260 \times 2 \times 73 = 37{,}960$
(Sun) $8 \times 13 = 104 \times 5 \times 73 = 37{,}960$
(Venus) $5 \times 13 = 65 \times 8 \times 73 = 37{,}960$

In other words, all the cycles coincide after 37,960 days. Mayan mythology claimed that then the "gods" would come to the great resting place.

The religious legends of the pre-Inca peoples say that the stars were inhabited and that the "gods" came down to them from the constellation of the Pleiades.* Sumerian, Assyrian, Babylonian, and Egyptian cuneiform* inscriptions constantly present the same picture: "gods" came from the stars and went back to them; they traveled through the heavens in fireships or boats, possessed terrifying weapons, and promised immortality to individual men.

It was, of course, perfectly natural for the ancient peoples to seek their gods in the sky and also to give their imagination full rein when describing the magnificence of these incomprehensible apparitions. Yet even if all that is accepted, there are still too many anomalies left.

For example, how did the chronicler of the Mahabharata* know that a weapon capable of punishing a country with a twelve years' drought could exist? And powerful enough to kill the unborn in their mothers' wombs? This ancient Indian epic, the Mahabharata, is more comprehensive than the Bible, and even at a conservative estimate its original core is at least 5,000 years old. It is well worth reading this epic in the light of present-day knowledge.

We shall not be very surprised when we learn in the Ramayana* that Vimanas, *i.e.*, flying machines, navigated at great heights with the aid of quicksilver and a great propulsive wind.

the Vimanas could cover vast distances and could travel forward, upward and downward. Enviably maneuverable space vehicles!

This quotation comes from the translation by N. Dutt, 1891: At Rama's behest the magnificent chariot rose up to a mountain cloud with a tremendous din. ..." We cannot help noticing that not only is a flying object mentioned again but also that the boulder talks of a tremendous din.

Here is another passage from the Mahabharata: "Bhima flew with his Vimana on an enormous ray which was as brilliant as the sun and made a noise like the thunder of a storm" (C. Roy, 1889).

Even imagination needs something to start it off. How can the author give descriptions that presuppose at least some idea of rays and the knowledge that such a vehicle can ride on a ray cause a terrifying thunder?

Certain numerical data in the Mahabharata are so precise that it gets the impression that the author was writing from first-hand knowledge. Full of repulsion, he describes a weapon that could kill all warriors who wore metal on their bodies. If the warriors learned about the effect of this weapon in time, they tore off their metal equipment they were wearing, jumped into a river, washed themselves and everything that they had come into contact with very thoroughly. Not without reason, the author explains, for the weapon made the hair and nails fall out. Everything else bemoaned, became pale and weak.

Another passage from the Mahabharata is bound to make us think:

It was as if the elements had been unleashed. The sun spun around. Scorched by the incandescent heat of the weapon, the world reeled in fever. Elephants were set on fire by the heat and ran to and fro in a frenzy to seek protection from the terrible violence. The water boiled, the animals died, the enemy was mown down and the raging of the blaze made the trees collapse in rows as in a forest fire. The elephants made a fearful trumpeting and sank dead to the ground over a vast area. Horses and war chariots were burnt up and the scene looked like the aftermath of a conflagration. Thousands of chariots were destroyed, then deep silence descended on the sea. The winds began to blow and the earth grew bright. It was a terrible sight to see. The corpses of the fallen were mutilated by the terrible heat so that they no longer looked like human beings. Never before have we seen such a ghastly weapon and never before have we heard of such a weapon (C. Roy, 1889).

The tourist who bumps his way to the pyramid of Cheops* to the west of Cairo on a camel called Wellington or Napoleon, depending on his nationality,* gets the strange sensation in the pit of his stomach that relics of the mysterious past always produce. The guide tells him that a pharaoh had a burial place built here. And with that bit of rehashed erudition he rides homeward, after taking some impressive photographs. The pyramid of Cheops, in particular, has inspired hundreds of crazy and untenable theories. In the 600-page book *Our Inheritance in the Great Pyramid*, by Charles Piazzi Smith, published in 1864, we can read about many hair-raising links between the pyramid and our globe.

Yet even after a highly critical examination, it still contains some facts that should stimulate us to reflection.

It is well known that the ancient Egyptians practised a solar religion. Their sun god, Ra,* traveled through the heavens in a bark. Pyramid texts of the Old Kingdom even describe heavenly journeys by the king, obviously made with the help of the gods and their boats. So the gods and kings of the Egyptians were also involved with flying. ...

Is it really a coincidence that the height of the pyramid of Cheops multiplied by a thousand million – 98,000,000 miles – corresponds approximately to the distance between the earth and sun? Is it a coincidence that a meridian running through the pyramids divides continents and oceans into two exactly equal halves? Is it coincidence that the area of the base of the pyramid divided by twice its height gives the celebrated figure $\pi = 3.14159$? Is it coincidence that calculations of the weight of the earth were found and is it also coincidence that the rocky ground on which the structure stands is carefully and accurately leveled?

There is not a single clue to explain why the builder of the pyramid of Cheops, the Pharaoh Khufu, chose that particular rocky terrain in the desert as the site for his edifice. It is conceivable that there was a natural cleft in the rock which he made use of for the colossal building, while another explanation, though only a feeble one, may be that he wanted to watch the progress of the work from his summer palace. Both reasons are against all common sense.

With what power, with what "machines," with what technical resources was the rocky terrain leveled at all? How did the master

drive the tunnels downward? And how did they illumi-
them? Neither here nor in the rock-cut tombs in the Valley of
were torches or anything similar used. There are no black-
ceilings or walls or even the slightest evidence that traces of
ning have been removed. How and with what were the
blocks cut out of the quarries? With sharp edges and smooth
How were they transported and joined together to the
andth of an inch? Once again there is a wealth of explana-
for anyone to choose from: inclined planes and tracks along
h the stones were pushed, scaffolding and ramps. And natu-
the labor of many hundreds of thousands of Egyptian slaves:
ian, builders, and craftsmen.

Some of these explanations stands up to a critical examination.
Great Pyramid is (and remains?) visible testimony of a tech-
that has never been understood. Today, in the twentieth
ury, no architect could build a copy of the pyramid of Cheops,
all the technical resources of every continent were at his dis-
al

THE EARTH'S EXPERIENCE OF SPACE

not long since scientists claimed that life on Mars is incon-
able. For some time now that has become "is *scarcely* conceiv-
" For after the successful reconnaissance mission by Mariner
we must concede, even if reluctantly, that the possibility of life
Mars is not unlikely. It is also within the bounds of possibility
that our neighbor Mars had its own civilization untold millennia
ago. In any case the Martian moon Phobos deserves special atten-
tion.

Mars has two moons: Phobos and Deimos (in Greek, Fear and Terror). They were known long before the American astronomer Asaph Hall* discovered them in 1877. As early as 1610 Johannes Kepler* suspected that Mars was accompanied by two satellites. Although a Capucine monk may have claimed to have seen the Martian moons a few years earlier, he must have been mistaken, for the tiny Martian moons could not possibly have been seen with the optical instruments of his day. A fascinating description of them is given by Jonathan Swift* in *A Voyage to Laputa and Japan*, which forms Part III of *Gulliver's Travels*. Not only does he describe the two Martian moons, but he also gives their size and orbits. This quotation comes from Chapter 3:

[The Laputan astronomers] spend the greatest part of their lives in observing the celestial bodies, which they do by the assistance of glasses far excelling ours in goodness. For although their largest telescopes do not exceed three feet, they magnify much more than those of a hundred yards among us, and at the same time show the stars with greater clearness. This advantage hath enabled them to extend their discoveries much further than our astronomers in Europe for they have made a catalogue of ten thousand fixed stars, whereas the largest of ours do not contain above one third part of that number. They have likewise discovered two lesser stars, or satellites, which revolve about Mars, whereof the innermost is distant from the centre of the primary planet exactly three of the diameters, and the outermost five; the former revolves in the space of ten hours, and the latter in twenty one and an half; so that the squares of their periodical times are very near in the same proportion with the cubes of their distance from the centre of Mars, which evidently shows them to be governed by the same law of gravitation, that influences the other heavenly bodies.

How could Swift describe the Martian satellites when they were not discovered until 150 years later?* Undoubtedly the Martian satellites were suspected by some astronomers before Swift, but suspicions are not nearly enough for such precise data. We do not know where Swift got his knowledge.

Actually these satellites are the smallest and strangest moons in our solar system. They rotate in almost circular orbits above the equator. If they reflect the same amount of light as our moon, then Phobos must have a diameter of 10 miles and Deimos one of only 5 miles. But if they are artificial moons and so reflect still more light, they would actually be even smaller. They are the only known moons in our solar system that move around their mother planet faster than she herself rotates. In relation to the rotation of Mars, Phobos completes two orbits in one Martian day, whereas Deimos moves only a little faster around Mars than the planet itself rotates.

In 1862, when the earth was in a very favorable position in relation to Mars, people sought in vain for the Martian satellites – they were not discovered until fifteen years later! The theory of planetoids came up because several astronomers suspected that the Martian moons were fragments from space which Mars

had attracted. But the theory of planetoids is untenable, for both the Martian moons revolve in almost the same planes above the equator. *One* fragment from space might do that by chance, but not two. Finally, measurable facts produced the modern satellite theory.

Russian scientist I.S. Shklovskii* and renowned American astronomer Carl Sagan,* in their book *Intelligent Life in the Universe*, published in 1966, accept that the moon Phobos is an artificial satellite. As the result of a series of measurements, Sagan came to the conclusion that Phobos must be hollow and a hollow moon cannot be natural.

In fact, the peculiarities of Phobos' orbit bear no relation to its apparent mass, whereas such orbits are typical in the case of hollow bodies. Shklovskii, director of the Department of Radio-Astronomy in the Moscow Sternberg Astronomical Institute,* made the same statement after he had observed that a peculiar unnatural acceleration could be confirmed in the movement of Phobos. This acceleration is identical with the phenomenon which has been established in the case of our own artificial satellites.

Today people take these fantastic theories of Sagan and Shklovskii very seriously. Further Martian probes are planned, also intended to take the bearings of the Martian moons. In the years ahead, the Russians intend to observe the movements of the Martian moons from several observatories.

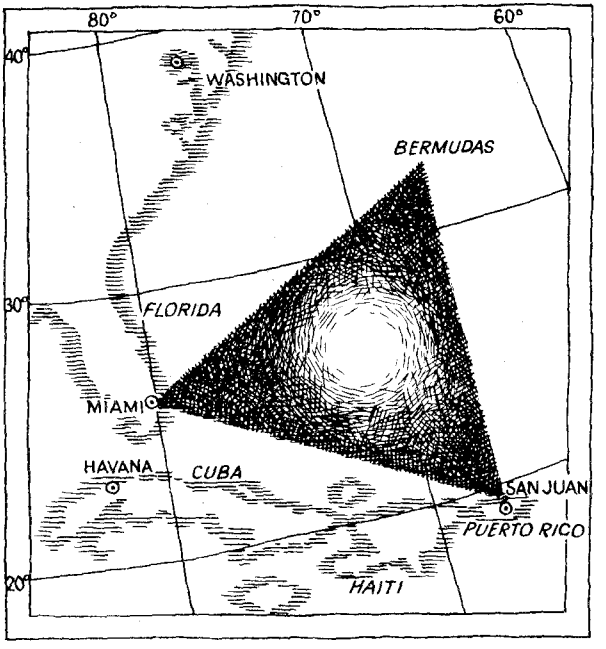
If the view supported by reputable scientists East and West that Mars once had an advanced civilization is correct, the question arises: Why does it no longer exist today? Did the intelligences on Mars have to seek a new environment? Did their home planet, which was losing more and more oxygen, force them to look for new territories to settle? Was a cosmic catastrophe responsible for the downfall of the civilization? Lastly, were some of the inhabitants of Mars able to escape to a neighboring planet?

In his book *Worlds in Collision*, published in 1950 and still much discussed in scientific circles, Immanuel Velikovsky declared that a giant comet had crashed into Mars and that Venus had been formed as a result of this collision. His theory can be proved if Venus has a high surface temperature, clouds containing carbureted hydrogen, and an anomalous rotation. Evaluation of the data provided by Mariner II confirms Velikovsky's theory. Venus is the only planet which rotates "backward," *i.e.* the only

planet that does not follow the rules of our solar system as d Mercury, the Earth, Mars, Jupiter, Saturn, Uranus, and Neptun

But if a cosmically caused catastrophe is a possible reason f the destruction of a civilization on the planet Mars, that would als provide material for my theory that the earth may have receive visits from space in the very remote past.

THE BERMUDA TRIANGLE: A MYSTERY OF THE AIR AND SEA



There is a section of the Western Atlantic, off the southeast coast of the United States, forming what has been termed a triangle, extending from Bermuda in the north to southern Florida, and then east to a point through the Bahamas past Puerto Rico to about 40° west longitude and then back again to Bermuda. This area occupies a disturbing and almost unbelievable place in the world's catalogue of unexplained mysteries. This is usually referred to as the Bermuda Triangle, where more than 100 planes and ships have literally vanished into thin air, most of them since 1945, and where more than 1,000 lives have been lost in the past

y six years, without a single body or even a piece of wreck-
om the vanishing planes or ships having been found. Disap-
ces continue to occur with apparently increasing frequency,
e of the fact that the seaways and airways are today more
ed, searches are more thorough, and records are more
fully kept.

nexplained disappearances in the Bermuda Triangle have
nued to the present day and no plane or ship is reported as
ue and finally classed as "search discontinued" by the Sev-
oast Guard without the expressed or unexpressed comment
ing among the public or the searchers that there is some
tion with the past and present phenomenon of the
uda Triangle. There seems to be a growing public awareness
mething is very wrong with this area. Recent numerous re-
from planes and boats which have had incredible experi-
within the Triangle and *survived* are contributing toward a
folklore of the sea, although the cause of the unexplained
e to planes and ships within this area is as mysterious as

The most varied and imaginative explanations have been of-
and seriously considered to account for the continuing dis-
ances and assumed (because no bodies have been recov-
fatalities. These explanations include sudden tidal waves
by earthquakes, fireballs which explode the planes, attacks
monsters, a time-space warp leading to another dimension,
magnetic or gravitational vortices which cause planes to
and ships to lose themselves at sea, capture and kidnapping
ng or submarine UFOs manned by entities from surviving
es of antiquity, outer space, or the *future*, looking for speci-
of currently existing earth inhabitants.

In any case the explanation or solution to the mystery seems
nected with the sea, itself the last and greatest mystery still
onfronting the inhabitants of the earth. For, although we stand on
e threshold of space, somewhat wistfully contemplating the
ons while believing that the world, now so thoroughly ex-
ored, has no more mystery for us, it is nevertheless true that
bout three fifths of the world's area, the abyssal depths of the sea,
e about as clearly or even less known to us as the craters of the
oon. We have, of course, long mapped the general contours of
e sea bottom, first through mechanical soundings and more re-
ntly by sonar and exploration by submarine and bathysphere,

plus deep-sea camera probes have charted its surface and under sea currents and are presently prospecting for evidence of oil in the continental shelves and soon perhaps at even greater depths.

Nevertheless, the deepest parts of the ocean may still reserve considerable surprises for us. The abyssal plain and the adjoining canyons and depths may contain unexpected fauna. The "extinct" coelacanth,* a supposedly prehistoric fish with residual limbs, was discovered to be very much alive and well in the Indian Ocean in 1938. This four-legged bluefish flourished about 60,000,000 years ago. Its last fossilized specimen, before the live one was found, had been dated at 18,000,000 years B.C.

Other mysteries include the great trenches in the oceans, curiously all having approximately the same depth – a staggering seven miles – and the living creatures that exist on the bottom under such tremendous pressure. Then there are the ocean currents, great rivers in the sea, some of them surface currents varying in depth while others flow hundreds of feet below the surface, often in other directions to the surface currents. There is the Cromwell Current in the Pacific Ocean, which some years ago rose to the surface and then subsequently reverted to its subsurface level. Almost all currents turn; those in the Northern Hemisphere clockwise, and those in the Southern Hemisphere counterclockwise. But why is the Benguela Current* an exception as it flows without turning?

The winds and the waves are further mysteries: the most sudden and violent storms occur in only two places, the hurricanes of the Caribbean and the west Atlantic area and the typhoons in the South China Sea. Sometimes, however, extremely strong waves, called seiche waves,* appear on an otherwise calm sea. It is believed that these waves come from underwater landslides or earthquakes not noted on the surface or foretold by weather reports.

The mineral wealth of the ocean is presently incalculable, and extraction and exploitation of these mineral deposits, in addition to oil, may considerably affect the financial scene of the future. The protective sea also covers treasures and vestiges of past civilizations. Many of these are evident in the shallow coastal waters of the Mediterranean and the Atlantic continental shelf, but others may lie, for example, more than a mile deep off the coast of Peru, where carved columns have been photographed lying among what may be submerged buildings indicating a tremendous downward

part of land into the ocean within the era of civilized man. Stories of sunken civilizations persist in many parts of the world's oceans, from lost Atlantis* in the mid-Atlantic, the Bahamas, or the Eastern Mediterranean; the mysteries of Easter Island* and other lost civilizations of the South Pacific; to the possibility of a civilization now buried under Antarctic ice, once having existed in the Antarctic before the poles shifted.

Parts of the ocean floor seem to be constantly shifting; in May one part of the Bonin Trench near Japan rose 6,000 feet. The majority of the hundred thousand earthquakes which take place each year occur along the Mid-Atlantic Ridge, commonly supposed since ancient times to be the location of legendary Atlantis. Then there is the mystery of the "false bottom," frequently recorded by deep-sea soundings, which frequently report a depth much shallower than that previously recorded and then later give the first reading again. It has been assumed that this false bottom is the result of the temporary presence of banks of fish or other fauna so thick that they present a solid surface from which the sonar bounces off with resultant equivocal information. An equally baffling mystery is the curious glowing streaks of "white water" in the Gulf Stream. This is variously thought to be caused by banks of small luminescent fish, marl stirred up by fish, or radioactivity in the water. Whatever it is, it was noteworthy enough to have been commented on by Columbus five centuries ago, and it was also the last light from earth that the astronauts could see on their way to space. Finally we have the theory of drifting continents, drifting away from each other through the sea from their original position of being clustered together as a supercontinent. This theory is only now being generally accepted and may have considerable bearing on the rotation, composition, and behavior of the earth itself.

There is a difference, however, between these multiple mysteries which may eventually be solved (and which meanwhile are intriguing to contemplate) and the one posed by the Bermuda Triangle, which introduces an element of danger to the traveler. It is true, of course, that numerous planes fly over the Triangle every day, that large and small ships sail its waters, and that countless travelers visit the area every year without incident. Besides, ships and planes have been lost at sea and continue to be lost in all the world's seas and oceans for a variety of reasons (and we must remember to differentiate between "lost at sea," which suggests the

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travelers visit the area every year without incident. Besides, ships
and planes have been lost at sea and continue to be lost in all the
world's seas and oceans for a variety of reasons (and we must re-
member to differentiate between "lost at sea," which suggests the

finding of wreckage or some identifiable flotsam, and "disappeared," which implies none at all), but in no other area have the unexplained disappearances been so numerous, so well recorded, so sudden, and attended by such unusual circumstances, some of which push the element of coincidence to the borders of impossibility.

There are many marine or aeronautical authorities who would observe that it is perfectly natural for planes, ships, or yachts to disappear in an area where there is so much sea and air travel, subject to sudden storms and the multiple possibilities of navigational mistakes and accidents. These same authorities are likely to make the comment that the Bermuda Triangle does not exist at all, and that the very term is a misnomer, a manufactured mystery for the diversion of the curious and imaginative reader. Those who claim that the Triangle does not exist are in one sense correct, for the Bermuda Triangle of unexplained disappearances may not be a true triangle but actually more of an ellipse, or perhaps a gigantic segment of a circle with the apex near Bermuda and the curved bottom extending from lower Florida past Puerto Rico, curving south and east through the Sargasso Sea,* then back again to Bermuda.

THE SEA OF LOST SHIPS

Ship disappearances within the Triangle have principally occurred within the region of the western Atlantic Ocean called the Sargasso Sea, a so-called largely immobile sea named after the seaweed *Sargassum.* If anything were needed to intensify the mystery of the Triangle, such an element is provided by the Sargasso Sea, itself a mystery ever since the first Spanish and Portuguese seamen encountered it five hundred years ago. And, if we include what now seem to have been probable penetrations and crossings of it by Phoenician* and Carthaginian* oceangoing sailors, it has been an observed mystery for thousands of years.

This seaweed sea is bounded on the north by the Gulf Stream as it moves first northeast and then east and on the west and south by the returning Gulf Stream and the North Equatorial Current. Although somewhat amorphous, it extends from about 37° north latitude to about 27° south latitude and from 75° west to 40° west. Under the deep waters of the Sargasso Sea lie the Hatteras and

Nares Abyssal plains, the precipitous Bermuda Rise, numerous mysterious seamounts (underwater mountains rising toward the surface but terminating in flat tops as if they had once been islands), and at its eastern limits, part of the North Atlantic Ridge, a tremendous north-south underwater mountain chain in the middle of the Atlantic Ocean whose highest crests break through the surface of the sea to form the Azores Islands. In other words, a stagnant sea almost devoid of currents except on its borders, extends from about 200 miles north of the Greater Antilles up the Florida and Atlantic coasts at a general distance of about 200 miles from land to the vicinity of Cape Hatteras and then out in the Atlantic in the direction of the Iberian Peninsula and Africa up to the North Atlantic Ridge and back again to the Americas.

The Sargasso Sea is characterized not only by its omnipresent seaweed but by its deadly calms, a fact that may have started the picturesque but unnerving legend of "Sea of Lost Ships," the "Graveyard of Lost Ships," and the "Sea of Fear." This sailors' legend told of a great Atlantic surface graveyard containing ships from all the ages of seafaring man, caught and immobilized in fields of seaweed, slowly decaying but still manned by skeleton crews, or rather crews of skeletons, comprised of the unfortunates who could not escape and shared the doom of their ships. In this area of death were to be found tramp steamers, yachts, whalers, clippers, packets, brigantines, pirate vessels, and, to make the story better, Spanish treasure galleons. In enthusiastic retelling of the stories, the tellers included other ships that should certainly have rotted away and disappeared by the time of the telling, such as the dragon ships of the Vikings with skeletons still at their oars, Arab sailing galleys, Roman triremes with their great banks of oars, Phoenician trading ships with silver anchors, and even the great ships of lost Atlantis, their bows covered with fitted gold plate – all doomed to rot for centuries in a motionless sea.

The first legends about the Sargasso Sea may stem from the Phoenicians and Carthaginians who possibly crossed it thousands of years ago and made landfalls in the Americas, as indicated by the many Phoenician stone inscriptions in Brazil, and some in the United States, caches of Phoenician coins found first in the Azores, Carthaginian coins later found in Venezuela and the southeast coast of the United States as well as ancient pictorial representations of what appear to be Semitic visitors in Mexico. The following report from the Carthaginian admiral Himilco,

made in 500 B.C., strikes a familiar if somewhat sensational chord in reference to the seaweed fields and lack of winds in the Sargasso Sea:

> ... No breeze drives the ship, so dead is the sluggish wind of this idle sea. ... there is much seaweed among the waves, it holds the ship back like bushes. ... the sea has no great depth, the surface of the earth is barely covered by a little water. ... the monsters of the sea move continuously to and fro and fierce monsters swim among the sluggish and slowly creeping ships. ...

Admiral Himilco may be pardoned a certain understandable exaggeration across the vault of time, and besides the Phoenico Carthaginian ocean travelers were most anxious to discourage other travelers of the time from sailing past the Pillars of Hercules* (Gibraltar) at the entrance to the Mediterranean into the ocean sea beyond. This was primarily to keep to themselves the profitable trade they had with cultures of the Atlantic coasts of Europe and Africa and perhaps even farther afield. The Carthaginians even had a mandatory death sentence for their sea captains who betrayed their routes or even their presence on the Atlantic, a factor which explains the Carthaginian penchant for sinking *all* strange ships near or past Gibraltar or, when not strong enough to do so, to escape notice, scuttling their own craft if necessary.

Tales of empty ships found in the Sargasso Sea or neighboring parts of the Atlantic almost invariably mention the *Mary Celeste*, perhaps the sea's most famous derelict. The incident did not occur in the Sargasso Sea, although the *Mary Celeste* passed north of it on her way to the spot north of the Azores where she was found by a British brig, the *Dei Gratia*, in November 1872. The latter vessel, noting the erratic course of the *Mary Celeste*, hailed her and, obtaining no reply, boarded her and subsequently took the *Mary Celeste* as a prize. The boarding party found her sails were set and her cargo of casks of alcohol was safely stowed in the hold. There were sufficient supplies of food and water but her complement of ten persons had disappeared, including the captain, his wife, and baby daughter. Money, pipes, personal possessions, and even the ship's log were left aboard, although the sextant was missing. The main cabin had been boarded up as if someone had wished to create a stronghold to repel attackers.

This mystery of the sea has been retold and embroidered,

been the subject of court trials and investigations, but still has not been solved. The disappearance of the crew has been variously explained as attack of pirates, mutiny and flight after killing the captain, fear of a cargo about to explode, or sudden knowledge of a contraband and dangerous cargo, an outbreak of plague, or hijacking by supposed friends. Lloyds of London, who paid the insurance, inclines to the theory that a sudden but short fire of the alcohol cargo may have frightened the crew off the ship and then gone out, given the properties of alcohol for sudden flare-up, burning with a blue flame, and then extinguishing itself. By the time the short flare-up subsided, the crew may have been unable to return to the ship from the lifeboat. Another possible explanation of irrational behavior on the part of the crew might consist in the presence of ergot in the bread among the ship's stores. Bread tainted with the growth of ergot has affected crews in the past, causing violent madness and death preceded by irrational behavior. A collective insanity brought on by this condition might have induced abandonment of the ship in panic and may explain some other crew disappearances on "ghost ships" in various seas of the world.

Harold Wilkins in *Strange Mysteries of Time and Space* makes a good case for the possibility of the ship's having been boarded and taken at sea by persons already known to the ship's complement, with the implication that the crew was disposed of and the empty ship then "rediscovered" at sea and taken as a prize.

In developing this theory, Wilkins points out the many inconsistencies in the stories of the captain and the crew of the *Dei Gratia*, and the fact that the *Dei Gratia* was moored alongside the *Mary Celeste* for over a week in New York harbor, and sailed shortly after the ill-fated vessel's departure.

After prize proceedings, the refurbished *Mary Celeste* went to sea again but soon acquired the reputation of being a "jinx ship," cursing misfortune, destruction, and death among those who sailed on her, until her final master, Captain Gilman Parker, after supplying overgenerous liquor rations to all hands and above all to himself, deliberately, it is said, sailed the *Mary Celeste* onto a rocky reef near Haiti and so ended her unlucky career.

* * *

Still another of the several mysteries connected with the Sargasso Sea, and one that has intrigued ancient as well as modern

observers, concern the spawning of eels. Aristotle (384-322 B.C.) was the first naturalist of antiquity reported to have brought up the puzzling question of the breeding grounds of the European eels, which were, of course, the only eels he knew about. The eels were known to leave their ponds, lakes, streams, and small rivers and swim down the large rivers that empty into the sea. This was all that was known about the breeding grounds of the eels until about 2,500 years later when a Danish scientist, Dr Johannes Schmidt, discovered where the eels had been going on their journeys during all the intervening centuries since the question was first raised.

The adult European eels follow the waterways that empty into the Atlantic; there they unite and swim in a great shoal, progressing slowly for about four months, accompanied by flights of feeding gulls and packs of sharks, until they reach the point in the Sargasso Sea where they stop and spawn at a considerable depth. There the adults die and the newly born eels start their long trip back, borne by the Gulf Stream on a return trip to Europe which takes about two years to accomplish.

The behavior of eels from the American continent follows the same pattern in reverse. These eels swim eastward and meet the European eels in the depths of the Sargasso Sea, and the young eels return to their ancestral homes in the Americas. This remarkable behavior of eels and their inherited nostophylia (memory of an ancestral home or breeding place) has given rise to some extremely interesting theories, including the one that their original breeding ground was in a great river of a former continent which once existed in the Atlantic, in the vicinity of the Sargasso Sea, and that the eels still seek out their original spawning grounds at the site of the vanished river which once flowed through a continent now thousands of feet under the sea. It has even been suggested that the weeds of the Sargasso Sea are adapted underwater growing remnants of the vegetation of the former Atlantic continent which sank, according to historic legend, with great rapidity, taking with it all its luxuriant forests and greenery.

IS THERE A LOGICAL EXPLANATION?

Although whirlpools appear in various parts of the world's oceans at various times, and notably within the Bahamas area of the Bermuda Triangle, none of the known phenomena, except per-

major seismic or atmospheric disturbances, could be compared with the oceanic whirlpool off Norway, described by Edgar Allan Poe* in his "A Descent into the Maelström". Speaking of this ship-destroying whirlpool from a point on its vast inclined and revolving wall, the narrator says:

Never shall I forget the sensations of awe, horror, and admiration with which I gazed about me. The boat appeared to be hanging, as if by magic, midway down, upon the interior surface of a tunnel vast in circumference, prodigious in depth, and whose perfectly smooth sides might have been mistaken for ebony, but for the bewildering rapidity with which they spun around ... As I felt the sickening sweep of the descent, I had instinctively tightened my hold ... and closed my eyes. ... Now looking about me upon the wide waste ... on which we were thus borne, I perceived that our boat was not the only subject in the embrace of the whirl. Both above and below us were visible fragments of vessels, large masses of building timber and trunks of trees, with many smaller articles, such as pieces of household furniture, broken boxes, barrels and staves. ... I now began to watch, with a strange interest, the numerous things that floated in our company ...

"This fir tree," I found myself at one time saying, "will certainly be the next thing that takes the awful plunge and disappears," – and then I was disappointed to find that the wreck of a Dutch merchant ship overtook it and went down before. ...

Such writings may have influenced some of the theories concerning ships disappearing in the Triangle as well as the shape of "the gulfs [that] wash us down" at sea. A more likely doom for small and even large boats in the area would be sudden tidal waves, or even waterspouts, the seagoing tornadoes which occur in certain seasons and which raise a vast funnel of water to a great height in the sky. A waterspout or several of them might well tear off a small boat or a low-flying plane, in the same way that tornadoes on land tear apart or carry houses, fences, vehicles, and people into the sky. Moreover, while waterspouts can be seen during the day, when there is time to take evasive action, they are considerably more difficult to avoid at night, especially by a plane flying in low-visibility weather. But by far the greatest suspects, with regard to sudden sinking of ships, are unexpected tidal waves, usually resulting from underwater earthquakes. The creation of

large waves depends on various factors: underwater earthquakes and landslides, atmospheric pressure, winds, storms, and hurricanes, not necessarily in the immediate area, or eruptions of undersea volcanoes. Huge waves can appear from a variety of causes in a calm sea, while waves in a rough sea have been estimated by competent observers to reach a height of at least 112 feet (U.S.S. *Ramapo*, February 6, 1963).

The huge waves caused by seismic disturbances (tsunamis) have been known to reach skyscraper heights of two hundred feet. These tsunamis can happen without warning and can easily sink a ship if the ship is anchored or capsize it if it is under way.

Not only do ships capsize when struck by these waves but sometimes even a large ship will break in half from the effects of tension, depending on how it is facing the waves and how far the troughs are apart between the waves. While smaller ships may ride over the crests of the waves and down into the troughs without difficulty, this fate overtook a destroyer, which was broken in two by great waves over which it extended a trough and a half, although it probably would have survived if its length had measured one *or* two of the temporary troughs.

There also exist other very destructive and unusual seiche waves, usually the product of underwater landslides caused by the pulling apart of a fault in the earth's crust. The seiche waves, smaller in height, are not as sensational-looking as the tsunamis, but they are immensely powerful, with great tides of water built up behind them. They are harder to recognize as they approach and they are therefore even more dangerous to ships. Such a wave, suddenly arriving without previous warning, could smash a ship and spread its wreckage over long distances, losing pieces of it as it traveled.

If ships can literally be swallowed by a sudden tremendous sea, is it equally possible for planes to disappear in the air? Planes have been seen by reliable observers to fly into a cloud but never fly out again – as if something had disintegrated them or snatched them out of the air during flight.

Stresses exist in the atmosphere that can be roughly compared with tidal waves, especially if a plane heads into them at a high rate of speed. Also, as there are often winds of different altitude levels, an ascending or descending plane can frequently encounter strong winds coming from a different direction than that indicated by the wind sock at the airport. If the intervening wind is strong

enough, this can often have unfortunate results for the plane concerned. This "wind shear" factor is an important element in air crashes and, in its intensified form of CAT (clear air turbulence)* it can be compared to the seiche waves that unexpectedly occur in an otherwise calm sea. The turbulence may be going either up or down or in a different horizontal direction and, when the change is rapid enough, either through the force of CAT or the speed of the plane, the effect is almost like flying into a stone wall.

Generally speaking, CAT cannot be predicted, although it is usually encountered at the edge of the jet stream, the air current that moves through the skies above the earth much as the Gulf Stream moves through the ocean, but with considerably more speed – two hundred knots per hour as compared with the Gulf Stream's four knots or less. CAT could possibly explain the loss of some of the light planes in the Bermuda Triangle, tearing them apart according to the amount of pressure exerted (the G factor*) or suddenly forming a vacuum and dropping the plane into the sea. CAT itself is a mystery, as it appears suddenly, if one can use the word "appear" for an invisible phenomenon, and it is unpredictable. Nevertheless, it is doubtful that sudden pressure change could have been the reason for all of the many planes lost in the Triangle and could have knocked out their radio communications as well.

Lacking a logical and readily acceptable explanation, independent researchers concerned with the disappearances in the Bermuda Triangle have gone even farther afield – some to explanations based on exceptions to natural law, others to suggestions of interdimensional changeover through a passageway equivalent to a "hole in the sky" (which aircraft can enter but not leave), others believe the disappearances are engineered by entities from inner or outer space, while still others offer a theory or combinations of theories that the phenomenon may be essentially caused by still functioning man-made power complexes belonging to a science considerably older than and very different from ours.

A SUGGESTION FROM THE OCEAN'S PAST

It is generally considered as proved that large sections of the earth's surface were once under water while other areas now under water were once land. This was noted by the naturalists of ancient times, when they found fossilized life in the desert, as well as

by modern naturalists who have found skeletons of whales in [illegible] inland areas as Minnesota and even in the Himalayan mount[illegible] while ample evidence exists that the Sahara was once an in[illegible] sea. While there is general agreement on large-scale interchan[illegible] of land and sea throughout the world, the question of timin[illegible] especially important for the consideration of the land and sea le[illegible] changes within the Bermuda Triangle within comparatively r[illegible] geological times.

Almost all the world's races and tribes preserve vivid accoun[illegible] of previous universal destruction by fire, flood, earthquake, explo[illegible] sion, or the shaking and shifting of the entire earth. In most case[illegible] only a single survivor, along with his family and selected animals, has traditionally been spared to start a new life, as did Noah,* in a new world, once the disturbances had ceased or the waters had abated. But Noah was just one survivor – the one familiar to the inheritors of Judaeo-Christian religious tradition. There were numerous survivors of the same or similar catastrophes, including Deucalion,* of Greek myth, who repopulated the earth by scattering stones; Baisbasbata, the flood survivor told of in the *Mahabharata* of India; Ut-napishtim,* of Babylonian legend, whose story closely resembles that of Noah; Yima, of Iran; Coxcox, of ancient Mexico, who escaped the flood in a giant cypress raft; Tezpi, of another, more developed Mexican race, who had a spacious vessel at his disposal, on which he loaded grain and animals; Bochica, of Colombian Chibcha legend, who finally got rid of the floodwaters by opening a hole in the earth (as did the Greek Deucalion); Tamandere, the guarani "Noah" of southeastern South America, who floated on a huge tree to the top of a mountain, where he survived; and many others throughout the world. In each case the animals which were saved reflect the local fauna with the general references to the animals taken on the Ark by Noah, exotically supplemented in the American legend by specific mention of such animals as llamas, jaguars, tapirs, buffalo, coyotes, and vultures saved by his ancient American counterparts.

With so specific a world legend – even the time period of the flood varies only slightly, mostly from forty to sixty days – it seems plausible to assume that a worldwide catastrophe did occur, leaving as it did so deep a trauma in the racial memory, and that it was connected with the sea, consequent changes in terrain, climate, and water levels throughout the earth.

Vestiges of this catastrophe or catastrophes are found not only

memory of man but are witnessed by evidences of vast risings, and bucklings of the land and the sea bottoms, such sandy beaches under thousands of feet of water around the and coastline beaches thrust hundreds of feet upward many coasts, especially in Greenland, Northern California, (where human artifacts are found near the bottom of anological striations resulting from this upthrust). The Andes ves, geologically fairly recent, seem to have been thrust or upward, perhaps carrying with them such cities as Tiahuawhile other coastal lands of South America dropped into ca Deep in the ocean. The same catastrophe may have the melting of the glaciers, which thereupon flooded the of the Atlantic islands and large parts of the continental , which were formerly above water. At the same time, clihanges occurred throughout the world, evidently with rapidity. In Siberia, frozen bodies of mammoths are still found, frozen so quickly that the meat proved to be edible, dogs, and later experimentally by Russian scientists. These mammoths, rhinoceroses, and other animals not generally associ with Siberia, were apparently entrapped in floods of freezing (or mud that subsequently froze) and preserved so quickly undigested foods (of plants no longer native to Siberia) have found in their stomachs.

There is an abundant proof that these areas have been above surface of the ocean within the last ten or twelve thousand s. A Russian expedition north of the Azores recently dredged ks from 6,600 feet which gave evidence of their having been med at atmospheric pressure about 17,000 years ago, while a eteenth-century dredging operation, while repairing a break in transatlantic cable in the vicinity of the Azores brought up es of tachylyte,* a vitreous lava which forms *above* water at ospheric pressure. The samples were estimated to be about 0,000 years old. (While this incident has often been commented on, the reason for the breaking of the cable is of special interest as an example of movements in the ocean floor – a sudden rise in the bottom of about 4,000 feet was what had caused the cable to break.)

Other fairly recent discoveries seem to support the time element of 12,000 years for the most recent submergence of large land areas in the Atlantic, which would also coincide with the estimated time for the Third Glaciation.* In 1956 Drs R. Malaise and

P. Kolbe of the National Museum of Stockholm offered the opinion that skeletons of fresh-water diatoms,* which Dr Kolbe had brought up in a sample core from a depth of 12,000 feet near the Atlantic Ridge, had originally been deposited in a fresh-water lake, formerly on the surface of land now sunk to the bottom of the ocean. The age of these fresh-water diatoms was estimated at 10,000 to 12,000 years.

This figure is oddly coincidental with Plato's* account of Atlantis in his *Timaeus* dialogue, in which he refers to a great continent having existed in the outer ocean "9,000 years ago" – or about 11,400 years before the present time.

While dates recorded from legends are suspect and even more so when they are second- or third-hand, since Plato received his information indirectly from Solon,* who, on his part, originally acquired it while on a trip to Sais* in Egypt, it is nevertheless remarkable that this time calculation comes up so frequently in other fields connected with these sunken lands.

Mastodon* and human bones have been found on the bottom of the North Sea, along with prehistoric tools, indicating a certain degree of advancement and the probability of cultural development in the Pleistocene* era prior to 11,000 B.C. But perhaps the most striking of all indications of the drowning of cultural remains of prehistoric peoples since the melting of the last glaciers are the underwater buildings, walls, causeways, and roads now being found with increasing frequency under the waters of the western coasts of Europe and South Africa and the southeastern coasts of North America. The latter include underwater buildings, walls, and stone roads leading east from the coasts of Yucatán and Honduras, roads which may connect with submerged cities still farther out at sea. There is even a thirty-foot-high one-hundred-mile-long example of sea "wall" leading out into the ocean of Venezuela near the mouth of the Orinoco. This was thought at first to be a natural feature, but its straight lines and composition tend to belie this first appraisal.

It is on the underwater Bahama Plateau, however, the area of the most concentrated incidents occurring within the Bermuda Triangle, that the most surprising discoveries of underwater remains have been made, and many of these at a depth of only a few fathoms. The submerged limestone formations of the Bahama Banks were largely above water about 12,000 years ago. This large land area contained bays and inland waterways which are now

land on depth maps as the deep parts of the ocean cutting in around the Bahama Banks. This considerable land area existed, at a time previous to the rising of the sea, a large island or islands which, if we are to believe the underwater remains, supported a complex culture.

From 1968 to the present time, underwater discoveries have been made, especially near Bimini, of what seems to have been massive stonework on the present sea bottom, huge blocks of stone placed together in what may be roads, platforms, harbor docks, or fallen walls. They strangely resemble the pre-Inca stonework of Peru, the pillars of Stonehenge,* or the Cyclopean walls of Minoan Greece.* The age of the stones is uncertain, although fossilized mangrove roots *which have grown over the stones* have given carbon 14 datings of about 12,000 years.

The most celebrated of the finds has been the Bimini "Road" or Wall," first discovered in 1968 by Dr J. Manson Valentine with divers Jacques Mayol, Harold Climo, and Robert Angove. First seen from a boat on the surface of the water, when the sea was especially clear and without surface movement, it was, in the words of Dr Valentine, "An extensive pavement of rectangular and polygonal flat stones of varying size and thickness, obviously shaped and accurately aligned to form a convincingly artifactual* arrangement. These stones had evidently lain submerged over a long span of time, for the edges of the biggest ones had become rounded off, giving the blocks the domed appearance of giant loaves of bread or pillows. Some were absolutely rectangular, sometimes approaching perfect squares. (One remembers that absolutely straight lines are never present in natural formations.) The larger pieces, at least ten to fifteen feet in length, often ran the width of parallel-sided avenues, while the small ones formed mosaic-like pavements covering broader sections ... The avenues of apparently fitted stones are straight-sided and parallel; the long one is a clear-cut double series interrupted by two expansions containing very large, flat stones propped up at the corners by vertical members (like the ancient dolmens* of western Europe); and the southeast end of this great roadway terminates in a beautifully curved corner; the three short causeways of accurately aligned large stones are of uniform width and end in *corner* stones. ..."

Some of the already discovered sites also seem to be rising or being cleared of sediment by tidal action so that their artificial or

man-made construction is more discernible. Dr James Thom distinguished oceanographer and diver, and decidedly neutral not skeptical, on the subject of "lost civilizations under the se recently examined thick columns holding up some of the stones the Bimini "wall," a fairly convincing refutation of opinions held numerous other oceanographers that the whole complex at Bimi and other places in the Bahamas are natural formations. Anoth group of divers, who had found a sunken anchor from a Spani galleon, discovered, as they examined it and scratched at the bo tom around it, that it was lying on top of a mosaic floor or terra which may have sunk thousands of years previously.

Every time traces of a sunken civilization are found in the At lantic (or elsewhere), a series of press and magazine articles a well as books customarily identify it with the "lost" continent of Atlantis. Atlantis, whose image has bemused mankind since an tiquity, was described in considerable detail by Plato in hi *Timaeus* and *Critias* dialogues as the land of the Golden Age of man, a great and wonderful world empire in the Atlantic which with "... violent earthquakes and floods ... in a single day and night of rain ... sunk beneath the sea ... and that is the reason why the sea in those parts is impassable and impenetrable ..."

Atlantis has, naturally enough, been identified with the Ba hama underwater ruins, although Plato, as antiquity's most fa mous commentator on Atlantis, seems to have located it in front of the Columns of Heracles (Hercules), now known as the Straits of Gibraltar, somewhere out in the Atlantic Ocean. A close read ing of Plato's account, however, will disclose a most interesting piece of information suggesting that the Atlantean Empire was no one island but a series of large islands in the Atlantic whose rule had spread to both sides of the ocean. Plato wrote:

> ... In those days [approximately 11,500 years ago] the At lantic was navigable and there was an island situated in front of the straits which you call the Columns of Heracles: the island was larger than Libya and Asia put together, and was the way to other islands and from the islands you might pass through the whole of the opposite continent which surrounds the true ocean; for this sea which is within the straits of Heracles [the Mediter ranean] is only a harbor, having a narrow entrance, but that other is the real sea and the surrounding land may be most truly called a continent.

It will be noted that Plato mentioned Libya (meaning Africa) Asia but specifically and separately designates the *conti-* that is, the continent in the west which he previously men- as being an area of Atlantean rule.

A look at the present depth table of the western Atlantic pre- a clear indication that, if the sea level were lowered 600 to feet, great islands would exist in the Atlantic where there are small ones. And it is of peculiar interest to recollect that this of the waters took place between 11,000 and 12,000 years coinciding with the account Plato reputedly received through from Egyptian priests at Sais whose written records ante- those of the Greeks by thousands of years.

Atlantis, through the course of the years, has been "located" in number of different parts of the world; under the Atlantic an, the Aegean, Caspian, and North seas, Western Africa, on, Tunisia, Germany, Sweden, the Sahara, Arabia, Mexico, catán, Venezuela, the Azores, Canary and Madeira islands, Brazil, Ireland, Ceylon, and even under the Indian Ocean, often depending on the nationality and, one may say, the *Weltanschauung** of the writer or investigator.

THE SURPRISES OF PREHISTORY

If an advanced civilization did exist before those we can know of, it seems reasonable to expect that some indication would survive, furnishing a clear proof (if anything is ever completely clear in archaeological research) that such a technically developed culture existed not just several but many thousands of years ago. However, just as would be the case with our own civilization were it to be destroyed, most of the buildings, machines, and artifacts would decay, rust, scatter, and become unrecognizable before several thousand years had gone by. Some indications might conceivably survive if they were buried within the shifting earth, under the permafrost of the North or the Antarctic ice, or hidden on the bottom of the sea.

The development of the carbon 14, potassium argon, uranium thorium, thermoluminescence, dendrochronoloy (tree-ring dating), and other dating processes has shaken some of our long held theories about the first dates of civilization. An iron mine in Ngwenya, Lesotho, was worked by unknown miners 43,000 years ago. Stone tools found in Iran have been given a date of 100,000

years. Large-scale copper-mining operations in northern Michigan apparently predated the Indians by thousands of years. In Wattis, Utah, a new tunnel dig into a coal mine broke into an unsuspected series of existing tunnels of unknown age. The coal found in these tunnels was so weathered that it was useless for burning. There were no Indian legends concerning such mines, nor did Indians use tunnel techniques for mining.

As man has explored deeper within the earth, certain tooled artifacts have been discovered contained within coal, stone, or other strata, implying an age so great that it can be only roughly calculated. A shoe print in Fisher Canyon, Nevada, embedded within a coal seam, has been estimated as being 15,000,000 years old; a print of a ribbed sole of a shoe or sandal found in sandstone rock under the Gobi Desert is thought to have been made several million years ago. Still another fossilized footprint of a sandal, uncovered in the vicinity of Delta, Utah, contained trilobites* embedded in it, meaning that they came after the sandal print or were attached to it. Trilobites were Paleozoic* marine animals that have been extinct, it is believed, for at least 200,000,000 years. A fossilized human skeleton excavated from a mine in Italy in 1959 was surrounded by strata whose age was calculated in millions of years.

A piece of quartz found in California revealed that there was an iron nail inside it, completely encompassed, like the prehistoric insects preserved in amber in the North Sea. A piece of feldspar from the Abbey Mine in Treasure City, Nevada, in 1865, was found to contain a two-inch metal screw, which had oxidized but left its form and the shape of its threads *within* the feldspar; the stone itself was calculated as being millions of years old. In the last century at the village of Schöndorf, Austria, a small iron cubelike object, less than a centimeter in length and breadth, was discovered inside a block of coal which had been split open. An incised line forms a groove around the cube, which has rounded edges, as if machine-tooled. There is, of course, no explanation as to what it was or how it got inside the block of coal millions of years ago.

At the time of the conquest of Peru there is a record that a nail was found within a rock by a Spanish-directed Indian crew within a Peruvian mine, an incident which caused consternation not only because of its apparent age but because iron was unknown in America before the arrival of the Spaniards.

A mastodon found at Blue Lick Springs in Kentucky was excavated at a depth of twelve feet. But, as digging continued, a cut-and-set-stone pavement was found three feet deeper, *under* where the mastodon had been lying. This is only one instance of ancient stonework within the United States, so old that its dating by surrounding or superadjacent objects (as in the case of the mastodon) has not been accepted.

These and other cases are so difficult to explain in terms of history that many are inclined to disbelieve them entirely while others credit them to visitors from other worlds who left their footprints on our world at eras so remote that what is now solid rock were malleable and viscous areas. The possibility exists, however, that these footprints and simple objects were made by men of extremely ancient races living on the earth and that the discoveries in mines mean that this civilization was so far back in time that only what has been hidden within the earth or preserved within other materials has so far been found, and even then not identified. One wonders how many small clues have been destroyed throughout the centuries with only a few enigmas remaining to furnish any evidence of predawn civilization other than legends.

Legends and carved pictorial representations of extinct but recognizable animals may be another indication of the antiquity of human culture. An animal closely resembling the toxodon is depicted on pottery found at Tiahuanaco, the two-and-a-half-mile city in the Andes of Bolivia. The toxodon, a prehistoric animal somewhat like the hippopotamus, had previously been considered to be extinct long before the development of civilized man and, in any case, his habitat was not adapted to a barren 13,500-foot-high plateau such as Tiahuanaco, nor would the Tiahuanaco area have been a likely spot for the site of a great culture, and there are indications, such as cornfield terraces above the present snow line in the surrounding mountains and a deep lake containing oceanic fauna, that the entire area may have been thousands of feet lower when Tiahuanaco was built, perhaps at sea level and on the coast.

On the Marcahuasi Plateau near Kenko, Peru, there are tremendous rock carvings – in some cases whole cliffs are modified by carving. These pre-Inca carvings, although weathered by countless ages, can be identified as lions, horses, camels, and elephants, none of which are supposed to have lived in South America during the time of civilized man. Also in Peru, llamas drawn on

very ancient pre-Inca pottery found in the ruins of a coastal city near Pisco, are shown with five toes, as they once had many thousands of years ago, instead of the cloven hoof they later developed.

What appear to be dinosaurs have been discovered in petroglyphs* incised on rock formations in both North and South America. But since ordinary lizards, gila monsters,* and iguanas, for example, resemble their remote dinosaur ancestors, it is difficult to determine whether these examples represent prehistoric monsters or ordinary lizards. This may be the case with an Indian or pre-Indian pictograph depicting a great lizard, scratched on a rock formation on Big Sandy River, Oregon. The picture, however, is an excellent likeness of a stegosaur.*

The Doheny Expedition in 1924 found petroglyphs of extreme age in the Havasupai Canyon near the Grand Canyon. One stone picture showed men attacking a mammoth, an unexpected petroglyph to be found in America, where man has usually been considered, geologically speaking, a fairly recent arrival. Among other pictographs examined there was a reasonably accurate portrayal of a tyrannosaur,* standing upright, partly supporting himself on his tail, exactly as later museum reproductions have shown him. Other petroglyphs along the Amazon and its tributaries show what seem to be other prehistoric animals, especially the stegosaur.

Near the village of Acámbaro, Mexico, during the excavation of a site in 1945, clay statuettes were unearthed which have been the cause of an archaeological uproar through the years. They consist of models of rhinoceroses, camels, horses, giant monkeys, as well as dinosaurs of the Mesozoic era. (The find was further discredited since the discoverer, Waldemar Julsrud, offering to pay only for whole statuettes found, inadvertently encouraged reproductions to be made by local Indians.) Carbon 14 tests on the figurines, however, indicate that they are from 3,000 to 6,500 years old. One of the figures so closely resembles a dinosaur called the brachiosaur* that, were it not for the geological eras in between, one would believe that the artist had actually seen such an animal.

The fact that early man drew or modeled animals that resembled dinosaurs is, of course, no proof that he ever saw them (although he could have seen their bones). The dragon of St. George* and the dragon of China,* as well as the dragon-like sirrush,* portrayed among real animals along the walls of Babylon were scarcely physical realities. Nevertheless, certain details sug-

gest that early man may have appeared much sooner than is commonly believed and that he dealt with some animals supposed to be extinct at his point in time.

Some of these survivors would be located in time in the later epochs of the Tertiary era.* However, since some of the pictographs seem to portray reptiles of the Mesozoic era, long before the advent of man, one might suggest an intriguing explanation. If highly civilized man existed on earth in an epoch before ours, his scientific curiosity would have led him to the discovery of the former presence of the Jurassic* dinosaurs as has been the case with us. With the disappearance of this former civilization this knowledge might have been preserved through legends (of dragons) and pictographs. Again, as in the case of our own civilization, one must remember that little more than 100 years ago traditionalists explained the presence of enormous fossils in the earth by claiming that God had made the fossils at the same time he created the earth.[1]

Andrew Tomas, writing of historic anachronisms in his book *We Are Not the First*, tells of an excavated skull of an auroch (an ancient wild ox) now in the Paleontological museum in Moscow. The skull, several hundred thousand years old, is pierced on the frontal part by a small hole evidently caused by a round projectile. The lack of radial split lines, the speed and heat of the projectile, as well as its shape, suggest a bullet. The supposed bullet was not fired after the auroch's death, since investigation showed that the wound had healed some time after it was inflicted. There is another such example in London (The Museum of Natural History), where there is on display a human skull, found in a cave in Zambia, and dated as 40,000 years old, with a comparable hole on the left side, also without radial cracks. The possibilities implied by these prehistoric shootings, if such they are, are intriguing.

These discoveries, isolated and interpretive though they may be, point to the probability that civilized man existed on Earth much longer than was previously assumed. Without even considering the possibility of civilization being brought to Earth from outer space, as has been frequently suggested, there would be time and space in the history of our own planet for one or several cultures to have developed to the point of annihilating themselves

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[1] See "The Famous Fossil Hoax", p. 122.

through warfare, disturbance of the environment, or of being destroyed by other forces which they may have unconsciously triggered.

THE STONEHENGE* CONNECTION

Stonehenge is an ancient megalithic monument located on the Salisbury Plain in southern England, about two miles west of the River Avon. Construction supposedly began around 1900 B.C. by the primitive Britons and took a total of almost 400 years to complete.

The biggest question that still remains concerning Stonehenge is *why* was it built? Why would those primitive Britons put all their time and energy into a project like that? Certainly not because one chieftain thought it was a good idea at the time. There have been many theories introduced by many historians, archaeologists and scientists. But not too many of them make much sense if you keep in mind the sort of primitive people who were supposed to have built Stonehenge.

The Britons had no written language, at least they left no trace of one. How could they have made the blueprints for a project as immense as Stonehenge, or left behind instructions for its completion to future generations?

Although there are other stone monuments in England that date back almost as far as Stonehenge, none of them are of the size and precision of that mysterious construction. And Stonehenge is the only monument in England where the stones are shaped to size. The shaping was apparently accomplished by direct pounding or bashing with large mauls weighing 60 pounds, made them from the same material as the very hard sarsen stones.* The task would have been hard and tedious, to say the least. In the book *Stonehenge Decoded*, it was estimated that it took 60,000 man-hours to shape and dress the sarsens. Using the rest of Mr Hawkins* calculations for the various phases of building, Stonehenge took a total of 1,497,680 man-hours to complete, assuming that 1,000 men were always on the job 10 hours a day.

Now we're back to the question *why*? Why would a primitive people engage in back-breaking labor for over 400 years?

The list of possible motives for Stonehenge is long and varied: it was a temple to the moon, a temple to the sun, a temple to a snake god, a palace, an astronomical observatory, an assembly

hall, a cemetery, a dance floor, a computer, a sacrificial altar, a cattle pen and a market place. The only explanation never offered was that it was built just for the fun of it.

If it was used as an astronomical observatory, the precision that appears at Stonehenge would have involved scores or even hundreds of years of careful sky watching. That would take us even further back in time, and naturally the further back we go, the more unlikely things become. It has been found that the "Slaughter Stone"* was originally in an upright position and soon after was knocked over because it blocked the view of the sun from the "Heel Stone."* If Stonehenge was built with the precision that the scientists would like us to believe, how could the Britons have made a mistake and put a rock in the wrong place?

In *Stonehenge Decoded* Mr Hawkins goes into great detail about how Stonehenge was used to predict eclipses of the sun and moon. Why? So the Stone Age priests could predict an eclipse and issue a warning to the people. What that warning was he never said, and he's assuming that the priests made their living by being able to predict eclipses. England was foggy even in 1900 B.C. and most eclipses probably went unnoticed. And since Mr Hawkins needed a computer to help him with his calculations, a computer would certainly have been needed to build Stonehenge in the first place.

My theory on Stonehenge may just be one more to add to the already long list. But through my explanation of Stonehenge, I may also be able to prove something about the area referred to as the Bermuda Triangle, which is another mystery that has puzzled scientists and may never be solved.

I don't think it's necessary to go into every strange occurrence that's happened in the Bermuda Triangle. The strange disappearances of boats, ships, planes, and people have been widely publicized in the last few years. The supposed causes of the disappearances range from a time warp in the area, to the sunken continent of Atlantis which still exerts some kind of influence beneath the ocean, to reports of abductions by UFOs* that fly at great speed and disappear into the sea.

Stonehenge cannot prove which, if any, of the above speculations is correct; but it proves that beings far more intellectually advanced than the Britons knew that something strange existed in that area of the Atlantic Ocean, and erected Stonehenge as a

marker so they would know where the area was and could avo
it.

Stonehenge is obviously large enough to be seen from the a
The entrance to Stonehenge is located on the northeast side; goi
into it, you would be facing the southwest. The Bermuda Triang
is located southwest of Stonehenge.

My "key" to the mystery of Stonehenge lies in the fact th
trilithons were used in construction. Trilithon* is a Greek wor
meaning "three-stone." Of all the ancient monuments built aroun
the world, Stonehenge is the *only* one that employed the use o
trilithons. A trilithon is a great big symbol for "pi." Pi is a Gree
letter, and is also a universally used mathematical symbol.

Once you realize that a trilithon is the symbol for pi, you can
readily recognize the fact that the builders of Stonehenge were
trying to tell us something. Not only are there five trilithons in the
center of the monument, the whole monument itself consists of a
series of trilithons in the shape of a circle.

Pi is an indefinite number, but for convenience, it is usually shortened to 3.14. Multiplying the diameter of a circle by pi is the only way you can find the circumference. Having that information is half the solution to the mystery. The rest of the clues are right there; all you have to do is look at Stonehenge and do a little simple arithmetic.

Taking the clues, one at a time, I will point out that the Stonehenge Connection may lie somewhere in the Bermuda Triangle.

1) The inner diameter of Stonehenge, marked by the megaliths, is 100 feet. Pi x 100 feet equals 314.

2) There are five trilithons (pi's) in the center. Multiply 314 feet by 5 equals 1,570 feet.

3) There are 30 upright megaliths that form the circumference of the circle. Multiply 1,570 feet by 30 equals 47,100 feet.

4) There are 30 lintels spanning the tops of the megaliths, forming a continuous circle. Since it sounds like a duplicate clue, go back to clue # 1 and start over, and the answer is the same as in clue # 3 (1,570 x 30 equals 47,100 feet).

5) Add the sum of clue # 3 and # 4. The total is 94,200 feet.

6) There are 56 Aubrey holes.* Apparently no one has been able to determine why 56 holes were dug. Fifty-six is not any easy number to divide, so it would have been hard for a primitive people to equally space 56 holes in a perfect circle. Multiply 94,200 feet by 56 equals 5,275,200 feet.

7) There are four station stones at Stonehenge. Multiply the total of clue # 6 by 4 and it equals 21,100,800 feet.

8) Now to convert feet into miles, you must divide the total by 6,076 feet (for nautical and air miles) and we are left with the grand total of 3,472 miles.

The actual air miles from London to Bermuda, as stated in the International Airline Guide is 3,437 miles. Salisbury, England, is located about 69.5 air miles southwest of London. Subtracting that from the mileage from London to Bermuda, we are left with 3,417.5 miles from Stonehenge to Bermuda. Subtract that from the total of 3,472 miles that we got from the clues, and we are brought to 104.5 miles southwest of Bermuda. Now, that's not very far into the Bermuda Triangle, using the boundaries of the tip of Florida, to Bermuda, to Puerto Rico, and back to Florida. But it definitely is into the Triangle.

I don't know who was responsible for building Stonehenge but it seems highly unlikely that it was the primitive Britons who inhabited England in 1900 B.C. In fact, the more research I do on Stonehenge, the more I believe in Erich von Däniken's theory about ancient astronauts.

I don't know if the builders of Stonehenge buried something in the Triangle, or if they discovered something strange existed in the area in the same way we are becoming familiar with it: through the loss of people and ships. The one thing that seems certain to me is that Stonehenge was intended to show us an area in the Atlantic that we should be cautious of. Maybe, sometime in the future, someone will discover the cause of the disturbing forces that operate in the Triangle. And it may be found 104.5 miles southwest of Bermuda. But until then, the mystery of the Triangle remains. Perhaps the key that unlocked the mystery of Stonehenge may one day unlock the mystery of the Bermuda Triangle.

PART TWO

THREE ASSUMPTIONS

The very phrase "developed nations" sounds somewhat arrogant, since it implies that the world's most advanced countries have reached the end of their possible development and that they have nothing more to learn or achieve. This is very far from being true. People in all ages are inclined to imagine that they have reached the peak of human achievement. Their descendants prove by their own accomplishments that their predecessors were wrong – but then they themselves often fall into the same complacent error. We ourselves are certainly guilty of it. A mere century and a half has elapsed since the Industrial Revolution, and we assume that we have now reached the height of our technological power. Our descendants will laugh at this belief, just as we laugh at the Victorians for believing exactly the same thing.

Is there, in fact, any limit to the possibilities of technology? We cannot answer this question with finality – nobody, in any age, will be able to – but it might be instructive to see how people in the past viewed their technical future with a conservatism perhaps even greater than our own. From the earliest times, nearly every advance in technology has been made against protests that it was impossible, invariably from people claiming expert knowledge, and almost invariably the protests were groundless. Arthur C. Clarke,* possibly the most farsighted philosopher of science of our age, declares as part of his "First Law": "When an elderly and distinguished scientist tells you that something is impossible, he is almost certainly wrong." "The expert can spot all the difficulties," Clarke goes on to explain, "but lacks the imagination or vision to see how they may be overcome. The layman's ignorant optimism turns out, in the long run – and often in the short run – to be nearer the truth." I have compiled a list of some of the more absurd of these historical negative predictions.

Napoleon, preparing to invade Britain from his great camp at Boulogne, was approached by a down-at-heel American engineer named Robert Fulton,* who explained how the blockading British

could be defeated. "What, sir," the emperor is reported to have snapped after listening to him impatiently for a few minutes, you would make a ship sail against the wind and currents by lighting a bonfire under her decks? I pray you excuse me. I have no time to listen to such nonsense." Had he listened, he might well have conquered Britain. The first primitive steamships, much as Fulton had forseen them, appeared soon after Napoleon's death. But the experts saw little future in them. "Men might as well expect to walk on the Moon as cross the Atlantic in one of those steamships," stated the eminent Professor Dionysius Lardner.

Military men have always been quick to declare that things are impossible. One reason why the Roman Empire decayed may have been the refusal of its leaders to interest themselves in science. Their attitude is typified in a statement by Julius Frontinus, Rome's leading military engineer in the time of Vespasian.* "I will ignore," he wrote, "all ideas for new works and engines of war, the invention of which has reached its limits and for whose improvement I see no further hope." Soldiers in all ages have tended to see "no hope for improvement." It is a cliché that they are always well prepared for the previous war. Hundreds of thousands of men died from the combined effects of machine guns and barbed wire during World War I – because nobody had studied the Russo-Japanese War of 1904-1905, in which exactly the same thing happened on a smaller scale. In our own time President Eisenhower,* himself a general, could not understand that something important had happened when the Russians launched the world's first spaceship, Sputnik 1, in 1957. "The Russians have put a small ball up in the air," he told a press conference. "That does not raise my apprehensions one iota."

Civilians can be just as negative. The introduction of railways led to arguments just as fierce as those that have accompanied the arrival of supersonic aircraft. A remarkable letter of complaint has survived from Governor Martin van Buren* of New York to President Andrew Jackson* in 1829:

As you well know, Mr President, "railroad" carriages are pulled at the enormous speed of 15 mph, by "engines" which in addition to endangering life and limb of passengers, roar and snort their way through the countryside, setting fire to the crops, scaring the livestock and frightening women and children. The Almighty never intended that people should travel at such breakneck speed.

been traditional in matters of

This kind of alarm has lon my* declared in the second cen
transport. The astronomer Ptole ss the equator, since the sun
tury A.D. that no man could cr s and set wooden ships alight. I
vertical rays would boil the ocea , and the daring voyages orga
took Europeans twelve centurie ator of Portugal,* to prove that
nized by Prince Henry the Navi s were long regarded as impossi
Ptolemy was a humbug. Airplane avier-than-air machine," the ul
ble. They involved "flight by a h nomer Simon Newcomb* wrote
timate impossibility. As the astro at class of problems with which
in 1903, "aerial flight is one of th
man will never be able to cope." Wright* flew the first powered

A few months later, Orville olina. There was no publicity at
aircraft at Kitty Hawk, North Ca p print what one of them called
first. Newspaper editors refused s later, when it was established
"this ridiculous story." A few wee e thing was authoritatively de
that Orville really had flown, or the weight of a passenger. So
clared: no plane could ever take lbur as a passenger on the next
Orville took along his brother W
flight. rt distance; but it would be no

Well, so men could fly for sh ve Chanute wrote a famous ar-
use to anybody. The engineer Oct f Orville and Wilbur Wright,
ticle about the two-man flight nce Monthly that carried it are
Copies of the issue of *Popular Sci* s machine may even carry mail
now a valued collector's item. "Th useful loads will be very small,
in special cases," he wrote. "But th ast, they will be used in sport,
The machines will eventually be f s commercial carriers." Eleven
but they are not to be thought of passenger service was opened
years later, in 1914, the first air l right, then, so the thing can
between two towns in Florida. A sense of proportion! Shortly
carry passengers. But let's keep er William H. Pickering* went
before World War I, the astronom deas. "The popular mind," he
into battle against some foolish i machines speeding across the
wrote, "often pictures gigantic flying ngers. It seems safe to say that
Atlantic carrying innumerable passe y. Even if a machine could get
such ideas must be wholly visionar it would be prohibitive to any
across with one or two passengers, own yacht." Today millions of
but the capitalist who could own his year at 600 mph, a speed that
passengers cross the Atlantic each y supersonic jets. The critics
will soon be more than doubled b for all aircraft – 660 mph, the
later proclaimed an absolute limit arned professors wrote equa-
speed of sound at high altitudes. Le

[illegible] proving that it was impossible to exceed this speed. Disdainfully, in 1947, Captain Charles ("Chuck") Yeager of the U.S. Air Force flew his rocket plane *Glamorous Glennis* at 670 mph.

Plans for space travel attracted similar derision. In the 1920s the citizens of Worcester,* Massachusetts, became alarmed at the noisy experiments of Robert Goddard,* who was trying to launch small rockets. There were frequent complaints to the police, and threats to tar and feather him after his craft had exploded or fallen from a height onto neighboring property. Yet America owes its successes in space more to Goddard, the inventor of liquid-fueled rockets, than to any other individual. His suggestion that rockets could one day fly through the vacuum of space and reach the moon earned him an attack from *The New York Times*. "He seems to lack the knowledge [about vacuum] ladled out daily in the high schools," said a contemptuous editorial. The article went on, with surprising ignorance of Newton's Third Law,[1] to declare that Goddard's proposed moon rocket would "need something better than a vacuum against which to react." Forty-nine years later, on the morning in 1969 when Neil Armstrong* and his colleagues left Cape Kennedy* for the moon, *The New York Times* very honorably printed a formal apology to the long-dead Robert Goddard. In Britain, in the thirties, members of the newly formed British Interplanetary Society did much of the theoretical groundwork necessary for a flight to the moon. They earned nothing but abuse from the scientific establishment. "I was amazed at the half-baked logic that was used to attack the idea of space flight," one of them recalled. "Even scientists who should have known better employed completely fallacious arguments to dispose of us. They were so certain that we were talking nonsense that they couldn't be bothered to waste sound criticism on our ideas."

Endless examples could be found of scientific predictions made in the last hundred years that were even more foolish than this. In 1899 the director of the U.S. Patent Office urged President McKinley* to abolish the Patent Office along with his own job because "everything that can be invented has been invented." Lord Rutherford,* having helped to split the atom in 1932, announced

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[1] Newton's Third Law, which governs the behavior of rockets and jet engines, states that "for every action there is an equal and opposite reaction." In other words, a rocket engine needs no air against which to push itself. The blast of gas pouring from its nozzles itself propels the vehicle. (*прим. автора*)

that he could see no practical use for his discovery. Ot
at Marconi* when he proposed that radio messages
the Atlantic. It was supposed that to do this he would
reflector as large as the North American continent
Alexander Graham Bell* demonstrated the use of the
1876, Sir William Preece, chief engineer of the British
was asked for his comments. He made this remarkable
sir. The Americans have need of the telephone - but
We have plenty of messenger boys." Lord Kelvin,* the
rian physicist, dismissed with contempt the now accep
of evolution: "We find something at every turn to sho
futility of Darwin's philosophy."

I have not listed all these anecdotes simply to poke
men of whom many, apart from these aberrations, has
ted to large parts of our knowledge and civilization. B
falsity of their negative predictions confirms Clarke
hints at the direction in which man is heading. Sir G
wards, in his 1958 presidential address to the Royal A
Society, suggested that man's progress could be usefully
by an index that has been called the "speed exponential
ing to this system, the rise of human technology is me
the distance that a person could normally travel in on
hour day. For hundreds of thousands of years this rep
pedestrian, who could do about 20 miles in a day. The
the horse, a few thousand years B.C., doubled the avera
hour distance to 40 miles. The road improvements of t
trial Revolution brought also the stagecoach system,
fresh horses could be acquired along the route. This h
raised the twelve-hour average to 75 miles. Railroads
creased it still further to 550 miles. Aircraft made a still m
cal improvement. By 1940, no less than 1,250 miles could
ered in a day, slightly less than the distance from L
Athens or from New York to Houston. The next two de
the jet engine more than quadrupled this figure to 5,500
that within a single day by 1960 we could travel between
and Johannesburg or between New York and Beirut. Su
craft in the mid-seventies will carry us more than 10,000 m
day, from London to Canberra or from New York to Sydn
is a very great speed compared with the stagecoach or the
but it is nothing to what will be achieved by residents of a
space station. These people, in a low orbit of 300 miles, w

a twelve hour day, during which they will see nine
up on its way to Mars will have a wearisome
months unless it doubles this speed to a maxi-
30,000 mph, enabling the astronauts to cover
hours. This is no fantasy. Manned expedi-
almost certain to take place during this cen-
in, taken early in 1971, to build the reusable
system (thus cutting launching costs by
and her agreement with Russia to carry out
Earth orbit, make it increasingly probable that
ll ultimately send joint manned missions to the
and yet I predict that all these vast expenditures
de with the colossal space activities of the next
imilar ratio to the fitting out of a stagecoach
llion Apollo program.

er, I have called this book *The Next Ten Thou-*
that such-and-such an event will take place
and another by 2500, and so on. But these dates are
For although catastrophes may prevent the events
happening during the next ten millennia, if we ac-
ptions *there is a probability of much greater*
that they will happen sooner or later. In a pe-
years, almost anything that can happen will hap-
make three assumptions. Three different kinds of
bring all humanity's daring aspirations to a final
can assess the chances for himself that my
ll prove valid:

will be no substantial change in the sun's radia-

olar system will not be invaded by a hostile or a
technology.
will be no fundamental change in human na-
precisely, that the human reaction to stimuli will

ption No. 1 worries me the most. It seems the most
the least unlikely, to break down. The diagram,
n refined since it was first conceived in 1913, is still
of a rough and ready document. The chances that it
ong in the case of any single star, like the sun, are very
hap one in many millions, but they are not zero. A

more serious danger is malicious interference. Blowing up the sun, and destroying all life on Earth in a single action, would be a perfect *Götterdämmerung** for a besieged warlord. It would be a spectacle to surpass all others; but the fact that nobody would survive to witness the effects might, paradoxically, make the action even more attractive to warped or highly "poetic" minds. One can easily cite examples of this kind of pyromania. Hitler is said to have exclaimed several times while taking refuge in his bunker in 1945, "I wish there was a bomb that could blow up the whole world!" Tiberius Caesar* used to quote with ominous relish the line from Euripides:* "When I am dead let fire the Earth consume."

At the court of Nero,* three imperial reigns later, somebody again quoted this line. Nero insisted that its first part should read "While I yet live." He soon converted fancy into fact and ordered Rome to be set on fire. According to Suetonius,* he watched the fire from a tower, enraptured by what he called "the beauty of the flames." He then put on his tragedian's costume and sang *The Fall of Ilium** from beginning to end. His conduct, if classical writers are to be believed, shows a state of mind that woud delight as much in a cosmic pyre as in the destruction of a city. The astronomers Carl Sagan and Iosif Shklovskii [1] suggest that a powerful civilization of the distant future might be able to blow up stars by means of a super-advanced laser with a power output of 10 trillion kilowatts. If each square centimeter of a small area of the sun's surface could be bombarded by 10 billion ergs of gamma radiation per second, a chain reaction might result, convulsing the whole sun into a supernova explosion that would obliterate the Earth. It is also conceivable that such an action might one day be threatened by blackmailers, hijackers on a global scale, or that the detonation of an enemy's sun could become standard military procedure in an interstellar war. It must be hoped, however, that the leaders of rival stellar systems would refrain from this sort of attack from the same fears of retaliation that restrain nations today

[1] Sagan and Shklovskii do not suggest this as a warlike scheme. They propose instead that artificially created supernova explosions could enable stars to be mined for their heavy elements. Ten trillion kilowatts is a tremendously large power output. It is about one thousand times the present power consumption (per second) of modern global civilization. (*прим. автора*)

on nuclear war. The construction of a sun-destroying laser gun would be very costly in any age and difficult to keep secret. The chances that Assumption No. 1 could break down through human failure must still be considered fairly slim.

We have no data with which to evaluate Assumption No. 2. Several writers have tried to show that the Earth was visited by aliens in the remote past, but we lack hard evidence. As for the present, I am always ready to be convinced of the existence of flying saucers – if only one of them would land, and its inmates would pose for photographs, perhaps, demand an interview with the president, or at least hold a press conference. It is difficult in any case to see *why* a species should send an expedition tens of millions of miles through space with no other purpose than to inform airline pilots. The chances of a breakdown in the second assumption must, in the absence of any data, remain very low.

The third assumption seems even stronger than the other two. We cannot summarize precisely what human nature is, but it appears certain that it has not changed in any fundamental way since the earliest recorded epochs of human history. Egyptians in the time of the pharaohs had much less information than we have – just as we know much less than will our descendants – but the general laws of psychology, the way in which a person will react to a stimulus in a given situation, have been the same since the dawn of *Homo sapiens*.

This generalization might seem to beg several questions. What are these general laws of psychology of which we talk so glibly? How will a person react to a certain situation in given circumstances? We still have only the vaguest notions. Despite huge numbers of books and research papers on the psychology of mobs and of individuals, we still have no general picture of "man." Hereditary factors, it now appears, have a much stronger influence on our behavior and intelligence than the environments in which we are brought up. In addition to infuriating many social thinkers, this scientific conclusion has made analyses of human nature very difficult and complicated. People differ in their behavior and thinking far more than do the members of any other known species. Some human reactions can be predicted with 99 percent certainty. If an employer slaps the face of his shop steward there will be a strike. If one country invades another there will be a war. But any reasonably intelligent pharaonic Egyptian could

have told us simple things like these. Of more complex cause-an effect chains of events we are progressively more ignorant. H man nature remains constant, but any general characterization man can only be made by compiling a vague string of adjectives.

What, then, can be expected to happen if my three assumpt ons hold true? Contrary to the Club of Rome's belief, there are r "limits to growth." There is no reason why our global wealth, or least the wealth of the industrial nations, should not continue t grow at its present annual average of 3 to 5 percent indefinitel Even if the Earth's resources prove ultimately to be finite, those c the solar system and of the great galaxy beyond are, for all pract cal purposes, infinite.

THE FAMOUS FOSSIL HOAX

The hoax of the Wurzburg fossils, a far-reaching piece of foolery perpetrated two hundred years ago by German university students, ranks in ingenuity with the "Balloon Hoax," the *New York Sun* "Moon Hoax," and other celebrated practical jokes of history.

The butt of the fossil joke was a serious-minded old professor, Johann Beringer, who held an honorable position as a Doctor of Philosophy and Medicine in Wurzburg University. The doctor, highly respected for his learning and studious habits, was appointed private physician to the reigning Prince Bishop* of the old university town. He was distinguished as a scholar and writer in the fields of zoology, botany, and medicine.

Of all the problems then engaging scientific minds, none had caused more contention than the origin and meaning of fossils. It was claimed by some that the creation of fossils was due to an unknown influence of the stars. Another theory explained fossils as the remains of oceanic animals and plants stranded on the land by the Flood.* It was not until about 1800 that it was determined that fossils were relics of animal and vegetable life that existed in prehistoric times and had become entombed in rock, in frozen mud, in the beds of rivers, even in the soft gum of conebearing trees.

The science of paleontology, or the knowledge of fossils, attracted Professor Beringer. He advanced an original theory that fossils were merely a capricious fabrication of the Creator, placed in the earth to test human faith. He was so keen about this pet notion that some of his pupils at the university could not forbear playing a trick on the old professor.

With the connivance of some of his own colleagues, the students prankishly fashioned "fossils" out of clay and hid them among the rocks of a hillside where they knew Beringer used to roam around on geological exploration. It was not long before the venerable professor chanced upon the fictitious deposits during one of his walks. Completely deceived, overjoyed at his discovery, Beringer hurried back to the university and exhibited the organisms he had found.

The jokers, perceiving with glee the success of their jest, now went further and buried the most fantastic figures their imaginations could suggest. Not content with these they even buried inscriptions, worked out on "fossil" shells, one of them being the name of God himself, in Hebrew!

Professor Beringer's elation upon the discovery of these latter forms knew no bounds. He was now completely convinced of the soundness of his doctrine, and made ready to publish the results.

The semireligious fervor of the honest old scholar swept all before it. Despite the advice of level-headed friends, he hurried his ponderous work to completion.

And now for the strangest part of the story. The jesters came forward and confessed. They exposed all they had done. To their confusion, Beringer refused to listen. The hoaxers reiterated their statements that the whole thing was a colossal joke. Beringer could not be convinced. He conceived this as a base trick of his adversaries. He suspected them of trying to rob him of the glory of proclaiming his discoveries and establishing the truth of his theory. He hurried into print. His *magnum opus** appeared!

The entry of the volume into the world of learned literature was heralded by a shout of laughter! The author's name became a byword in the universities of Europe. Some declared his book was only an attempt to fool the scientific world, others set it down as the product of a mind diseased.

Copies of the weighty volume, printed in Latin, bore the title *The Figured Stones of Wurzburg*, and was illustrated with "marvelous likenesses of two hundred figures, or rather, insectiform* stones." It was published in Wurzburg in 1726. The pompous dedication, full nine pages long, is to Christopher Francis, Prince Bishop of Wurzburg. After the dedication and the preface, comes the body of the work, descriptive of Beringer's discovery of the fossils, the manner of their exhumation and examination, the account of the attempt of his colleagues to dissuade him

glassware, tools and buildings that can be retrieved by careful digging.

Miss Colyer has had several sites under excavation in Lincoln in recent years.

A major site is the Lower West Gate where the new city office building was erected. Miss Colyer considers it to be the best preserved Roman gate in the country. It is the first gate she found in the wall that was built to surround the extended colonia.

The Lower West Gate was probably used into the fifth century. One of the road surfaces produced coins of Theodosius (379-395) and Arcadius* (395-408). Both towers in the newly excavated gate were hollow, containing a room for the guard. The towers were built of reused material. One of the stones is carved with beautiful friezes that probably came from a temple. In some places the walls are as much as 15 feet high, with a base as wide as 16 feet, nine inches.

Modern archaeologists don't like to think about the havoc caused by greedy treasure hunters during the Victorian period. Organized digging methods were not introduced into England until the 1880s. Until then digs were treasure hunts in search of loot. Burial mounds were much sought after prizes. An English digger in 1771 proudly reported excavating 31 mounds in one day in search of treasure.

At the Flaxengate site, for example, the diggers have painstakingly uncovered three medieval town houses of 13th century vintage, literally a spoonful at a time. During the dig they found evidences of late Saxon ruins (tenth or 11th century). The crew was confident Flaxengate would eventually yield some interesting Roman finds.

Miss Colyer considers this site particularly important because it may indicate the existence of extensive Roman ruins beyond the walls of the extended colonia.

The Lincoln sites have yielded quantities of durable first and second century A.D. Samian ware. These were a standard, good quality tableware imported by the Romans from Italy, France and Germany. Samian ware has a distinctive orange glaze and was decorated by pressing stamps into the mold.

Native domestic pottery of the Roman period was also manufactured in Lincolnshire. Lincoln ware of the 14th century had a distinctive lead-based green glaze. Unglazed Shelly ware con-

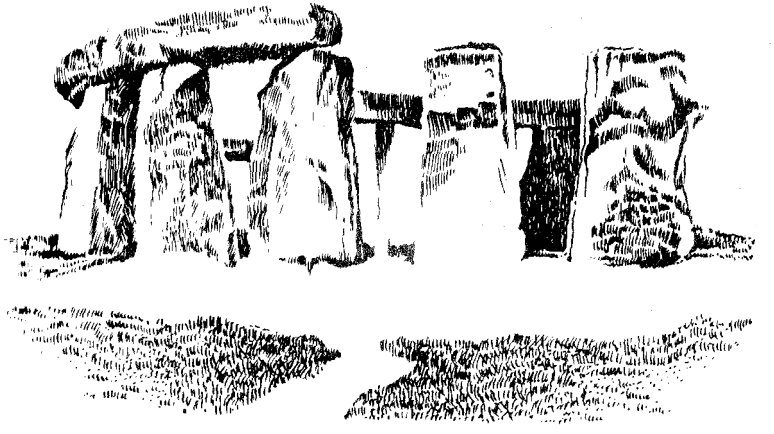
fired clay and crushed seashells, and served as tableware for the common people until the 15th century.

Since types, shapes and decoration of pottery changed with the period, such clues enable pottery finds to be correlated with a specific period or culture.

Food pots were often reused as containers for the cremated bones of the deceased. Some crematory pots have been found at sites in Lincoln, although Roman law, for hygienic reasons, required remains to be buried outside the walls.

Archaeological finds from previous digs in Lincoln are stored in a museum sponsored by the city and county. The building is the 14th century Greyfriar's, the earliest church of the Franciscan order* now surviving in England.

STONEHENGE*



It was natural that Stonehenge should attract early and hold consistently the attention of antiquaries and pre-historians. It is far and away the most impressive prehistoric monument north of the Great Pyramids. And, like the Pyramid of Cheops,* it has been the subject of innumerable esoteric and mystical theories and cults that are still – in the teeth of all scientific evidence – very much alive.

It was John Aubrey* who started the ball rolling. A widely traveled antiquary of the Stuart period,* he had in 1649 discovered the immense stone circle of Avebury, not many miles from Stonehenge and lying below the slopes of that Windmill Hill which was

later to give its name to the first Neolithic colonists of Eng
The tremendous stone circle of Avebury and its encir
embankment surrounds an area of twenty-eight and a half a
and encloses a whole village. More than thirty times the are
Stonehenge, it loses by its very vastness the impressiveness of
latter structure. It is simply impossible for the eye to take in
whole scope of the monument. But John Aubrey was at no loss
an explanation of the structure. It was, he stated blandly, a tem
of the Druids.* And when, thirty years later, he was ordered
Charles II* to make a report on Stonehenge, he attributed th
monument also to the Druids.

As we saw when we examined the story of the megalith
tombs, the Druids have always fascinated British and, to a less
degree, French antiquaries. The known facts about Druids a
few, and speculation has therefore had free rein.

They are first mentioned about 200 B.C. by Sotion of Alexa
dria, who calls them the philosophers among the Celts. Julius
Caesar* gives the fullest account of them in his description of h
conquest of France about 50 B.C. The druids, he says, are bo
priests and judges; they form, among the anarchically independe
Celtic tribes, an intertribal organization under an archdruid, an
they meet each year near Chartres.* As judges they gave decision
both on personal and on tribal questions. As priests they wo
shipped all the multifarious gods of the Celtic pantheon, but the
believed in immortality and in the transmigration of souls. The
carried out human sacrifices, burning their victims in wicke
cages. Julius Caesar did not find Druids in England, but heard i
France that their "training college" lay in England.

It is Pliny* in his *Natural History* who, a century later, tells u
that the oak was regarded by the druids as a sacred tree, and de
scribes the cutting of the mistletoe with a golden sickle. Diodorus
Siculus* gives further details of the human sacrifices, claiming that
prophecies were made on a basis of examination of human en-
trails.

The only other mention of druids in Britain is by Tacitus,*
who refers to their presence in Anglesey in A.D. 61.

Welsh and Irish legends of doubtful authenticity, later date,
and ambiguous meaning suggest that druids continued to exist
there until the coming of Christianity.

And that is all. But it was enough for Aubrey – and more than
enough for William Stukeley,* who was capable of creating a

new mythology and hierocracy on much more slender foundations.

As a medical student at Cambridge in the first years of the eighteenth century William Stukeley showed a scientific bent of a wonderful order – and a tendency to steal dead dogs for dissection. He became a close friend of Sir Isaac Newton, and became a surgeon of Grantham. He showed an early interest in archaeology and was attracted to field studies by the necessity of taking long rides in the country as a part of his self-prescribed treatment for gout. After his election to the secretaryship of the Society of Antiquaries in 1718 he did some extremely useful work in this field. His surveys of Avebury and Stonehenge are the first accurate plans to be made of these monuments, and they are of value to this day as revealing a wealth of detail which two hundred years of wear and tear have since destroyed. But he accepted Aubrey's explanation of the purpose of the two monuments, and gradually over the years his obsession with druids grew. Although a doctor by profession, he felt called upon to take holy orders and counted it as his mission in life to reconcile Christianity with the "aboriginal patriarchal religion" of the druids. His original plans of Avebury and Stonehenge were worked out again and reinterpreted. His very valuable drawings and cross sections of the barrows of Salisbury Plains were labeled in a complicated and completely baseless system as burials of druids, archdruids, priests, priestesses, and kings.

The impetus given by Stukeley to the cult of druidism developed during the Romantic movement of the eighteenth and early nineteenth centuries. An attempt was even made to reconcile the esoteric theories concerning the Great Pyramid* with the druid cult of Stonehenge, and the druids were put forward as the repositories of the Ancient Wisdom of the East. Stonehenge was interpreted as a stellar observatory, its alignment worked out in relation to the heavens, and various of the barrows that in large numbers surround the monument selected as observation platforms for the astrologers who had, it was believed, established their college there.

It was during this period that the solar alignment of Stonehenge – one of the few demonstrable facts in the welter of theorizing – was worked out. From the earthwork that surrounds Stonehenge an avenue formed of two banks of earth leads away to the northeast, traceable for about five hundred yards. Less than a hundred yards along this avenue stands an unhewn monolith,

known from ancient times as the Hele Stone.* A line drawn from the Hele Stone to the "altar stone"* in front of the center trilith bisects exactly the two horseshoe-shaped patterns of stones at the center of the monument and marks the undoubted axis of the whole complex. And if you stand at the center of the altar stone at dawn on Midsummer Day and look along this axis, then you will see the sun rise almost precisely over the Hele Stone.

The precision is not quite exact, and the inaccuracy was the factor that gave the first clue to the date of Stonehenge. The slight wobble of the axis of the earth results in a gradual movement of the point at which the sun rises at the midsummer solstice, and this movement can be measured by astronomers in terms of years. In 1901 Sir Norman Lockyer,* the Astronomer Royal, carried out accurate measurements of the alignment between the center of the altar stone and the center of the Hele Stone, and worked out the date at which the sun would have been directly aligned on the Hele Stone at Midsummer Day. Although he was himself a convert to the concept of Stonehenge as a druid temple, his results gave a date for the erection of Stonehenge as "lying between 1900 and 1500 B.C.," a date well over a thousand years earlier than the first historical mention of druids. A carbon-14 dating of charcoal found in 1950 in one of the holes dug during the original erection of the monument gives the date as 1847 B.C. with a possible error of 275 years in either direction.

Stonehenge typifies for us the story of the settlement of Europe. In it we gather together all the threads that unite to form the warp and the woof of the continent. It was founded by the immemorial inhabitants of the land, the hunters, but only after the hunters had been roused to higher things by the stimulating impact of the first farmer colonists and in particular of the missionary settlements of the megalith-builders with their Eastern religion. It was translated into stone by the beaker folk* of Spain who had wandered and traded their way across the breadth of Europe and had mixed their culture with that of the battleax nomads from the steppes of Russia. And finally it took form as the mightiest expression of the wealth and far-reaching power of the mercantile princes of Bronze Age Europe. The story of its investigation, too, symbolizes the course of archaeological progress, from the semi-mystical rationalizations and the esoteric druid-worship of Aubrey and Stukeley to the precise stratification and carbon-14 dating of Stuart Piggott and the modern school.

Stonehenge, the Egyptian pyramids and the Mayan temples were more than monuments. Like giant calendars, they marked for their builders and users the first day of summer. When the precise astronomical alignments of these monuments were first noted, some researchers were skeptical. They doubted that ancient peoples, especially those who built Stonehenge, had the astronomical sophistication necessary to design and use such devices. Increasingly, however, the evidence suggests that they did. It now appears that even the nomadic Plains Indians of North America had their own Stonehenge – the Big Horn Medicine Wheel.

The Medicine Wheel* is a pattern of stones laid out on the ground just above the timberline in the Big Horn Mountains of northern Wyoming. The pattern is that of an imperfect circle with a diameter of about 25 meters. In the center of the circle is a cairn or pile of stones about four meters in diameter. From this hub 28 spokes or lines of stones radiate and connect with the outer wheel. Six smaller circular cairns are unevenly situated around the rim. Considering that the Plains Indians built almost no stone monuments, this is a very elaborate structure.

Tree-ring analysis of a piece of wood found in one of the cairns dates the wheel at about 1760. Construction of the wheel is attributed to the Plains Indians, all of whom lived in the area and for whom the Big Horn Mountains had a special significance. The wheel was first investigated by whites in the late 19th century but its purpose has remained a mystery. Now, astronomer John A. Eddy suggests that the Big Horn wheel may have been a primitive astronomical observatory.

Eddy has studied the alignments of the wheel and its cairns and has made observations at the Big Horn site during the past two summers. He explains that the high altitude (9,640 feet) and the clear horizons of the site make possible the viewing of sunrise and sunset at the summer solstice. The view from one cairn, for instance, across the center cairn marks the point on the horizon where the sun will rise on the first day of summer (an important piece of information to a nomadic people whose livelihood depended on a knowledge of the seasons).

The 28 spokes, suggests Eddy, could have been used as day counters for lunar intervals. The remaining cairns, he says, may have been used to mark the rising points of various bright stars* at

the time of solstice. Such observations would have served to double check and increase the precision of the sunrise method.

Eddy's explanation works, but it raises some questions. How useful, for instance, is such an inhospitable wind- and snowswept site for observing sunrises? At solstice in 1972, one morning out of three was clear at sunrise. In 1973, three mornings out of four were clear. So this site, says Eddy, is probably as good as Stonehenge.

The other problem has to do with the authenticity of the site. One writer has suggested that the entire structure was redesigned and relaid by US Forest Rangers, using different stones, between 1931 and 1955. But Eddy considers this suggestion unsubstantiated. He admits that the structure could have been altered by visitors because it was not protected until 50 years ago. But comparisons of the present-day site with old photographs show that the general appearance of the Big Horn wheel has not changed since 1905.

PALENQUE:* A MAYAN CITY INSPIRED BY THE ANCIENT EAST?

Crumbling walls and pyramids crowned by temples with roof combs strangely reminiscent of India stretch seven miles along a high ridge. Many buildings have been reclaimed from the jungle but more than 500 known pyramids and jungle-covered mounds scattered over 15 square miles have yet to be revealed. Only during the past 25 years has intensive digging been done at Palenque, and the surface is barely scratched. Recent discoveries of earlier structures beneath those already reclaimed lead some archaeologists to believe that the great ceremonial center may have been founded even before the first millennium B.C.

Each time a new temple is explored, more questions than answers erupt, but one fact is clear: almost everything about Palenque is different.

Most other great Mayan cities were ceremonial centers only. But in Palenque, scientists have found culinary artifacts and cooking fire remains. In most centers, temples atop stone pyramids were made of wood that rotted away long ago. Not at Palenque. Here, the pyramids are topped by magnificent multichambered stone temples with unique bas-relief sculpture on stucco panels, and capped by carved stone pagoda-like roofs that look like those of temples in Indonesia. One Palenque temple is a near duplicate of some in Ajanta, India.

There is another surprise in the corbelled vaulting of the Temple of the Inscriptions.* Overhead, large recessed niches in the form of Moorish arches march along corridors.

Other striking hints of Eastern influence abound. In 1949, Dr Gordon F. Ekholm, associate curator of anthropology at the American Museum of Natural History, exhibited cultural links between the Old and New Worlds. Among them was a Palenque bas relief depicting a Maya priest holding a lotus blossom by the stem – a representation that Alma M. Reed, authority on Mexican art and Byzantine cultures, points out is startlingly similar to one at Khasaparna, India. A throne in the form of a lotus blossom appears in a Palenque sculpture. In the Temple of the Foliated Cross,* a low relief lotus grows from a conch shell – a motif, Miss Reed observes, that appears on a Ninth-Century Javanese relief in Borobudur.

The dramatic similarity of Mayan and Asiatic use of lotus designs, Dr Ekholm indicated, is difficult to dismiss as "coincidence."

But that's hardly the end of it. Strange Maya figures with deformed skulls and bearded Semitic profiles are portrayed on several panels, seated in posture very similar to the Buddhist "lotus position."* A monster mask in bas-relief on an altar panel in the Temple of the Foliated Cross has a near twin in a sculpture found in the abandoned jungle city of Angkor Wat* in Cambodia. In both, a cruciform "tree of life" sits atop the mask. Another sculpture found in the building, known as the "Palace," has a priest-king sitting on a two-headed jaguar throne* that has a surprisingly similar counterpart in Hahoba, India.

When and how did it all begin? No one knows. The original name of the city is lost in antiquity. The present one is borrowed from the nearby village of Palenque, a Spanish word meaning "palisade."

Each pre-Columbian center in Mesoamerica is divided into three time periods of artistic and cultural development: Pre-Classic, with beginnings that some archaeologists now think may go back before 1000 B.C., in some cases; Classic, an era of great works, ranging from about 300 to 900 A.D.; and Post-Classic, which ended with Spanish conquests in the 1500s.

Palenque's Pre-Classic origins are known to precede 300 B.C. at least. Its Classic period reached supreme heights in art and architecture about 700 A.D., after hundreds of years of building. Most authorities believe the "palmy days" ran from about 400 to

900 A.D. The Post-Classic era (usually a period of enemy invasion, corruption of ideologies and decline) apparently was very short at Palenque. The city seems to have been abandoned abruptly in the 10th Century, perhaps even earlier. This much *is* known: it was a ghost city long before Hernán Cortés* and his Conquistadors raped the trusting civilization of Middle and South America. Though he had to pass within 20 miles of Palenque on his march through Yucatan in the early 1520s, he evidently was unaware of its existence, as were his Indian guides.

Apparently it wasn't until the 17th Century that Indians told a mission priest about "stone houses" in the jungle, resulting in the visit of a Señor Fray Ramon Ordonez y Aguiar to the ruins. He wrote a book attributing the city to an Atlantean civilization founded by a white-robed "god" named Votan.* But most early descriptions of the city produced by the Spanish conquerors vanished in Spanish archives, and Palenque, for a time, was "lost" again. Then, in 1839, John L. Stephens, a New York lawyer and archaeology buff, with illustrator Frederick Catherwood, set out to explore all of Mayaland, from Copan in Honduras to ruins in eastern Yucatan. They hacked their way into Palenque during the rainy season of 1840 and set up shop among the overgrown ruins. The now famous two-volume report of their wanderings, *Incidents of Travel in Central America, Chiapas, and Yucatan,* finally described (and illustrated) Palenque's wonders accurately.

Today, as when Stephens and Catherwood came upon it, the largest and most elaborate building in Palenque is the building called the "Palace." It occupies a terrace some 40 feet high and about two football fields in extent on a central site known as the great plaza. The basic structural feature of the Palace is the corbel or "false" arch, which was often used by the Maya. It was made by inclining the upper portion of parallel walls inward until they almost meet, and then closing the gap with flat stone slabs. Rooms are limited in width but can be as long as desired. Other structures bordering the plaza include the Temple of the Inscriptions and the Temple of the Foliated Cross.

Most of the buildings are adorned with the finest Maya stucco sculpture in existence. The stucco was made of cement containing an unknown tree bark extract. It rendered the mix workable for longer periods, and "set" into a rock-hard product that has weathered the destructive tropical climate for more than 1000 years. To date, no one has been able to duplicate this curious concrete. Fig-

ures were formed naked by artists, and clothes added in subsequent layers.

The walls of the palace are lined with stucco reliefs of people in endless ritual poses. Most of the figures have the cranial deformation known to have been practiced by upper strata Maya as a mark of rank or distinction. The effect was achieved by binding the heads of babies between flat boards until the skull, in profile, sloped to a point from the bridge of the nose. Other admired marks of distinction evident in the sculpted figures include crossed eyes, achieved by dangling a wax ball from an infant's forelock, and congenital malformations such as club feet; and excess fingers or toes, apparently brought on by inbreeding among the upper classes, were also obviously desirable.

In her book *Fair Gods and Stone Faces*, Constance Irwin points out another area in the world where similar skull deformation was practiced, and where inbreeding and its consequences were a "mark" of royal lineage: ancient Phoenicia,* and other places in the Fertile Crescent.

The Maya's proclivity for pyramid building makes lay observers, and even some scholars, suspect Egyptian influence. "Independent inventionists," however, who believe that identical things develop independently in isolated cultures at comparable stages of development, have pointed out that Egyptian pyramids were monumental tombs, while Maya pyramids were simply platforms on which to perch temples for ceremonial purposes. This was true for most ceremonial centers. Not in Palenque, however.

In 1949, Dr Alberto Ruz Lhullier,* director of Maya studies at Mexico's National University, began work with an archaeological crew on Palenque's Temple of the Inscriptions. Tallest (75 feet) and most impressive pyramid in the complex, it is dated at 692 A.D., according to deciphered glyphs.

While removing debris, Ruz observed that some stone slabs had saucer-size stone plugs. When removed, these turned out to be handholds. The stones were lifted out and the men found a rubble-filled pit, with vertical sidewalls continuing downward. Further excavation revealed a stairway so solidly plugged with stone and mortar that 12 months of digging, over a four-year period, were required to reach a masonry wall. The men were now more than 65 feet beneath the temple floor.

Here, the diggers uncovered a stone bin containing jade or-

naments, a large teardrop pearl and some pottery. Encouraged, they chiseled away at the wall and broke through into a small dungeon. On the left, a huge triangular slab was inset vertically in a masonry wall. At its base lay the crumbling remains of six skeletons, later determined to be youths – one a girl. The cranial deformities suggested they were offspring of nobility.

A crack below the vertical slab indicated a "loose fit." Ruz aimed a light through, and gasped. More steps led down into a long, vaulted chamber. "The interior sparkled and glistened with the effect of snow crystals," he recalls. "Delicate festoons of stalactites hung like tassels of a curtain ... above the floor was an enormous carved slab in perfect condition ..."

On June 15, 1952, after two days of work, Ruz was able to enter the chamber – the first living human within its walls in more than ten centuries. He knew he'd hit the jackpot.* Around the walls, god-priests paraded in stucco relief. A huge sarcophagus – the first ever found in a Maya pyramid – occupied the center of the room. It measured ten feet long and seven wide. The lid was an intricately carved limestone slab framed in glyphs that included the Maya calendar dates of 603 and 683 A.D. The central figure was a royal Maya, later identified as the city's great ruler Pacal, whose mother Lady Zac Kuk (whom he married) and son Chan-Bahlum were the peak of a dynasty that ruled Palenque from about 500 to 780 A.D. Pacal had a club foot, split toe and other congenital deformities. Behind him was an elaborate cross – a stylized "tree of life" maize plant, with serpent heads on the cross arm ends and a quetzal bird* on top. Beneath this five-ton lid was a smaller, hand-shaped slab covering a stone sarcophagus.

In this receptacle rested the fragile bones of the priest-king himself. They indicated a man of five feet, eight inches height in life, some eight inches more than the average male Maya of the time. An array of gems and jade ornaments surrounded him. Arms and finger bones were heavy with amulets and rings. A beaded breast-plate covered the rib cage, and pieces of a jade mask lay on the face.

Ruz has suggested that the rich accoutrements indicate a system similar to Egypt's in which the priest-king was considered a god. Alma Reed has pointed out that masks and breast-plates of rare minerals – usually thinly hammered gold – were common on

[illegible] in royal tombs of ancient Egypt, Phoenicia and even [illegible]

Most startling of all, however, was the familiar looking shape of the inner sarcophagus. Hand chiseled, its inner chamber and lid are formed like stone sarcophagi found in Phoenician tombs: [illegible] at sides and top; flared and flat at the foot. Phoenician sarcophagi were copied from wooden Egyptian mummy cases, which were stood on end – hence the wide, flat bottom. On the heavy stone coffins of Phoenicia, the design was no longer functional. Did the Mayan stone carver have an older model in mind?" asks the archaeologist.

Since Ruz's initial discovery, more handholds in sanctuary floor slabs have turned up other pyramid tombs. It is now suspected that many other pyramids will prove to be "monumental tombs" of Maya priest-lords.

What became of Palenque's population? Agricultural failure due to drought and soil exhaustion, along with natural disasters, have all been suggested. Congenital deterioration through inbreeding is another solution posed by some scholars; so is epidemic disease.

But for a number of contemporary scientists there is a more logical answer: revolt of abused masses against a degenerate, self-indulgent, egocentric hierarchy that confused itself with god or gods and ruled by fear.

Do the recent discoveries in Mayaland mean that old concepts are invalid and that trans-Atlantic, pre-Columbian contact is fact? Not yet. But with each dig, archaeologists come closer to what may be complex truths. Similarity of funeral rites in ancient Egypt and Palenque, Alma Reed points out, "tend ... to underline the parallels." Archaeologist Constance Irwin says: "Beyond the Aztecs,* Mayas* and Incas* lie older, unexplained cultures and baffling hints of pre-Columbian, even pre-Christian contact between the New World and the Old." But the clue that may throw the balance is cited by Dr Ekholm who admits that, while coincidence in cultures are common, they become significant when a critical number occur in one place.

Whether or not the riddles of Palenque are about to go critical remains to be seen. Scientists may be getting close. For the past two years, archaeologists from around the world have met in Palenque to survey the present body of knowledge about the Mesoamerican cultures. University computers have been at work

trying to crack the Maya glyphs.* Already more progress has been made than in the previous three centuries.

What these glyphs reveal may provide a window on the entire human past in the Western hemisphere.

GOLDEN CLUES TO THE MYSTERY OF THE ANDES

If the known history of the New World were written with one page for each year since the rise of civilization here, out of some 2,000 to 3,000 pages, all except the last 500 or so would be blank. But the illustrations would be magnificent.

Since the time of the Spanish conquest, in 1532, early Peruvian civilization has usually been associated with the vast Inca empire the Spaniards found. Ironically, the Incas themselves were also lately established military conquerors, who had been in power for less than a century and whose art was largely the product of captive craftsmen from older civilizations. With the aid of guns, treachery, religion and smallpox, the Spanish quickly obliterated even the memory of the Inca empire and its predecessors. Then they began melting the golden art works into formless ingots* as fast as slave labor and a frontier technology would allow.

That some artifacts survived is an accident of history related to the steps by which civilization arose in this area in the first place. The conquistadores were more greedy than thorough: They never realized that the roots of the highland civilization they were plundering lay in remote areas of the Pacific coast. From under those coastal sands, in one of the driest deserts on earth, come most of the these remaining treasures and fragments of the story of the people who made them.

Current research on the origins of Peruvian civilization centers on the unique circumstances by which scattered villages merged into larger population centers capable of supporting division of labor by classes, including craftsmen. These centers apparently did not arise with the development of agriculture, as in the Old World, but rather grew up in the third millennium B.C. along the coast, based on an unusually abundant maritime harvest. (The currents off Peru still support perhaps the greatest concentration of ocean life anywhere on earth.)

When agriculture finally was developed by these coastal desert dwellers, they used water of rivers flowing from the Andes to irri-

their crops. How much interchange these coastal people had with their highland neighbors is still unknown, but until the rise of the Inca, coastal society seems to have remained more advanced. Indeed, one of the largest current land reclamation projects in the world is an attempt to reopen just one of the ancient irrigation canals on the Peruvian coast.

From the earliest times, these ancient societies adopted a set of institutions very different from those common throughout the rest of World. Perhaps the most important difference was the use of labor exchange instead of money – a practice that still exists on the village level throughout the region. Taxes, for example, were collected as portions of a crop or as a period of work for the state. These taxes, in turn, allowed the state to support the administrative class and the craftsmen that were gathered into principal cities. The system worked so well that only an elaborate counting device unique – not abstract mathematics or written records – was necessary.

As a result, practically all we know about the various states that rose and fell in South America for three millennia comes from their art. Although this record is an exciting one in its variety, technical accomplishment and creativity, not enough artifacts have been found undisturbed to allow archaeologists a chance to piece together a consistent story. The desert sands, particularly, have yielded well-preserved specimens of gold, cloth and pottery, but an incredible 99 percent of the treasure has been recovered by looting. What the Spaniards did not destroy, modern grave robbers have torn away from any meaningful context.

From the scant archaeological data and a painstaking analysis of motifs and techniques evident in the available artifacts, four major regions can be distinguished as locations for thriving centers of art. One of the earliest cultural traditions, called the Vicus, was located on the far northern coast of Peru and seems to have disappeared as a separate entity more than a thousand years ago. The first discovery of this culture was apparently made by looters in the early 1960s, and very little is known about the period. Similarly, few works represent the highland culture of the Incas, because of early Spanish looting. That leaves roughly the northern and southern halves of the Peruvian coast as sources for the majority of surviving goods and the locations of the other two major artistic traditions.

The southern coastal region is the site of a particularly durable

artistic tradition, stretching back to the earliest days of gold working and reaching a long plateau of achievement during the so-called Nazca* period, from about 200 B.C. to 700 A.D. Nazca is typical of early Peruvian "corporate styles" that resulted when artists were supported directly by the state, which in turn dictated how their work was to be done. The gold mask, for example, probably reflects some symbolism important to the state religion of the time, and it would probably have been used in some state ceremony, say the burial of an important official.

The most famous of the Nazca artistic accomplishments, however, are huge line drawings created by raking gravel on the desert plain. (The weathered stones are dark on one side, light on the other.) Some of the markings are simple geometric figures with straight lines that may extend more than 20 miles; others are smaller drawings of birds, spiders and even a killer whale.

Unfortunately, the best-known interpretation of these markings is that of the popular author Erich von Däniken, who writes that extraterrestrial beings used the site as an "improvised airfield for their spacecraft." A lack of archaeological data and the haughty silence of the scientific community have helped von Däniken sell such speculations in 35 languages with total book sales approaching 35 million copies.

Simpler explanations seem more plausible, although more research is needed to choose among them. In 1975, author-adventurer Jim Woodman demonstrated that the ancient inhabitants of the Nazca plain could have built a hot-air balloon to direct the work, using their finely woven textiles and a gondola of reeds from Lake Titicaca. Others have speculated that the figures were drawn using a giant grid.

However, University of California anthropologist Lawrence Dawson believes that evidence collected at the site indicates an even simpler method of laying out the figures was probably used. Along the straight lines, he says, are stations where stakes were apparently driven into the ground, about a mile apart. The stakes could have been aligned with each other by eye and then a cord stretched by surveyors to lay out the lines in the same way one sets out a row of carrots in a garden. From his own observation, Dawson says he believes the smaller animal figures could have been drawn without any mechanical aid. The subjects of these smaller drawings are also common motifs in Nazca pottery and textiles.

The river valleys of the southern Peruvian coast are rather small and never supported large populations. The continuity and uniqueness of their arts reflect the remoteness and independence of their inhabitants. The northern coast, however, was far more cosmopolitan. With fertile valleys and bustling cities, the region's wealth became the great prize of the conquering Incas, who swooped down from the mountains. Its artistic achievements served as a source and standard for the new empire.

Little is known about the nature or extent of the early state that apparently ruled much of this region, but from about 100 B.C. to A.D. 700 a corporate artistic style called Moche* is common through much of the area. Perhaps the outstanding highlight of this cultural flowering is the group of pottery vessels representing individual portraits with a realism unique in the ancient New World. Moche artisans also developed gold-working techniques of considerable complexity, including hammering and engraving over wooden forms, annealing, gold-overlay, welding and soldering. A miniature ceramic model of a Moche smelter shows clearly how metalworkers blew through long tubes to produce a flame hot enough to refine ores or mix the various constituents of a desired alloy.

Around the eighth century A.D. the Moche style declined, presumably because of the waning fortunes of its parent state, to be replaced by a style called Chimu.* This style was associated with the rise of the Chimor empire, centered at the coastal city of Chan Chan.* Eventually, the empire's extent was second only to that of the Incas, who conquered Chimor in the mid 1400s. At the time of this conquest, the splendor of Chan Chan made the Inca capital at Cuzco "look like a rude village of peasant farmers," according to Field Museum assistant curator Michael E. Mosley.

The treasures of Chimor suggest a life rich with ceremony and even celebration. We have no way of knowing the exact purpose of the elaborately sculpted *tumi* knife with its crescent blade, but the soft gold would have been virtually useless for any but ceremonial function. Of the ample golden cup, however, evidence suggests that Chimor noblemen quaffed their maize beer with a gusto equal to that of their Renaissance European contemporaries. The story of how such a rich treasure was preserved for so many centuries is less happy: When a Chimor emperor died, his tomb was fashioned from the palace he had occupied during his reign – including a mass burial of servants to support him.

artistic tradition, stretching back to the earliest days of gold working and reaching a long plateau of achievement during the so-called Nazca* period, from about 200 B.C. to 700 A.D. Nazca art is typical of early Peruvian "corporate styles" that resulted when artists were supported directly by the state, which in turn dictated how their work was to be done. The gold mask, for example, probably reflects some symbolism important to the state religion of the time, and it would probably have been used in some state ceremony, say the burial of an important official.

The most famous of the Nazca artistic accomplishments, however, are huge line drawings created by raking gravel on the desert plain. (The weathered stones are dark on one side, light on the other.) Some of the markings are simple geometric figures, with straight lines that may extend more than 20 miles; others are smaller drawings of birds, spiders and even a killer whale.

Unfortunately, the best-known interpretation of these markings is that of the popular author Erich von Däniken, who writes that extraterrestrial beings used the site as an "improvised airfield for their spacecraft." A lack of archaeological data and the haughty silence of the scientific community have helped von Däniken sell such speculations in 35 languages with total book sales approaching 35 million copies.

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If these treasures of gold, tapestries and ceramics offer a tantalizing glimpse of a unique civilization suddenly halted in mid-career, they also raise a host of frustrating questions for the student of past cultures. Why, since succeeding kingdoms rose and fell by violent conquest, did the ancient Peruvians not use their technology to better military advantage? In the Old World, the development of bronze and iron ages rested largely on the use of these metals for slashing weapons, such as swords. Yet the Peruvians seem to have preferred cruder weapons, although they could easily have produced bronze swords and had imported a few bows and arrows for hunting. And what of the arts themselves – why should elegance and creativity have become so prized in societies lacking so many of the accomplishments associated with the other cradles of civilization?

THE LIGHT IN THE TOMB

How did the ancient Egyptians manage to illuminate the stygian gloom* of their royal tombs? No daylight ever pierced the murky labyrinth of passageways leading to the heart of royal tombs, such as that of Pharaoh Ramses III.* Yet skilled artisans painted murals on these rocky walls so intricate that they must have been executed under quite bright, steady light. What could the light source have been? This riddle is only one of the many vexatious puzzles that have haunted the world's imagination for 25 centuries. How could the Pyramid-builders haul multi-ton blocks of stone for miles, then hoist them to 30-story heights? How did they overcome the tricky math problems attendant on building the pyramidal shape? Nowadays researchers are attacking these ancient questions not only with their imaginations but also with the latest technology. The result has been an outpouring of eye-opening new scientific explanations and shrewd – if often controversial – surmises. Take the problem of how the tombs were illuminated. Did the Egyptians use candles and lamps to provide light during construction and while the art-work was being done? If the answer is yes, then why aren't the walls and murals smudged with smoke? One solution, discovered by guards and guides several centuries ago, was the use of polished metal mirrors placed along the passageways to reflect sunlight into the tombs. The method is still employed. While the mirrors would have been an elegant solution to the lighting problem, Egyptologists today generally think that

the mirrors were at most only an additional light source; the smudging was kept at a minimum by dipping the candles in a salt solution and by adding salt to the oil of the lamps.

An American amateur Egyptologist, Martin Isler, has put forward a fascinating speculation about how the giant blocks – some weighing as much as 15 tons – of which the Pyramids are made were lifted into place. He rejects the notion that ramps were used and believes that ramps of the day would have crumbled under the weight and the wear and tear. He contends, instead, that several artifacts found at two sites in Egypt are in fact the remains of "simple" pulleys. A simple pulley does not involve a wheel but is any object grooved for rope. The artifacts Isler has in mind are carved from red basalt and have grooves that appear to be intended to guide three ropes side by side. Until now, it has been believed that the principle of the pulley was unknown in Egypt. If Isler is right, one of the great mysteries of Pyramid construction may have been solved.

And still the revelations come. Lately, an American electronics engineer named T.E. Connolly has tackled the mystery of the Pyramids' mathematically precise construction. The base of the Great Pyramid of Cheops covers 13 acres, yet its sides vary in length by no more than 7.9 inches. The sides are almost perfectly aligned, north-south and east-west. But the most puzzling of these measurements involves the apparent use by the architects of that schoolchildren's bugaboo the mathematical symbol *pi* (π), which stands for the ratio of the circumference in many Pyramids of a circle to the circle's diameter.

All evidence indicates that the Egyptians had only an approximate knowledge of *pi*, yet the ratio of the height to the base circumference is precisely one-half *pi*. How can this be explained?

The height of a Pyramid, Connolly says, was probably measured in cubits* (a term that occurs frequently in the Bible). Originally, a cubit was the distance between a man's elbow and the tip of his longest finger. But in time the so-called royal cubit was standardized to 52 centimeters (about 20 inches).

Connolly, however, thinks there was an alternative kind of measurement that explains the Egyptians' use of the enigmatic *pi*. He supposes that instead of measuring a Pyramid's base dimensions with ropes knotted to indicate cubit lengths, the ancient builders used a cylinder-shaped drum and simply rolled it along the base of the Pyramid. By counting the number of drum revolu-

tions they could easily determine linear distances. The diameter of such a drum might quite naturally have been in their familiar measure, cubits.

Obviously, the length of such a "rolled cubit" is much greater than the standard 20-inch cubit. In fact, the rolled cubit is equal to the circumference of a circle whose diameter is a standard cubit. Thus, by using a rolled cubit the ancients incorporated *pi* into their calculations without ever realizing it!

Connolly next imagines that architects would have chosen a simple ratio of Pyramid height to width. He assumes a 4 to 1 or 3 to 1 ratio between the height of a Pyramid and the distance from its center to the edge of the base. This proportion being used, the height can be represented as 4 x *n* cubits (*n* is the number of cubits), and the circumference of the base as 8 x *n* *pi* cubits. When these figures are reduced, the proportion turns out to be one-half *pi* – exactly the ratio of the Pyramids' dimensions that has mystified the scholars for so long!

Connolly further points out that if the 4 to 1 ratio were used, the resulting angle of elevation in the Pyramid would be 51 degrees, 52 minutes – an unlikely angle to choose, yet precisely the one found at the large Pyramids. Connolly's ingenious solution thus provides an answer to two abiding mysteries: How could the ancients have used the figure *pi* without knowing they were using it, and why did they select a particular angle of elevation in designing their Pyramids?

Another riddle concerns the very shape of the Pyramids. The pyramidal form was popular in the ancient world; pyramidlike structures can be found in Mesopotamia and Central America. Whatever the reasons for the form, it poses peculiar difficulties from an engineering standpoint: The edges of the structure must be perfectly aligned from the start of construction, or they will not meet in a single point at the Pyramid's top.

The noted British physicist Kurt Mendelssohn has raised a telling question: Without modern surveying equipment, how could the ancients have pinpointed the apex-to-be, several hundred feet in the air, and built steadily toward it? Even an error of 2 degrees would have meant a mismatch of *45* feet at the apex of huge Pyramids such as those at Giza.

Mendelssohn argues that some sort of central core must have been the first stage in any Pyramid design. That way, a marker

could be planted at the core's top to guide the alignment of the edges.

A novel research tool – the hot-air balloon – has been introduced to Egyptology by the University of California, Berkeley, Theban mapping project. The tombs at the site of the ancient city of Thebes* (near modern Luxor) are perhaps the most important archaeological site in Egypt, and a team under the direction of Kent Weeks is mapping them for the first time. During 1982, two hot-air balloons carried archaeologists aloft to study tombs in the walls of the Valley of the Kings and the Valley of the Queens that can otherwise be reached only by rock climbers.

Other unlikely devices are also at work. Cosmic ray detectors are being used to search out hidden chambers in the tombs. Meanwhile, physicists, engineers and mathematicians are already busy reviewing the models developed by Egyptologists and archaeologists and pointing out discrepancies and inconsistencies in some of the hypotheses. Clearly, scientists, relying on a combination of informed imagination and modern research techniques, will be playing an ever greater role in the quest for solutions to the riddles and anomalies of ancient times.

ANCIENT EGYPTIAN SKY MAGIC

"Only in the East, where six hundred million human beings live, is it possible to found great empires and realize great revolutions." Thus wrote Napoleon Bonaparte, and in the spring of 1798 he set out for Egypt with a force of 38,000 men and 175 civilian "savants".* From this otherwise rather disastrous expedition came the first great work on Egyptology, the huge, multivolume *Description de l'Egypte.*

The obelisks, the Sphinx,* the great pyramids – these excited the curiosity of the Europeans who were for the first time really encountering the mysteries of ancient Egypt. And then there was Dendera, an enormous, partly buried temple lying just west of the Nile about 300 miles south of Cairo. Napoleon's troops were overwhelmed by the spectacle when they reached Dendera on May 25, 1799. Its walls were chiseled with basreliefs and even more mysterious hieroglyphics, but on its ceilings was something wondrously recognizable and familiar: the signs of the zodiac.*

A great circular zodiac, about $1\frac{1}{2}$ meters in diameter and forming the principal part of the ceiling of one of the associated

chambers, aroused some of the greatest interest, for it had all the makings of a celestial planisphere. The savants carefully sketched it, and their large engraving is one of the finest plates in the *Description* as well as one of the most handsome (though not perfectly accurate) renditions ever made of this zodiac.

When the existence of the Egyptian zodiacs became known, and particularly after the circular zodiac itself was brought in 1820 to the Louvre in Paris, a flood of articles debating the work's great antiquity swept through the learned journals of Europe. Some argued from the zodiacal signs shown in the solstitial positions that the stone dated from 4000 B.C. Others identified it with the star chart supposedly seen by Eudoxus* in Egypt, and dated it 1300 B.C. Abbe* Halma, the redoubtable translator of Ptolemy* into French, thought he saw within the zodiac evidence for a pair of solar and lunar eclipses dating from 364 B.C.

It must have been quite a shock when in 1822 Jean-Francois Champollion* announced that he could read the hieroglyphs for AOTKRTR in association with the circular zodiac temple, and that the title "Autocrator" had been used only by the emperors Claudius* and Nero* in the first century A.D. In 1828 Champollion had a chance to visit the temple itself. So eager was his party to go ashore that they pushed their way through the grass and brush under the light of the full moon. His excitement registers even in the calmness of his words: "I will not try to describe the impression that the temple, and particularly its portico, made on us. ... We stayed there two hours, filled with ecstasy." Champollion quickly confirmed his earlier conjectures: The temple was not "extremely ancient" as the Egyptian commission had concluded, but less than 2,000 years old. Although begun in the Middle Kingdom* and extended by the pharaohs Thutmose and Ramses,* the temple had received its final form only after Alexander the Great.*

Despite its status as one of the first recognizable ancient Egyptian depictions, and despite the magnificent deciphering of the hieroglyphics by Champollion and his successors, the Dendera zodiac has proved to be one of the most intractable pieces of lore. It is still puzzling Egyptologists. Although the zodiacal constellations are quite evident, most of the other symbols remain undecipherable.

Within the zodiac the hippopotamus and the front leg of a bull (or ox) are most conspicuous; beyond it to the south are a variety of gods, animals, and an outer boundary of 36 timekeeping

groups.* The last are called the decans (from the Greek *deka* for 10), since each one is roughly 10^0 wide. In 1856 the German scholar Heinrich Brugsch successfully read the names of the five naked-eye planets, which are scattered throughout the Dendera zodiac according to their astrologically most propitious places. Since then further progress has been tediously slow.

The Dendera zodiac proves to be one of the most recent in Egypt. On earlier Egyptian depictions of the sky the zodiac is entirely missing. The explanation is natural enough: The 12 zodiacal signs are a Mesopotamian invention, coming to Egypt from Babylon a few centuries before Christ. The superstitious artists at Dendera added the new constellations but didn't throw anything else away, leading to the result that some parts of the sky were doubly represented. It is no wonder that attempts to match the Dendera circular zodiac directly against a modern star chart are doomed to failure.

The liberties taken by the ancient Egyptians in arranging their sky figures are easily seen by examining the unfinished tomb of the nobleman Senmut (about 1473 B.C.). Its ceiling displays an astronomical representation that is the oldest work of its kind. Here stands a fantastic array of figures: Hippo,* Man, Lion, Croc, and others. Strikingly, the crocodile can be seen in two versions: a finished pose next to the smiting man's fist, and an earlier sketch, barely peeking through, showing Croc in a horizontal pose. In other words, the artist chose a symbolic representation, not a detailed mapping of the sky.

It has always seemed to me astonishing that a major way of looking at the sky for at least two millennia, by one of the great civilizations of the past, has now been almost entirely lost to us. On the other hand, when we realize how inexact the depictions of the constellations are, perhaps we can feel lucky that even part of this tradition has been securely interpreted.

What have we learned about this ancient cosmology? The Egyptian sky can be divided into two main sections. The northern constellations are those north of the ecliptic,* or possibly north of the Milky Way.* The southern constellations include the series of timekeeping decans that have given rise to our 24-hour division of the day. According to the monumental *Egyptian Astronomical Texts* of O. Neugebauer and Richard A. Parker, only three ancient Egyptian configurations can be identified with any certainty: the Big Dipper,* shown as the foreleg of a bull and named Meskhetiu;

Sirius,* represented as the goddess Isis;* and Orion,* represented as the god Osiris.*

The remarkable symbolism of the Egyptian sky is well represented by Meskhetiu. On Middle Kingdom coffin lids and on the very late Dendera zodiac, this figure is shown as the foreleg of a bull. Indeed, the stars of the Big Dipper can be envisioned as having such a pattern. On Senmut's ceiling, however, the constellation is depicted as the entire front part of a bull with four very atrophied legs.

The shape of the Big Dipper is also like that of the adz, a sculptor's tool with a sharp blade at right angles to its handle. In Egyptian society the sculptor occupied a special place. With his tool he could make statues, and with the proper magical incantations such images could be brought to life in the afterworld. Thus, a standard part of the Egyptian death ritual was accomplished by a god wielding an adz before the mummy, the "opening of the mouth"* ceremony. The scene is beautifully shown in the famous tomb of Tutankhamon,* where the dead pharaoh's successor, Ay, holds the adz before the mouth of Tutankhamon's mummy. The symbolism continues on the stand in front of Ay, where an adz is neatly stacked with the foreleg of a bull.

The equation between the sculptor's magical adz and the foreleg of the bull is even more explicit in a number of other tomb scenes. One example occurs in the tomb of Rekhmere, where one panel shows the adz used in the opening-of-the-mouth ceremony, and the next panel is identical except that a foreleg replaces the adz. Clearly the artists were covering all bets,* making sure that the sky symbol would be brought correctly into the tomb, if not in one way, then in the other. I have been told by archaeologists in Upper Egypt that model adzes made of meteoritic iron have been found in some tombs.

Of all of the modern Egyptologists who have probed the mysteries of these ancient depictions, Virginia Lee Davis has perhaps been the most successful and certainly the most ingenious. For example, she has noticed on the stand in the Tutankhamon mural not only the two representations of the Meskhetiu (the foreleg and the adz) but also the feather, the sign of Maat.* This goddess, who represents the natural order of the universe, was the sun-god's starry daughter. Her hieroglyph is a trapezoid, symbolic of the banks of the Nile and also the shape of the constellation Canis Major,* the asterism that stands on the banks of the Milky

Way. Can this be another magical sky symbol in the Egyptian scheme? She has also noticed that Isis (Sirius) and Osiris (Orion) are often depicted as standing in boats, perhaps on the Milky Way Nile, and she suggests an identification between the Ship decan* and the Great Square of Pegasus.*

"Of the northern constellations, the texts say that they form 'a group of fighting-faced characters,'" she writes. "Artistic convention tends to square up their configuration, but their ferocious forms remain." The lion, the crocodiles, the smiting man, the bull, and the scorpion are, indeed, a ferocious lot! "The texts often mention two claws or adzes or fingernails that 'hack up the celestial mansion.*'" One of these, Davis points out, is transformed into a foreleg and then into a complete bull; could not the other be similarly transformed from a jackal's small digging hoe, to a falcon's claw, and then to a falcon-headed man? Thus, she argues, both the Big and Little Dippers could be the celestial adzes chasing each other around the celestial pole (which was in Draco* 4,000 years ago), and the falcon-headed man could be Draco with Ursa Minor, the Little Dipper.* Using similar lines of argument, she identifies the Smiter* with Gemini, the Man-with-the-Ropes with Bootes,* and the Lion with Leo.

Although it is presently impossible to verify any of these fascinating but speculative identifications, they seem plausible. Further interpretation of texts not now taken as astronomical may eventually bring a much greater understanding of the Egyptian sky mysteries.

HISTORIC COMETARY TALES*

Halley's comet* and the countless others that blaze across the night skies have had a profound effect on history. They have influenced literature, art, religion and warfare, perhaps even evolution and the very beginning of life. For centuries comets were widely regarded as harbingers of disaster, omens of death, pestilence, wars, drought, earthquakes and floods. Modern science has dispelled many of these myths, but some persist today. In a bizarre twist, scientists themselves are beginning to attribute great cataclysms of the past to what the ancients called "hairy stars."

The Chinese, who recorded the appearances of comets as early as 613 B.C., thought that the glowing specters were celestial brooms wielded by the gods to sweep the heavens free of evil,

which then fell to earth, bringing wars, floods, droughts and other disasters.

Comets have borne that stigma ever since. Aristotle* thought the night visitors were earthly "exhalations" that rose into the atmosphere and were ignited in fiery upper regions, causing drought and high winds on earth. On its pass in A.D. 66, Halley's, in the words of the Jewish historian Flavius Josephus,* "hung like a sword in the sky" and presaged the fall of Jerusalem in A.D. 70. Halley's return in 451 was thought to portend the defeat of Attila* the Hun's armies at Châlons by Flavius Aëtius.*

Comets came to be so closely associated with the deaths of great leaders, says Astronomer Donald Yeomans, that historians waited expectantly for a celestial sign every time a monarch died. When the Emperor Charlemagne* expired in 814 and no comet appeared, Yeomans says, "historians made one up and inserted it into history."

Halley's appearance in 1066, complete with a forked tail, was stitched into the renowned Bayeux tapestry, which depicted the Norman Conquest. Behind the comet's tail, above six cringing and pointing figures (apparently Saxons), are the words THEY ARE IN AWE OF THE STAR. While the Saxons may have attributed their defeat to the comet, William the Conqueror probably for ever afterward considered comets to be good omens. In 1301 Halley's so inspired the Italian artist Giotto* that in his famed nativity scene* he portrayed the star of Bethlehem* as a comet. The comet heralded the descent of Turkish armies on Belgrade in 1456, and in the same year was blamed for the birth of two-headed calves.

Shakespeare's works reflect the cometary myths of the late 16th and early 17th centuries. In *Julius Caesar*, for example, the Emperor's wife, after seeing a comet, warns the noblest of Romans: "When beggars die there are no comets seen; the heavens themselves blaze forth the death of princes." But in the same play, as Cassius and Brutus plot Caesar's assassination, Cassius says, "The fault, dear Brutus, is not in our stars, but in ourselves."

The winds of change, however, were slow to reach Boston, where in 1682 the Puritan minister Increase Mather,* awestruck by the same comet that inspired Edmond Halley, asked the members of his congregation if they would continue their evil ways "until God sends his arrows from heaven, to smite them down into the grave."

Indeed, superstition about comets has persisted into 20th

century. As Halley's came into view in 1910, some residents of Chicago prepared themselves for death by cyanogen-gas poisoning when, as it was widely predicted, the earth passed through the comet's tail.

The 20th century has spawned some notions about comets that seem even more fantastic than the ancient myths. British astronomers Fred Hoyle and Chandra Wickramasinghe have suggested that over hundreds of millions of years, primitive biological entities, perhaps even cells, developed within some comets. These may have been delivered to the earth as the first form of terrestrial life by a comet that impacted billions of years ago. Francis Crick,* co discoverer of the DNA molecule's structure, and Organic Chemist Leslie Orgel have proposed a less fanciful theory: Comets brought with them the chemical percursors of life, in the form of amino acids and other molecules.

That comets do occasionaly strike the earth seems certain. Some scientists think a tiny chunk of a comet, exploding in the atmosphere above Siberia in 1908, caused a tremendous blast and fireball in the Tunguska region, felling trees in a 200-sq.-mile area and knocking the nearest residents (40 miles away) off their feet.

During the past few years, evidence has been accumulating to support physicist Luis Alvarez's* theory that a giant comet (or asteroid) struck the earth 65 million years ago, pulverizing a huge area and spewing so much debris into the atmosphere that the skies darkened for months, temperatures dipped, and much of the life on earth – most notably the dinosaurs – perished. It was the demise of the dinosaurs, many evolutionists believe, that enabled man's tiny mammalian ancestors to emerge from hiding, occupy the environmental niches left vacant by the great beasts and other destroyed species, and evolve into Homo sapiens. Impacts by comets may have been responsible for mass extinctions of life at other times in the past. And scientists are certain that it can happen again.

WILL THE UNIVERSE EXPAND FOREVER?

Which is the way the world ends? Is it a bang or a whimper? T.S. Eliot* opted for the whimper, but he did so largely on moral and theological grounds. Robert Frost* couldn't decide between fire and ice.

It appears that on purely scientific grounds cosmologists can't

completely decide either. Will the universe continue to expand forever, getting thinner and thinner and adiabatically* colder until the game ends with a frozen whimper? Or will the expansion eventually stop, and a collapse ensue to a hot little ball in which saint and sinner alike will be barbecued? A "neighbourhood meeting" was held in Cambridge, Mass., by the Smithsonian Astrophysical Observatory* to discuss the question. No overwhelming consensus emerged, and none was really expected. In the opinion of George Field, the organizer of the meeting, the question may never be completely resolved.

The reason is that there are so many uncertainties and loose ends in the data, and so many assumptions to be made in drawing conclusions from them, that two equally competent observers can come up with virtually opposite conclusions from essentially the same data.

James E. Gunn of the California Institute of Technology and P.J.E. Peebles of Princeton University* came to significantly different values of a crucial parameter in the argument, the ratio of the universe's actual matter density to the critical density required for closure. If the universe is dense enough, the mutual gravitational attraction of its parts will bring the expansion to a stop and reverse the motion. If the ratio of actual density to critical density (called omega) is one or greater, there is closure; if the ratio is much less than one, the universe is open.

Both Gunn and Peebles use essentially the motions of galaxies and clusters of galaxies to deduce gravitational effects and therefore density. Gunn comes up with an omega equal to 0.1; Peebles makes it 0.7. Given the uncertainties, this is a factor of about six difference. Not only is that large: Gunn's determination militates in favour of an open universe; Peebles' comes close to a closed one.

Field asked the two men how come they differed so widely. Gunn replied that the mass-to-luminosity ratio of galaxies was at stake. It is assumed that a galaxy's mass is related to its luminosity, and Gunn says his figure is 200 while Peebles used 400 or 500. Gunn also says he considers the luminosity density of the galaxies to be less than what Peebles thinks it is. Combining the two discrepancies gives the factor of six.

"That doesn't sound like my calculation," Peebles responds. "I didn't mention M/L^* or luminosity density." He believes the traditional figures applied to those concepts are unreliable, and he

of his analysis, he insists, in a way that avoided recourse to them. Thus, the two men are even at cross purposes in discussing their differences.

There are a number of other tests both global and local that bear on omega or the deceleration parameter q^o which is related to it. They include such things as counting distant objects in a given volume of space and comparing the number to that of nearer ones; using the apparent sizes of certain objects as yardsticks to measure the curvature of space; comparing present to primordial abundances of certain elements to get a handle on the density.* All these are complicated measurements requiring difficult data reduction;* more detail on the ways and means will be considered in subsequent articles along with the promise of future improving techniques.

Meanwhile it should be remembered that the whole discussion rests on the axiom that Edwin Hubble* was right. In studying galaxies Hubble noticed that the light of each was always redshifted.* He assumed this was a Doppler shift* arising from a difference in velocity between our galaxy and the distant one. Since all the differences were positive, every galaxy seemed to be flying away from every other galaxy.

So Hubble postulated the expanding universe and derived a relationship between distance and redshift that goes as a simple proportion, a linear relation. At the meeting was one devil's advocate,* a mathematician from the Massachusetts Institute of Technology named I.E. Segal, who proposes that this emperor has no clothes.*

The problem on which he chooses to bite* is the so-called Hubble diagram. The apparent brightness of galaxies also varies with distance, so it should be possible to graph apparent brightness against redshift and get a nice clean line representing Hubble's linear relationship. In fact, the diagram comes out a broad smear. Astrophysicists explain this by saying that the galaxies are wrong, not Hubble: all galaxies don't have the same intrinsic luminosity so the luminosity-distance relation is not exact. Segal says let's forget this and simply apply statistics to the data as they stand. He finds the graph best fits a second-order or squared relationship rather than Hubble's linear one, and he asserts that the expanding universe hypothesis is all wet.*

The assertion was greeted by the assembled astrophysicists with a chill as cold as intergalactic space. After the formal close of

the session, a heated argument ensued between Segal and several prominent astrophysicists over a number of points, including whether the galaxies whose redshifts are known are a fair sample for statistical analysis.

It's a good question. Of the uncounted galaxies in the sky, only 3,000 have had their redshifts measured, and most of these have been special-interest items. A systematic field of redshifts, those in a given volume around our own galaxy, which would make a regular sample, extends only to 200. One of the great future needs is a much more exhaustive redshift catalogue. Getting it with ground-based observations is difficult, because each measurement is time consuming and must compete for telescope use with more glamorous observation programmes. A not entirely facetious suggestion by Herbert Gursky of the Smithsonian's Center for Astrophysics is to put up an orbiting telescope that could do them wholesale at a rate of 25,000 a year. In contrast Mt. Palomar* does about 20 a year. If all of Palomar's time were used, denying the world's largest telescope to other investigations, it might increase that number by a factor of about 10.

ASTRONOMERS SEEK 'NEMESIS'* TO BACK UP EXTINCTION THEORY

With bounding curiosity and a theory to establish, astronomers are searching the northern skies for a star they call Nemesis, a small, dim companion of the Sun. Nemesis may not exist, but the quest goes on and soon will expand to the southern skies.

Other astronomers, similarly inspired, have revived interest in Planet X, the putative body that has long been sought beyond Neptune and Pluto. They are examining new data for evidence of such a planet's existence.

Some of the best minds of science are thus at play these nights and days in a provocative and promising attempt to understand how the heavens may hold the answer to what happened to the dinosaurs and, more important, what caused the mass extinctions that, according to new fossil evidence, seem to afflict the Earth every 26 million years or so.

The informed imaginations of these scientists run to unseen heavenly forces, a star or planet yet to be discovered, that trigger a hail of comets through the solar system. Some of the comets col-

lide with the Earth, and the collisions fill the atmosphere with dust, blotting out sunlight for months and causing global death.

For several months the possibility that has stirred the greatest interest and debate is the one involving the Sun's theorized companion star, Nemesis (or "death star," as scientists sometimes call it).

Some skeptical scientists have questioned whether Nemesis could maintain an orbit sufficiently stable to make a close approach to the solar system precisely every 26 million years. But proponents, while modifying the hypothesis somewhat in an effort to satisfy these objections, insist that the Nemesis hypothesis could still hold the key to the mass extinctions.

Richard A. Muller, a professor of astronomy and physics at the University of California at Berkeley, said: "It's been demonstrated beyond all doubt that the orbit of Nemesis is sufficiently stable to do what we said the star would do. I think the case in favor of Nemesis has become much stronger."

Dr Muller, with Marc Davis of Berkeley and Piet Hut of the Institute for Advanced Study at Princeton, proposed the Nemesis hypothesis a year ago in response to a stunning new paleontological study of mass extinctions.

In the 1970s, Walter Alvarez, a Berkeley geologist, found a layer of clay in Italy that contained unusually large amounts of the rare element iridium, more usually found in extraterrestrial bodies like asteroids. This led to the theory, advanced by him and his father, Luis Alvarez, a Nobel Prize-winning physicist, that an asteroid struck the Earth 65 million years ago, creating months of darkness that wiped out the dinosaurs and countless other species.

In 1983, after an exhaustive study of the fossil record going back 250 million years, J. John Sepkoski and David M. Raup, paleontologists at the University of Chicago, reported a previously unrecognized pattern to mass extinctions. They appeared to occur almost fail every 26 million years.

At first, Luis Alvarez decided the Sepkoski-Raup hypothesis was wrong. To check himself, he asked Dr Muller to play devil's advocate. In so doing, Dr Muller became persuaded that the Sepkoski-Raup hypothesis was right.

Dr Muller and his associates then came up with a hypothetical explanation that could account for such regular extinction patterns.

Many stars, they knew, come in pairs, a smaller star orbiting dominant one or two relatively equal bodies orbiting a com-

mon center of gravity. In astronomy these are called binary systems. What if the Sun had such a companion? Such an object, if far away and very small, only 5 to 10 percent as massive as the Sun, could easily have escaped notice.

The companion star, they reasoned, could follow an eccentric orbit, about one and a half times as long as it is wide, that would take it far out, as much as three light years from the Sun, and bring it back to the vicinity of the near solar system only once every 26 million years. It would make its closest approach out beyond the known planets in the cloud of comets that is believed to exist there.

No one has seen this comet cloud, but astronomers assume from the trajectories of known comets that they come from the region known as the Oort Cloud.*

As the companion star passed in or close to the cloud, according to the hypothesis, its gravitational force would jostle hundreds of thousands of comets and send many careering toward the Sun, affecting the planets.

The last time this must have happened, judging by the Sepkoski-Raup interpretation of the fossil record, was about 13 million years ago. Thus, Nemesis would now be at the farthest point in its orbit, due back in another 13 million years.

Since April, astronomers at the University of California's Leuschner Observatory* have been using a 30-inch telescope in an attempt to detect any stellar object whose motions might betray its likelihood as a solar companion. In March, telescopes farther south are to begin looking at other parts of the sky.

Daniel P. Whitmore, an astronomer at the University of Southwestern Louisiana at Lafayette, came forward with a similar companion-star hypothesis at about the same time that Dr Muller's group did. Now Dr Whitmore has conceived of an alternative hypothesis that is to be published soon in Nature.

He looks to Planet X as the possible heavenly force that perturbs the Oort Cloud every 26 million years. Such a distant planet has been predicted on the basis of the apparent wobbling orbital course of Uranus and Neptune, evidence of possible gravitational tugging from an unseen object.

According to the Whitmore hypothesis, developed with John Matese at Southwestern Louisiana, the planet would orbit the Sun once every 1,000 years in a region far beyond Pluto and in the inner fringe of the Oort Cloud. Being fairly close to the Sun, it would

have a stable orbit. The planet would have long ago cleared out a comet-free gap in the cloud.

But Dr Whitmore thought of a way in which the planet could cross the comet disk twice every 52 million years to cause a destructive fall of comets on Earth: the planet's orbit could be tilted with respect to the plane of the other planets and the inner comet disk. And because of perturbations from other planets, Planet X's orbit as a whole could precess, or slowly rotate, so that, even though it makes a close approach to the Sun once every 1,000 years, only twice in a 52-million-year rotation period would it actually cross through the cometary disk.

Since Planet X, if it exists, must be quite dim, astronomers expect that their best chance to prove its existence would be heat emissions detected by infrared telescopes. The infrared data for that region of the sky are now being processed.

HOW DUMB WAS THE DINOSAUR, ANYWAY?

Dinosaurs just aren't what they used to be.

The stock picture of a coldblooded behemoth,* sluggish in thought and action, is extinct, its death as sudden as the unknown cataclysm that wiped out the dinosaurs themselves about 65 million years ago. In the new, spruced-up image, dinosaurs were agile and fast. They nurtured their young. They were well adapted to their environment. They were warmblooded. Perhaps some even bore live young. Far from being "an evolutionary sideshow, a menagerie of irrelevant dead ends," argues Robert Bakker, a paleontologist at the University of Colorado Museum, and author of a new book, **The Dinosaur Heresies**, the creatures altered the course of evolution in vital ways that are felt even today.

Such dinosaur revisionism is shaking the dust off fossil collections around the world. And Bakker is one of the prime shakers. Styling himself as a heretic who dares to challenge the dinosaur orthodoxy, Bakker has piled one startling notion upon another. All of his arguments are variations on one theme: Dinosaurs were far more advanced than ever imagined. Their extinction was due not to stupidity and ineptitude but to chance, and things could have turned out very differently.

Some of his ideas have caught on. "Bakker's on safe ground when he says they were active animals," says Harvard paleontologist W. A. Crompton. "They are not built as sluggish ani-

mals – they're built like ostriches, antelopes, the bigger ones like elephants. They could move at a decent pace."

But Bakker has provoked a stormy reaction from many paleontologists who say the issue is not orthodoxy vs. heterodoxy, but hard science vs. flights of fancy. And they worry that Bakker's speculating has gotten out of control, especially when he talks of a 6-ton tyrannosaur* speeding across the ground at 45 miles per

hour and live-born brontosauruses.* "A lot of these are not new discoveries – they're simply new ideas," says Nick Hotton, curator of vertebrate paleontology at the Smithsonian Institution. John Ostrom of Yale* believes the new school of paleontologists is asking good questions, but cautious about "going beyond the actual evidence."

Bakker's recent publication of **The Dinosaur Heresies** has intensified the storm. The book, wrote one reviewer in the respected British journal **Nature**, makes those who "don't happen to share Bakker's views about dinosaurs appear to be bumbling and unimaginative drones, so devoid of intellectual activity that they are barely distinguishable from the fossils they study."

Bakker's assertion that brontosauruses bore their young live may be the most provocative of his ideas. Physics laws limit the size of an egg. For an egg to be much bigger than a cantaloupe,* its shell would have to be so thick that the hatchling could never force its way out; nor could oxygen get in. So Bakker argues that a 25-ton brontosaurus should start life as a 200-pound baby born live rather than a cantaloupe-size, 10-pound hatchling. Live birth, in turn, implies a degree of parental nurturing rare in modern reptiles, most of which dump large numbers of eggs and let the hatchlings fend for themselves. While the evidence is circumstantial, Bakker feels it is convincing. "The brontosaurus is unusual in having a huge pelvic outlet," he says. "And we never find a brontosaurus smaller than 200 pounds."

On the other hand, almost no baby dinosaurs of *any* species, including confirmed egg layers, have been found. The only hard evidence has come from Jack Horner, a paleontologist at the Museum of the Rockies* at Montana State University, noted for his knack of finding remarkable fossils. Combing Montana's northeastern plains, he located what seem to be dinosaur nests. They contain fossil hatchlings, and even intact eggs of a duckbilled dinosaur* he has dubbed "maiasaur."

"O.K., but what do they prove?" asks Alan Feduccia of the University of North Carolina. To the new school, the nests are more proof that dinosaurs nurtured their young. The crushed eggshells, says Horner, show that the hatchlings occupied the nests after hatching out, so they must have been tended by parents. Feduccia counters that "crocodiles and alligators build nests and care for their young," too, so Horner's nests say nothing profound about how dinosaurs lived.

The revisionists' basic tenet holds that dinosaurs were warm-blooded. The question of warmbloodedness is central to any debate about dinosaurs, Bakker says, because it "touches every aspect of the critter.*" Because they regulate their own temperature, warmblooded animals can tolerate a wider range of climates. They can remain active in cold weather or at night and can grow faster. More generally, warmbloodedness is a sign of an evolutionary sophistication that dinosaurs were never thought to possess.

What Bakker calls the "smoking gun" in support of warm-bloodedness is that dinosaurs dominated the earth for 100 million years while mammals were "just hairballs." These days, Bakker

observes, "if you go to the tropics, there are no big, active land reptiles. All the big, successful critters are warmblooded."

"It doesn't hold up to critical analysis," counters Richard Taylor, a biologist at Harvard who has studied how animals gain and lose energy by measuring their respiration, temperature and heat flow as they exercise on a treadmill. "The advantage of high body temperature is not speed. You can build a cold muscle that operates as fast as a hot muscle." Fish, he points out, are quick and mobile at temperatures down to 40 degrees. "What's important," says Taylor, "is that you can't build a muscle that operates over a wide *range* of temperatures." A warmblooded animal can keep its body close to the temperature its muscles were "designed" to operate at. That temperature should be high enough so that when a given animal works hard, it is hotter than the surrounding air and can quickly shed excess heat.

That creates a special problem for a dinosaur. "If you take something as big as a brontosaurus and you assume it has a constant body temperature and a high metabolic rate, the amount of heat it would generate would literally cook the animal," says Crompton. The largest warmblooded land animal today – the African elephant – can dump its excess heat only by dint of a special "heat exchanger" – its large floppy ears. Then there is the food problem. A 6-ton elephant spends up to 15 hours a day finding the 300 pounds of food that it needs to keep its warmblooded metabolism stoked up. A warmblooded 25-ton brontosaurus would have to consume a ton a day – "a feat that seems inconceivable," says Ostrom, "given that the creature's head was about the size of a horse's but lacked the horse's grinders."

For all the excitement generated by the new ideas, some paleontologists wonder about the relevancy of the fierce debate. The warmblooded argument, suggests Feduccia, "may be somewhat moot." An animal the size of a large dinosaur would change temperature only very slowly – giving it the chief advantage of warmbloodedness without the high food budget. And, Hotton points out, small dinosaurs, which would have lost heat more rapidly, were rare. "The smallest dinosaur is bigger than 80 percent of living mammals."

Perhaps more to the point, many of the arguments may be unresolvable, the truth forever gone like the dinosaurs. Says Feduccia: "All these things are basically lost to the past."

Where Have All the Dinos Gone?

Of all the mysteries of the dinosaurs, none has generated more speculation than why the beasts vanished some 65 million years ago. Increasingly, the evidence points to an explanation that's literally out of this world:* A giant meteor or comet that crashed into the earth, blasting huge clouds of debris aloft. With sunlight choked off for months, plant life would have dwindled, robbing the dinosaurs of their chief food supply. Small omnivorous mammals could have gotten by with scavenging.

The impact theory was suggested seven years ago by physicist Luis Alvarez of Lawrence Berkeley Laboratory,* who found high concentrations of the element iridium in clay throughout the world, deposited just when the dinosaurs vanished. Iridium is rare on earth but is richly concentrated in comets and meteors. That suggested an impact occurred, and that its force was enough to eject a dust cloud that settled over the globe.

New researchers at the U.S. Geological Survey in Denver have bolstered Alvarez's theory. Bruce Bohor and co-workers examined the crystal structure of quartz particles from the similar clay deposits at seven sites. In every instance, the quartz showed signs of being struck by an enormous shock wave. The only other places such shocked quartz is found are known meteor-impact craters and underground nuclear-test sites.

Volcanic eruptions also give off high concentrations of iridium, and had been suggested as an alternative explanation for Alvarez's discoveries. But volcanoes pack too little punch* to shock quartz grains. A meteor 6 miles across, on the other hand, striking the earth at 45,000 miles per hour, would release as much energy as several billion atomic bombs. The resulting prehistoric nuclear winter could have sent the dinosaur to oblivion.

LANGUAGE EVOLVING PART TWO

Language probably began among the Neanderthals* during the Fourth Glaciation. Modifiers may have preceded nouns and verbs.

Where, when and how did the human language ability originate? Archaeology can provide some of the most relevant answers to these questions. Anthropologist Ashley Montagu, for instance, suggests that a detailed study of toolmaking may yield clues to the

cognitive processes of early humans and to the origin and evolution of language and speech. His thesis is that speech originated in the process of toolmaking, and he says that the variety of tools made by australopithecines* indicates an ability to communicate at a level of abstraction requiring a medium such as speech.

At the New York Academy of Sciences' conference on the origin and evolution of language and speech, he explained how speech and toolmaking were probably tied in with the development of big game hunting – which is much more successful if the hunters can verbally signal changes in logistics and strategies. The three – speech, toolmaking and big game hunting – would probably have evolved with a sort of three-way feedback relationship leading to the further development of each. To verify such a theory, Montagu calls for a "scientific study of tools, a science as it may be called of hoplonology." (*Hoplon* is Greek for tool or implement.)

If the toolmaking hypothesis is correct, then some form of speech could have been in use one or even two million years ago. But a study of tools and toolmaking may not, as Montagu suggests, prove the link between speech and tools. Princeton University psychologist Julian Jaynes, for one, believes that speech was not necessary for the transmission of such rudimentary skills as simple tool use and toolmaking from one generation to another. Indeed, he says, speech may have been a hindrance: "It is almost impossible to describe chopping off flints into simple choppers and hand axes in language. This act was transmitted solely by imitation in exactly the same way in which chimpanzees transmit the trick of inserting vine stems into ant hills to get ants... . In our own culture, it is doubtful if language is at all necessary in the transmission of such skills as swimming or riding a bicycle."

But Jaynes does have a theory of how language developed, and it is based on much more than the archaeological record. Up-to-date inputs from evolutionary theory, learning theory behavioral processes, brain structure and environmental or ecological factors are all considered in his explanation.

When did speech evolve? To answer this and all questions about speech and language evolution, Jaynes says three factors must be taken into account: the survival value of speech, associated behavioral patterns and brain structure.

First of all, he says, we naively assume that speech is always beneficial. This is questionable. If a species is fully adapted to its

ecological niche, it could perhaps be shown that a sudden ability to communicate syntactically would be disastrous. If the communication is vocal, it might attract predators. If by gestures, it might put its users in a vulnerable position (without the full use of their hands). But more important, a new form of communication might detract from the innate signaling mechanisms that have been successful in organizing the social grouping of the species.

It follows from such considerations, says Jaynes, that human language developed only during an era in which some portion of the human population was being persistently forced into new ecological niches to which it was not fully adapted. Any trait as universal in a species as language is, and with as precise a neurological basis as language has, must have developed during an age when it had a great and persisting survival value.

Behavioral patterns must also be taken into account because the ability to use and organize words into sentences must have resulted in very real behavioral changes. Learning theory helps explain this. To look at an object and name it at the same time allows a concentration upon it that otherwise would be absent. A child that can name colors will probably remember and recognize them better and will probably be better at using them. And just as the psychobehavioral development of a child leaps forward with speech, a similar leap must have occurred when humans as a species first developed language. Therefore, says Jaynes, "the development of language will result in behavioral sequelae* whose artifacts we may find archaeologically."

Brain structure is the third consideration. The three cortical areas involved in language (supplementary motor cortex and Broca's area* in the frontal lobe* and Wernicke's area* around the fissure of Sylvius*) are more or less the same in contemporary speakers and may be assumed to have been necessary for the complete development of language as we speak it today. Getting information about the brains of early humans, however, is not easy. Jaynes admits that the validity of his views may rest upon the endocasts of Neanderthal skulls yet to be discovered.

Endocasts (casts of the inside of skulls) are used to estimate the size and shape of the brains that formerly inhabited those skulls. The process has been used for many years, but more precise methods and measurements are now available, and information bearing on Jaynes's theory was presented at the meeting.

"The most striking and consistently present cerebral asym-

metries found in adult and fetal brains," says Marjorie Le May of the Massachusetts General Hospital in Boston, "are in the region of the posterior end of the sylvian fissures – areas generally regarded as of major importance in language function." Le May's work suggests that this asymmetry was present in Neanderthal brains. One skull, the La-Chapelle-aux-Saints* specimen, provides the evidence. If other Neanderthal skulls confirm Le May's conclusion, it may indicate that speech, or at least some of the speech areas of the brain, had begun to develop by the time of the Neanderthals – as Jaynes suggests.

So when did speech evolve? The first factor Jaynes mentioned was survival value. So dramatic a development as speech, he says, had to coincide with significant ecological changes that would have forced severe changes in habits. The most obvious and dramatic ecological changes were probably a result of the great periods of glaciation. Each glaciation lasted about 70,000 years. The middle or coldest parts of each of these periods were 600,000; 400,000; 150,000, and 35,000 years ago. The warm interglacial periods were without sufficient ecological challenge to provide language with a necessary survival value, so Jaynes rules them out as times of speech development.

He further rules out the first two glacial periods because at time the major hominid* populations were still in Africa and moved from the effects of glaciation. The third period is ruled out for other, more subtle reasons. The hominid race at that time, *Homo erectus*, used tools, lived in caves and hunted big game. But the brain of the creature, says Jaynes, had not evolved to the size and structure assumed necessary for the complete development of language. In addition, he says, their tools were too crude and primitive. Jaynes says the hominids of this time (150,000 years ago) "communicated just like all other primates, with an abundance of visual, vocal and tactile signals that were very far removed from the syntactical language we practice today."

That leaves the Fourth Glaciation as the time during which speech evolved and developed. This began about 70,000 years ago, reached its coldest period about 35,000 years ago, and slowly receded to normal by around 10,000 years ago. During this time, the late Neanderthalers were part of a general human line that had great variation, a variation that allowed for an increasing pace of evolution as nomadic tribes traveled over wide distances and into new ecological niches.

"These considerations then," says Jaynes, "fulfill the three constraints we have placed upon the solution." The climate provided a theatre of sufficient selective pressure so that a communication system, such as language, would have considerable value. The behavioral changes were evident in an explosion of new and different tools about 40,000 B.C. And third, the brain, especially the frontal lobes and possibly the speech area, had increased in size and proportion to the extent that a language ability would probably have been neurologically possible.

Where did all of this happen? The same three constraints suggest an answer. The most likely place for speech to have developed, says Jaynes, was in the north temperate zone in a band from France and Spain across Europe, North Africa, the Near East and Asia, and from there spreading southward.

How did speech begin? Once again Jaynes is not at a loss for an answer, though he does caution that he is painting in the broadest strokes possible and notes that what he is describing is an ideal or working model of which there may be variants. It is intended, he says, to provoke a new kind of thinking about the development of language and speech.

Speech may have begun, as Condillac suggested, with the "language of action." It is known that the brain's limbic system is responsible for most of the vocal cries of present-day subhuman primates. The entire vocal repertoires of rhesus and squirrel monkeys, for example, can be elicited by electrical stimulation of points throughout the limbic circuit. This suggests that the vocal calls of early hominids were probably controlled by the limbic system. The transfer of control of vocalization from the limbic system to the cortex had to be an important step in the evolution of speech. Such a transfer would probably have made possible intentional vocalization, as opposed to the instinctive and emotional cries produced by the limbic system.

Ronald E. Myers of the National Institute of Health studies the neurology of vocalization and speech. He reports that lesions in areas of the cortex that correspond to human speech areas fail to impair vocalization in the monkey. This implies that human speech cannot be considered simply as an elaboration of the vocal responses of lower primates (limbic output), but that it evolved quite independently and serves a different purpose.

The area of the cortex that evolved in connection with speech appears to be mainly in the left hemisphere. A possible explana-

tion comes from Horst D. Steklis and Stephen R. Harnad of Rutgers University.* They say there is no evidence of anything like cerebral dominance in most of the lower primates. This was probably also true of the earliest hominids. The first evidence for handedness, they say, comes with tool use and weapon use by the *Australopithecus*. There is evidence that the majority of these tools were chopped by right-handed individuals. The fine motor control of the right hand, as is known, is linked to the left hemisphere of the brain. Advances in toolmaking and fine motor control would have led to further cerebral asymmetry. "Fine motor control being already lateralized," the researchers say, "linguistic elaboration also occurred on the more specialized side."

What ecological pressures were responsible for the switch in intentional signaling from the visual-gestural to the auditory-vocal channel? As population migrated out of Africa into the northern climates, visual signals became less effective for a variety of reasons, says Jaynes. Dark caves and hunting by night made visual signals almost useless. Tool use made it important to free the hands and body for increasingly complicated activities. "It is therefore plausible that incidental vocal signals under these persisting pressures took on the intentional function that was formerly the property of visual signals only. This was a momentous step, and probably had a long evolution which was not complete until the end of the Middle Pleistocene* and the approach of the Fourth Glaciation."

By then, our ancestors may have been ready to begin talking. The first real elements of speech, suggests Jaynes, were the endings of intentional cries first varying simply by intensity and then being differentiated further. Imagine a cave dweller screaming "wahee!" at the approach of a saber-toothed tiger.* The intensity of such a signal would probably naturally correspond to the intensity of the danger – perhaps in its ending phoneme. A tiger far off might result in a cry of much less intensity and develop a different ending such as the more relaxed "wahoo". It is these endings, then, that become the first modifiers meaning near and far. And the next step toward syntactic language would be separating the endings from a particular cry and attaching them to another with the same indication.

The age of modifiers, in Europe, says Jaynes, probably lasted until about 46,000 B.C. This estimate is based on the development of Neanderthal skulls.

After the age of modifiers came the age of commands. Modifiers separated from the cries they modified could have become commands. The new cry of "ee!" shouted to someone could mean "come nearer," while "o!" could mean "go farther." The advantage of such commands to hunting groups is obvious.

Jaynes goes on to explain how inflectional questioning and negation may have developed. He moves from there to the development of nouns (for animals) between 25,000 B.C. and 15,000 B.C. Archaeological data help provide the dates. The age of modifiers coincided with the making of superior tools ("sharper" may have been a useful modifier). The age of nouns coincides with the drawing of animals on the walls of caves. After animal or life nouns came thing nouns. This coincides with the invention of pottery, pendants and ornaments. Names for people came next. Once such names are available, individuals can be thought about or recreated in their absence. This may have developed between 10,000 and 8,000 B.C., when ceremonial graves began to appear. Just as a noun for an animal makes that relationship a much more intense one, so does a name. And when a named person dies, the name still goes on, hence burial practices and mourning.

Jaynes discusses verbs, prepositions, other parts of speech and syntax and presents explanations for how all of them could have developed during the relatively short time span of 70,000 years.

Finally Jaynes compares his theory with that of others: "The main features of the model that I have presented are in contrast to most previous proposals about the origin of language. All previous theories have placed it historically at least a million years ago and its place of origin as Africa.

"... Previous models all emphasize nouns as coming first. But a central feature of the present theory is that modifiers not only preceded everything else, but necessarily had to do so until they were stabilized into commands before they could be relaxed into nouns."

Jaynes's theory, like all others, contains a certain amount of conjecture. But with increasing evidence from a variety of fields (like that presented at the New York meeting), successive theories will contain less and less conjecture. We will know more and more about the nature of language – and all that it implies about the nature of humanity.

The winter of 1976-77 was for most of us a blast of bitterness unparalleled in our memory. Yet, according to many weather-watchers, the worst is yet to come.

You may find it hard to imagine anything much harsher than last year: Upstate* New York groaned under 26 feet of snow and Buffalo was paralyzed by a massive 15-foot snowfall. Chicago, Pittsburgh, Jacksonville, Nashville, and dozens of other cities recorded their lowest temperatures ever. Indianapolis was 18^0(F) below zero for weeks. Chesapeake Bay was jammed with five feet of ice and ships could leave only behind ice-breaking tugs.

Like a Biblical forecast of doom come true, half the world reeled under a barrage of weather-related blows; snow blanketed the USSR, creeping further southward than at any time in history. Hungary and Czechoslovakia, on the other hand, were uncommonly warm. Britain bent under blizzards, Australia fought brush fires, and Brazil's normally busy São Francisco River became unnavigable.

We know that even within recorded times the climate has been quite different from today's. At one time Greenland really was green, and England was a major producer of wine.

But from about 1550 to 1850, Europe and North America suffered through a "little ice age." In an almost perpetual winter, plagues, crop failures, famines, and epidemics were common. England's cold was so intense and pervasive that the Thames froze repeatedly and Londoners held winter fairs and even roasted oxen on the ice.

The "Little Ice Age" was followed by the warm period in which we have grown up and relatively luxuriated. But, imperceptibly, over the last few decades our climate has begun to undergo another major change.

Indicative of the primitive level of weather-forecasting, perhaps, is the lack of a consensus on where the climate is headed. But few scientists today question that a major turnaround is in progress and that, for the majority of the globe's inhabitants, the turn will be for the worst.

"Some say the world will end in fire,* and some say in ice," wrote Robert Frost. He could have been referring to today's climatologists. They offer two frightening prospects:

The first is that the earth will become considerably warmer

and that the polar ice caps will melt. The second is that, on the contrary, we are headed for potential – even sudden – disaster in a much colder era.

The warming theory is expounded by a respected Soviet academician, Mikhail I. Budyko.* He points to winters in Scandinavia which have been, on the whole, mild in recent years; to temperatures in Australia, New Zealand, and Antarctica, which have risen slightly; and to records showing that at 40 scattered sites in North America the thermometer either has stayed the same or has risen over the previous six years – before last winter, that is.

Budyko credits the warming trend to man-made factors, especially atmospheric pollution. As chief culprits, he indicts industry's increase in carbon dioxide production and destruction of part of the earth's ozone layer by aerosol-spray cans.

Carbon dioxide does not prevent sunlight from reaching the earth, but does stop it from escaping back into space in the form of heat. This trapping of solar energy is the so-called "greenhouse effect."*

At its worst, a substantial increase in temperature would threaten to melt the polar ice caps and flood the shorelines of many countries, destroying such cities as London, Venice, and Amsterdam. This scenario shows the Statue of Liberty* ankle-deep in New York harbor's rising waters. Much of the world's most fertile agricultural land would be inundated and lost to food production.

In addition, a marked warming trend would bring other "climatic conditions not observed for many centuries," warns Budyko. Most disturbing of these is drought and subsequent starvation. As precursors of such disaster, some adherents of the Russian climatologist point to the Sahel disaster,* as well as the droughts which afflicted his own country and others earlier in this decade.

Flooding, drought, and starvation necessarily would mean mass migrations and political turmoil, forecasts the CIA* in a report on the weather, recently declassified. Disaster could also be followed by attempts to reverse the process through various new kinds of climate modification schemes. But such solutions conceivably could trigger changes worse than the original "disease," in the view of some analysts.

Budyko predicts five to ten years before these changes manifest themselves entirely.

On the other hand, most climatologists seem to believe the long-range trend is change toward a cooler climate. Some even predict that a new Ice Age soon will overtake the earth.

Though this sounds like yet another disaster theory, suitable for Hollywood treatment, the "new ice age" proposition is supported by some highly respected experts bearing a surprising amount of scientific data.

The theory is based, in part, on geological and historical studies and, further, on examination of recent climatic trends.

The ice cover of the Northern Hemisphere, for example, increased by 12 percent in 1971, as revealed in satellite photos. This is equal to the combined area of France, Italy, and England. Antarctica's ice mass also grew by 10 percent in a single year (1966-67), and neither pole is growing any smaller; any new Ice Age would emanate from the poles.

Iceland is of particular interest to climatologists, who see it as a kind of weathervane for the entire world, since changes in the climate often appear there first. It may, therefore, be significant that Iceland's temperature has dropped one degree (F) in 30 years. This may not appear to be much but during the last Ice Age (when what is now Chicago was covered by a mile-high mound of ice) the earth's annual mean temperature was only 7.2^0(F) cooler than today. A drop of just 3^0 (F), these theorists believe, could usher in a new Great Ice Age.

The outlook for man in an Ice Age would be even worse than in a hothouse earth. According to the British science writer Nigel Calder, Ireland, Britain, Scandinavia, Finland, Switzerland, Nepal, Sikkim,* and New Zealand all would be completely covered by a massive immovable sheet of ice. Much of the globe, including the United States and Canada, would be traversed by slowly moving glaciers.

Numerous African and Asian states would suffer severe famine and drought. In fact, only small portions of the earth (such as Central America, southern Europe, equatorial Africa, and Southeast Asia) would escape devastation.

What are the chances of such a New Ice Age in our lifetime? Probably slim; but the state of the art is such that we cannot know for sure. The National Academy of Sciences has stated that the chance of a deep freeze within the coming century is a real possibility. Though the British scientists put the odds as

ten to one *against* it, Nigel Calder says it's ten to one that an ice age *will* occur soon.

A more likely prospect is that what we are entering is a new "little ice age," or neo-boreal period. Reid Bryson believes this, citing increased volcanic activity which has a tendency to block sunlight and cool the earth. Dust – 30 percent of it man-made or of industrial origin – is also blamed as another significant cooling factor.

A cooling trend could take place imperceptibly. On the other hand, geological studies in Greenland have shown that ice ages can overtake the planet with surprising suddenness. The transition from a warm interglacial period may only take seven to ten years.

Mastodons have been found in the Soviet Union frozen in solid blocks of ice. They were discovered standing upright, with partially digested grass in their stomachs, as if surprised mid-meal. A sudden, devastating storm apparently had overtaken them and left them standing there, in perfect condition, on ice, for 10,000 years.

Scientists call such a sudden cold attack a "snowblitz." A snowblitz could start in the northern regions with a snowstorm that would not completely melt throughout a particularly cool summer. The fresh white snow would reflect about 85 percent of the sunlight back into space, making the earth lose that much of the sun's warmth. The next year's snow then would pile up on top of the previous snowfall, accelerating the process. When the snow cover reaches a thickness of 12 inches, scientists say, it starts a virtually irreversible process – and a new ice age begins to creep down from the polar regions.

It's not easy for us, who have become accustomed to "abnormally" kind weather, to accept such grim forecasts. Conflicting opinions of climatologists may tempt us to reject the entire controversial prospect as headline-grabbing hyperbole.* But last winter's performance should persuade us that nothing is permanent, including the weather – and that, whether we like it or not, overwhelming change may well be on the way.

IS ANTARCTICA SHRINKING?

The Antarctic continent is a bleakly beautiful world, a place of jagged peaks sculped by winds, of sheer mountains strangled in glacial ice. It is so cold that even sunlight seems to shiver. To the

scientists who work there, Antarctica is a figurative deep freeze as well as a literal one: within its ice cores it preserves the record of the world's climatic past – the ice ages and the warm spells – and may hold clues to future weather as well. "The best data on the world's climate is locked up in the ice sheets," says Edward Todd of the National Science Foundation (NSF). "Antarctica exerts a greater influence on the world's environment than any other piece of real estate."

Spring is coming to the southern continent, and with it come nearly 300 researchers in the NSF's 65-million-dollars Antarctic Program. As temperatures rise from wintertime lows of minus 94 degrees to summertime averages of 32 degrees, it becomes a little easier to conduct experiments, although living on the southern continent is no summer vacation. The research stations are lonely outposts where the prime diversions are card games and cocktails. The isolation can be so overwhelming that "the only thing you hear is the sound of air molecules banging against your ears," says Anthony Gow of the US Army Cold Regions Research and Engineering Laboratory in Hanover.

Many scientists endure the sounds of silence in the hope of answering two basic questions of Antarctic research: is the ice sheet getting bigger or smaller, and what effect do rising levels of atmospheric carbon dioxide (CO_2) have on it? As man burns fossil fuels,* he adds CO_2 to the air and creates what is known as the "greenhouse effect"* – a layer of gas that traps heat and warms the globe. Common sense says that such a warming will melt the ice sheets and raise sea levels; some geologists predict that the seas could rise 20 feet in the next 200 years, inundating all the world's ports and many of its cities. But it is also possible that the warmer air would have a completely opposite effect: since it can carry more moisture, it could increase the snowfall on Antarctica and make the continent grow. Scientists can run computer models on these possibilities until the next ice age, but they won't really know how CO_2 affects Antarctica's 7 million cubic miles of ice until they understand how it did so in the past. "Nature doesn't pay attention to our models," says Todd. "To get answers to whether Antarctica is growing or shrinking, you have to go down there and make measurements."

Echoes: Using precise chemical tools, scientists will identify the kinds of gas trapped in the ice to learn the composition of the ancient atmosphere. Listening to radio echoes reflected by the

different ice layers, it is possible to measure their thickness and flow. Echo sounding, perhaps the most revolutionary tool of Antarctic science, has already revealed that the continent is actually two separate masses of ice and earth. East Antarctica, with 83 percent of the ice, is a "true" continent since it sits on regular bedrock above sea level. But West Antarctica, across the Transantarctic Mountains, is a "marine" ice sheet, sitting on the ocean floor and an archipelago. Because the eastern sheet is above sea level, it has stayed intact for at least 10 million years. The western one resembles an unprotected cube of ice and, according to some geologists, it disappeared entirely during a warm spell 124,000 years ago.

Even on East Antarctica the ice is constantly shifting. The sheets are so thick that they spread under their own weight, much like pancake batter being ladled onto a hot griddle. The ice sheets follow channels in the rock and break into ice "streams" which are heated by friction to the melting point underneath, enabling them to slide on their beds. "Until 25 years ago we didn't know that such ice streams existed," says Charles Swithinbank of the British Antarctic Survey. The streams move at an average one-third of a mile per year, eventually draining into the sea or ice shelves, like the Ross, which are pinned to underwater islands. The immobile shelves buttress the ice streams and prevent them from sliding out unimpeded to the sea; occasionally sections of the shelves split off and the result is an iceberg.

The role of the ice shelves in keeping Antarctica from sliding into the sea is highlighted in a new book, "The Last Great Ice Sheets". It argues that a 6-degree rise in temperature brought on by the greenhouse effect would melt thin ice sheets in the Northern Hemisphere. Antarctica, where the ice is an average of 6,000 feet thick, wouldn't feel any direct effect of the warmer air for thousands of years, says geologist George Denton of the University of Maine. But it would be threatened by rising seas. The melting northern ice would raise sea levels around the globe, and Antarctica's ice shelves, pinned to the sea floor today, would rise with the water until they were ripped from their moorings. Without the shelves to hold back the ice streams, says Denton, "it's like you've removed the cork from the bottle. The wine – the ice streams – would flow out." The runaway streams would draw ice down from the interior of the continent until the whole sheet disappeared within 200 years because of an insidious feedback effect:

as the initial increase in sea level melted some of the sheet, it would raise the water level still farther, until West Antarctica was just a memory in the mind of a homeless penguin.

Cores: Previous theories that predicted a much quicker meltdown haven't held up. Evidence shows that ice simply couldn't surge out of Antarctica fast enough to make it disappear in a few decades. Even the slow-meltdown scenario has its critics. "My feeling is that there are enough layers of foundation underneath the sheet to stabilize the ice," says Gow. One way to help settle the dispute is to seek the future in the past. Glaciologists are therefore using standard tricks of geology, such as dating sediments left by ancient ice movements, as well as borrowing tools from chemists to analyze ice cores and reconstruct the earth's climatic past and the sheet's changing size. "Paleoclimatology is now in a period like plate tectonics and evolution once were," says Denton. "We feel that we're on the verge of breakthroughs."

Much of that excitement stems from astonishingly precise ice-core-analysis. By using sophisticated drilling technology, scientists have been able to pull up a dowel of ice from Byrd Station* 7,098 feet long. Working with segments 4 to 5 inches in diameter and a few feet long, they scrutinize layer after layer of ice on their light tables and use chemical analysis to measure and identify the gases locked inside the cores. Because ice traps air as it forms, bubbles in the core reflect the composition of the atmosphere thousands of years ago.

Curiously, researchers read different messages in the frozen bubbles. Scientists from the University of Bern in Switzerland reported that CO_2 rose steeply at the end of the last ice age, when the earth began warming. "Carbon dioxide shows a tremendous increase 12,000 years ago, from 200 to 280 parts per million (ppm)," says Bernhard Stauffer. That may be coincidence, or it may be cause and effect, because there have been so many unexplained fluctuations of CO_2 in the past, scientists aren't sure whether the gas causes a warming trend or simply amplifies an existing one. Indeed, CO_2 levels rose as high as 400 ppm in the past without melting the ice. The current level is 338, and projections into the next century range as high as 600.

That would seem to threaten the ice sheets, but other tests on the Byrd core are more optimistic. By measuring the volume of trapped bubbles, scientists can tell how thick the ice sheet was in the past. The technique is simple: more or bigger bubbles imply

higher atmospheric pressure and thus a thin ice sheet with a surface near the ground. Applying this rule, French glaciologist Dominique Raynaud and Ian Whillans of Ohio State University found that the ice has grown about 725 feet thicker since the end of the last ice age. "We think that by raising temperatures, CO_2 makes more snow fall over Antarctica and increases the rate of accumulation on the ice," says Whillans.

Retreat: Even if the ice sheet has been growing over the centuries, scientists are concerned about the possibility of a sudden reversal; an early warning of change in the ice is vital if civilization is to plan for a world with new coastlines. For that reason, the British Antarctic Survey has been measuring the Antarctic Peninsula, with disquieting results. In the last 300 years global temperatures rose by nearly two degrees. "We have hard evidence of a retreat in the Antarctic Peninsula, or disintegration of the ice shelves at their edges," says Swithinbank. "This retreat is something we have observed in our lifetime. I myself believe that increasing carbon dioxide is likely to lead to a continued warming trend around the coast of Antarctica."

Whether a warming trend would dump more snow on the southern continent or make it melt remains unanswered. But the question is an insistent one, and prudence means erring on the pessimistic side.* Charles Bentley of the University of Wisconsin, for one, doesn't believe in the "superrapid retreat" scenario. But, he says, "the seriousness of what could happen is great enough that we have to keep investigating to make sure I'm right and they're wrong." Civilization arouse as the earth grew warm 8,000 years ago. It would be a cruel trick if that warmth obliterated its own creation.

CRAZY RAINS OR ANIMALS THAT FALL FROM THE SKY?

"Fish!" shouts the red-faced storekeeper to his helper. "There are fish all over the sidewalk."

"Fish?"

"Fish! And there's so many they're about to bust down the awning out front!"

Both men scramble from the tiny Providence, R.I.,* general store and join a crowd of townspeople already out in the rain.

"Can't say as I didn't expect something like this," says a pipechewing oldster* in foul weather gear. "Yellow sky like that, and the sun looking so blue and unnatural. Just the same as it was

the day of the Crazy Rain in 1841 when I was a [illegible] ago. And it doesn't always rain just fish. I heard [illegible] birds – even snakes – have been seen to rain right like this one. Kind of yellow and strange."

This dialogue is strictly fiction, but the situation [illegible] did rain fish on the outskirts of Providence in [illegible] gentleman was not just spinning a yarn when he [illegible] what he called "Crazy Rains." In fact, he was putting mildly. A fall of animals from the sky is the most [illegible] freak rains – and the most difficult to believe even [illegible] are numerous documented cases.

First mentioned by Athenaeus* nearly 2000 years rains were accepted by the ancients as natural; "Fish heaven," wrote learned Jesuit Caspar Schott, in 1667, which had been accepted since time immemorial.

In 1673, centuries of celestial magic were ex[illegible] Jacobson Debes in a book about Faeroe Islands.* [illegible] of herrings on a 400-foot-high island hilltop, he [illegible] were carried there by a waterspout. He was probably incredible lifting ability of waterspouts easily ac[illegible] largest falls known. Many cases are known in which waterspouts have emptied small ponds, and one was known to have laid bare a harbor bottom.

Many well-corroborated fish rains have been report[illegible] parts of Europe. In England, "whittings and sprats sand-eels in 1918, and many other falls occurred [illegible] dates. Describing a rain of minnows* in Wales, one deposed to his vicar: "I was startled by something falling me – down my neck, on my head and on my back. On p[illegible] hand down my neck I was surprised to find they were li[illegible] I took off my hat, the brim of which was full of them [illegible] ered the ground in a long strip about 80 yards by [illegible] measured afterwards."

In this country, many such showers have fallen [illegible] found in the streets of New York in the summer of [illegible] in Boston on June 30, 1841. The ones that fell on Pro[illegible] on May 15, 1900, were perch and bulltrout,* and the[illegible] many of them that little boys gathered them by the pail[illegible] fish rains were reported at Tillers Ferry, S.C.,* on June [illegible] and in many other places. A shower of eels in such [illegible]

[illegible] to take them away for fertilizer was re-[illegible], at Coalburg, Ala.*

[illegible] shower on record, a fall covering some 50 [illegible] Singapore in 1861, by a famous naturalist,

[illegible]dence and the witnesses, skepticism prevailed a [illegible]cause no scientific man had ever had a rain of [illegible]The arguments would probably continue today, [illegible]bliged: On October 23, 1947, Dr A.J. Bajkov, a [illegible]ith the Department of Wildlife and Fisheries, [illegible] of fish in Marksville, La.* Hundreds of fish, [illegible]s, fell on the streets and roofs of the houses, [illegible]atrians. They were cold and fresh and fit for [illegible]. The fish fell in foggy and calm weather, fol-[illegible] of numerous small tornados the day before. [illegible]as not solved: The fish fell in a strip about 1000 [illegible]0 feet wide.

[illegible]s and tadpoles have been reported as early as [illegible] probably occurred as often, but the number of [illegible] smaller. Much skepticism attended these rains, [illegible]known to come out of hiding with the rain. They [illegible]e numbers and some of the enormous falls re-[illegible] been migrations instead. But there is no ques-[illegible]ed, particularly of tadpoles, which live in wa-[illegible]bject to being airlifted.

[illegible]rted in various parts of the U.S. A frog shower [illegible] Windham, Conn.,* in 1804; tadpoles rained on [illegible] 1901 (a good year for frog rains, as several were [illegible]shower of small toads were reported at North [illegible], on July 21, 1933.

[illegible], 1939, *The Times* of London quoted a Wiltshire* [illegible]g a frog shower the day before. This man, running [illegible]avy rain, heard plunking noises behind him. "I [illegible]d, "and was amazed to see hundreds of tiny frogs [illegible] concrete path. ... I swept them up and shoveled [illegible]ket."

[illegible]ads fell on the sidewalks of Montreal* in 1857, re-*Montreal Weekly Gazette*. A rain of reptiles was re-Minnesota in 1873, but the description was that of [illegible] salamander." A "snake rain" on January 15, 1877, at [illegible]* received wide attention. The New York *Times*

and the *Scientific American* said there were thousands of them. The local U.S. Weather Bureau observer agreed to the quantity but was unable to find anyone who actually had seen them descend. All were found on a newly-laid, unpaved street, with trenches for gutters, and it is unlikely that they came from elsewhere.

The biblical narrative of a shower of quail (Numbers XI, 31)* records no miracle. In 1896, birds by the hundreds dropped dead on the streets of Baton Rouge, La. The birds were said to have been driven inland by a coastal storm and to have been killed by a sudden fall in temperature. During the night of September 24-25, 1930, a great flock of partridges was caught by a heavy storm over the Black Sea port of Burgas, Bulgaria, and many fell exhausted in the streets.

The various investigated rains of worms and larvae have been proven spurious – these were merely driven from their hibernating quarters by the saturation of the soil by heavy rains.

Accounts of showers of insects are plentiful. Many of these insects, particularly winged ants, need no assistance from the elements to follow their habit of swarming forth in immense numbers, but some reports show sustained transport of insects by wind and their falling from the skies after the manner of rain. Three such showers occurred in France in the 1800s. A rain of insects, in part small neuropteroids* and in part winged ants, was reported in Germany; and an enormous shower of winged insects at Szentes, Hungary, on August 14, 1901, covered the ground a foot deep within a few minutes. A shower of huge ants – the size of wasps – was reported in Manitoba, in 1895.

Some falls of spiders and gossamer (cobwebs) are recorded. In 1869, several were reported in England. About October 12, "a vast number" of spiders came down at Tiverton, and on the 15th, again near Tiverton, cobwebs, "like pieces of cotton," fell in "wondrous quantities." The fall continued all afternoon "covering fields, houses and persons."

Animal rains have amazed the observers who probably marveled at the powers of the gods, but not all rains were taken lightly. There were other rains – ones that struck terror into the hearts of ancients – rains of sulphur, showers of ink and the terror of the ages, the rains of blood.

Red rains have frightened people since the beginning of history. One of the plagues of Egypt* was a bloody rain: Homer* and

Virgil* both mention them; and they figure conspicuously in medieval chronicles. Gregory of Tours* tells of a rain of blood that fell on Paris in 582 when "many people had their clothes stained with it and cast them off in terror." These rains were sometimes accompanied by yellow skies and bright blue suns. "The whole city appeared bathed in red," wrote an observer of such a rain in Italy. The drops of heavy rain looked like blood ... the sky became bright yellow, and afterward fiery red."

Many explanations were advanced. Desert dust from the Sahara is agreed to be the coloring agent in Europe, but no acceptable explanation exists for the far-away showers over Russia, off the coast of Newfoundland or over Australia – where enormous quantities of muddy, red rain fell in 1903, at the same time that red rains were falling all over Europe. Authorities excluded volcanic origin, and chemical analyses made in various countries were inconclusive. German naturalist C.G. Erenberg formed a theory that a zone of dust, replenished from time to time by wind, exists in the atmosphere and that rains originate there.

Sulphur rains turned out to be pollen of various plants. The yellow color suggested sulphur; pollen, especially of pine, is highly inflammable; imagination supplied the smell of brimstone,* and superstition jumped to the conclusion that the devil had been busy.

Raindrops charged with chalky earth-dust produced showers of "milk." Black rains, or showers of ink, are established to be due to soot or black dust. A black rain over Fresno, Calif., in 1926, was caused by particles of soot from an oil fire. Light clothing was soiled in the inky downpour.

So you see, that fictitious old salt* from Providence wasn't so far off in his tales. These fantastic rains of animals and other things have amazed and terrified man for hundreds of years. It *is* true, however, that the stories of crazy rains get a bit distorted or "improved" each time they are told – many of the tales are utter nonsense – but there is no doubt that such phenomena do occur, just not as often as reported. True animal rains are rare.

CAN THE AIR ABSOLVE MAN'S SINS OF EMISSION?

The CFC gases* (chlorofluorocarbons), which are odourless and harmless to humans, circulate in the innards* of refrigerators and air-conditioners, and have done since the 1930s. They are also

used as a source of pressure in aerosol sprays to drive out the contents of the cans; as a solvent; to clean computer-parts; and to make foam cartons and other insulating materials. Because they are inert and do not react with anything, CFC molecules are not broken down near the earth's surface. Eventually each one of them reaches the upper atmosphere, which is where the trouble might begin.

There they are zapped* by ultraviolet radiation from the sun, which splits off a chlorine atom from the CFC molecule. The free chlorine atom attacks ozone, a form of oxygen consisting of three oxygen atoms. The ozone molecule then splits into two molecules: ordinary two-atom oxygen and another molecule containing one atom of chlorine and one of oxygen. If the chlorine-plus-oxygen molecule meets another atom of oxygen it breaks down again, into a two-atom oxygen molecule and one chlorine atom. Free once more, the chlorine can go off and destroy some more ozone.

Ozone itself is formed in the upper atmosphere during a similar atomic quadrille of changing partners: it is made when single oxygen atoms join up with two-atom oxygen molecules. Several chemical interactions can break it down: the worry is that chlorine from CFCs, and perhaps some other man-made chemicals, speed up the destruction of ozone so that it is broken down faster than it is created and the total amount of ozone in the atmosphere shrinks.

Ozone can be a good thing or a bad thing, depending on where it is. Some 90% of it is in the stratosphere – higher than 10 kilometres up – where it is a good thing. Ozone absorbs much of the harmful wavelengths of ultraviolet radiation and stops them reaching the earth's surface, where they would damage the chemicals of which genes are made (and thus cause cancer), retard plant growth, degrade plastics and other man-made compounds, and damage plankton at the bottom of the sea – thus, perhaps, sending a nasty rattle up the food chain.

Closer to the earth's surface, ozone is a pollutant which attacks plants. It is responsible for much of the damage to forests in Europe and Canada for which acid rain* was wrongly blamed. Much of this low-level ozone is produced by nitrogen oxides* and hydrocarbons* from car exhausts, and it is increasing above cities.

But it is the ozone high up in the stratosphere that gets more publicity. In 1978, four years after scientists worked out how CFC's attack ozone in the stratosphere, America and a few other coun-

tries banned their use in most aerosols; alternatives were fairly easy to find and hairsprays are a handy scapegoat. Substitutes for the CFCs' other uses are not easy to find. World production (which fell every year from 1975 to 1982) has risen for the past five years.

Since the first warnings in 1978, the picture has got murkier because scientists have learned more about the atmosphere. Emissions of carbon dioxide (from deforestation and the burning of fossil fuels) and methane (from paddy fields and farting livestock, among other things) are accelerating the production of ozone and cancelling out the effect of CFCs. According to Dr Michael McElroy, a professor of earth and planetary sciences at Harvard University, emissions of CFCs should, in theory, lead to around a 1% reduction in ozone per decade. (And each 1% fall in ozone, according to current predictions, would lead to a 3.5% increase in skin cancer.) But because of the balancing effect of other gases – and despite some rather frail evidence of depletion at the top of the stratosphere – the total amount of ozone in the atmosphere is probably static.

So claims that the amount of ozone above the earth is already decreasing – and that this might account for an increase in skin cancer which American doctors have observed – are premature. Yet CFCs might still matter. Although some of these molecules break down quickly, the average one lives in the atmosphere for 75 years before attacking ozone. Thus the level of CFCs in the atmosphere in the middle of the next century may be much higher than it is today. It could be – although there is no evidence to support it – that once CFCs reach a certain crucial level, their ability to destroy ozone will suddenly increase.

The best computer models of the atmosphere must juggle with many gases in minute* quantities, scores of chemical reactions, plus all the uncertainties of weather and climate. None of them predicted the Antarctic phenomenon that is misleadingly known as the ozone hole. Each spring, the amount of ozone over the Antarctic decreases by ever-larger amounts and recovers by early summer. Most of the depletion occurs in the Antarctic vortex, a vast, fast clockwise swirl of stratospheric air, and the latest evidence suggests that man-made chemicals are to blame. The vortex is an unusual place and what is happening there has no obvious morals for the rest of the atmosphere. It may even act as a "sink" for chlorine, thus ameliorating the effects of CFCs else-

where. Only one thing is certain: limiting the production of CFCs would not harm the atmosphere and could do some good if other pollutants decrease.

CHRIST UNDER THE MICROSCOPE

As sophisticated techniques are drawn from other fields such as criminology and cartography, interest in the Turin Shroud* has increased. Little that the scientists have done has shaken the legend of the shroud, but little they have done has helped to explain how the image of a man got there.*

The shroud is a piece of linen 14 feet 3 inches long and 3 feet 7 inches wide. It contains the image both of the front and the back of a man, with the two heads touching, as if the man was laid on his back on the bottom half of the cloth and the remainder was then drawn over his face and front. Archaeologically it is unique – burial shrouds usually decay with the body and no similar imprints are known.

When I saw the shroud on Saturday night in Turin Cathedral, my first impression was surprise that this burnt, water-stained, and wrinkled piece of cloth should be so venerated. Yet, the image of a long-haired bearded man with his hands crossed in front of him is unmistakably and strikingly there. The reddish brown image is faint and seems clearer if you stand further away from it.

The picture on the shroud is anatomically correct for a human corpse and has considerable detail such as hair and beard. Proponents claim to see evidence of all that *The Bible* says happened to Jesus: scourge marks on his back, swelling below the right eye corresponding to being struck on the face, bleeding from the crown of thorns, and so on. I viewed the shroud for some minutes and to me, many of these "details" seemed more like water stains and burn marks. Are the faithful simply reading their expectations into the ink blots? I can't say.

In any event, I did see some of what the proponents claim. For me, the most dramatic were the "bloodstains" on the wrist, arms, and forehead. No water stains these, but clear marks. They are the same colour, but much darker than the rest of the image. In the end, I could not help but be impressed by the image I saw.

Fittingly for modern scientific interest, it was photography that brought renewed interest in the shroud. In 1898 Secondo Pia took a photograph of the shroud which showed the image to be a pe

fect *negative*. In other words, Pia's photo negative looked like an ordinary picture. The combination of the increased contrast of the photograph and the reversed image made the picture much more striking. The traditional shroud pictures are in fact negatives of the shroud.

First interest in the shroud came from doctors and pathologists, who attempted to relate what they saw in shroud photographs to their knowledge of wounds and bodies. One question was the placement of the nail in the hand. Tradition and most art puts the nail through the palm, while the shroud shows the blood-stain on the wrist. The first identified skeleton of a crucifixion victim was only uncovered a decade ago and, indeed, it appears that the nails went through the wrists.

The biggest problem for sindonologists* is authenticity. The shroud first appeared in France in the 14th century, a time of many fake relics. The shroud itself was branded a fake, and it was even said that the man who painted it had been found. Nothing was known of it before, although Ian Wilson tries to trace it back to Odessa* in the 6th century (*The Turin Shroud*, Gollancz, 1978), a view hotly supported and contested at the meeting.

Carbon dating is the most obvious way to date the linen, if not the image, but it was resolutely resisted by the Turin authorities on the grounds that it would destroy too much of the shroud. It is now claimed that dating can be done with one thread 20 cm long to an accuracy of ±150 years. But the two US labs that claim to be able to do so are fighting among themselves, and having technical difficulties, so the keepers of the shroud again said no to carbon dating. Under strong pressure from the British delegation, however, the authorities finally backed down. Don Coero Borga, secretary of the International Sindonology Centre in Turin, said that the samples taken from the shroud in 1973 would not be locked up with the shroud, and that when the two universities reached agreement, threads would probably be taken from these samples for carbon dating.

Swiss criminologist Professor Max Frei has provided some history for the linen by applying the pollen analysis he uses professionally – and which is widely used in archaeology. Taking dust samples from the shroud on sticky tape in 1973, he was able to identify the pollen of 48 plants. Sixteen grow in France and Italy, as one would expect to find from historical evidence of public displays. But 21 are desert plants, including some which grow only in

saline areas such as those near the Dead Sea. Frei estimates that 95 per cent of pollen comes from within a few kilometres, so that by comparing regional distributions of plants, one can accurately place the cloth. Thus he was able to prove that the shroud cloth definitely was exposed to air near Jerusalem, and may have been displayed in Odessa and Constantinople.*

Finally, art historians at the meeting pointed out that the image of Christ on the shroud is the dominant image of Christ in both Eastern and Western Christian art, and can be traced back at least to 370 A.D. (before Wilson says the shroud was first discovered). But is art based on the shroud or the shroud based on art?

The biggest argument against fraud is that the shroud is simply too good. The evidence of wounds and rigor mortis* would be extremely difficult to fake, yet turn out to correspond well with what we know of crucifixion. Anatomically it is much too good for the 14th century. And no one has been able to produce a similar image (although no one has tried as hard as a would-be forger). These lead sindonologists to argue that it cannot be a 14th century fake, and I tend to agree. Thus, they argue, it must be real.

But could there have been a double fake, one in the 14th century and another in the last century? The shroud was widely shown in the 15th and 16th centuries, but not later. Could it be that the first fraud became too obvious? In the 19th century it was shown only five times, the last two in 1868 and 1898. Few at the 1868 exhibition would have remembered the details 30 years later. Might the shroud's owners have done a better job in that time, using modern technology and medical knowledge, including tests such as Barbet's,* and using ancient linen from the middle east? Might a statue have been created solely for this purpose, heated to give an impression on the cloth, and then destroyed? Or a fresh corpse worked on to provide the right markings and then used to imprint the image with ink or aloes and myrrh? A strong argument against this is that good drawings of the shroud, produced around 1600, show some key details such as the wound in the wrist, not the palm (a point taken up by few artists of the time). Nevertheless, there have been a number of sophisticated Victorian archaeological frauds, so we cannot ignore this possibility.

Perhaps the biggest difficulty in dealing with the science of the shroud is that sindonology does not have one of the most important checks common in science to prevent sincere scientists from presenting wishful thinking as data. There are no opposition sci-

enthusiasts – no experts with an alternative theory to defend who would work just as hard to disprove the original theory. Perhaps it is just lack of interest, although some may have been put off by the knowledge that critics would never actually get to the shroud.

The new tests will not be conclusive – they will only be part of a long process of proposing theories and then supporting or eliminating them. And the bitterest pill – accepted by the sindonologists – is that science could prove the shroud a fake but can never prove it real.

THE MURDER OF NAPOLEON

In the style of the classic armchair detective, a Swedish dentist, who is also an amateur toxicologist and ardent fan of all things Napoleonic, set out in 1955 with an engrossing theory on the track of murder most foul. But with a difference. This murder – of the great French Emperor Napoleon himself – occurred in 1821! Using the most up-to-date forensic techniques and laboratory equipment, the dentist dogged "the Napoleon case" for 23 years. First he had to prove to his own exacting standards that a murder had indeed been committed (the commonly held belief was that Napoleon had died of cancer). Then he had to pick the murderer from among the retinue that followed Napoleon into his final exile on the British island of St. Helena after his defeat by the English at the Battle of Waterloo.

At dusk, the cannon of the British garrison sounded retreat. The emperor sighed, and a doctor, his eyes on his watch, counted the time until he would sigh again. Fifteen seconds passed, then 30, then a minute. The pulse disappeared. Napoleon was no more.

The melancholy duties of death fell first of all on 30-year-old Louis Marchand, who all his adult life had served Napoleon Bonaparte. In the terrible last months, the valet had spent almost every waking moment at his master's bedside. "After my death," Napoleon had instructed his doctor, "I want you to open my body." An autopsy was scheduled, therefore, for the next afternoon, and Louis Marchand spent the morning preparing for it.

It was to take place in the billiard room where Napoleon used to spread out his beloved maps and refight his military campaigns. It had been chosen because it was the largest and best lighted of

the 23 rooms in Longwood House, the sprawling, gloomy building that had housed Napoleon and his entourage on St. Helena. Napoleon's bare body was carried in and placed on a sheet spread over the table.

Shortly before two o'clock the participants and observers began quietly filing into the room. The autopsy would be an intensely political event: Why had a man whose physical vigor and stamina were legendary died at the early age of 51? Napoleon had grown steadily weaker during his years in exile, and the cause of his poor health had become a bitter issue between the exiled French and their English guardians. The exiles blamed the climate of St. Helena and accused the English government of deliberately sending Napoleon there to die. Sir Hudson Lowe, the English governor of St. Helena, was so fearful of anything that might be blamed on himself or his government that he had court-martialed an English military doctor for diagnosing Napoleon as suffering from hepatitis, because it was a disease that could be attributed to the island's environment.

Of the eight doctors, seven were English, all aware of the political implications of their findings. The eighth, Francesco Antommarchi, was a 31-year-old Corsican who had been Napoleon's personal physician for the last 19 months. Antommarchi, at Napoleon's request, was to perform the autopsy; the English doctors would observe.

At the end the doctors were not able to agree on the cause of death. The eight handed in four separate reports. They did agree that an ulcer existed in the stomach. Antommarchi called it "cancerous"; the English doctors found "scirrhous (hard) portions advancing to cancer." This led to the long-accepted belief that Napoleon had died of cancer of the stomach, though none of the doctors reported an actual cancer. Such a verdict would relieve Hudson Lowe and the English of all responsibility.

The report signed by the English doctors found the liver to be "larger than natural." That was just what Lowe did not want to hear – a diseased liver would support the theory that Napoleon's death was caused by health conditions on St. Helena. The governor asked the British doctors to take the offending statement out of the report. They reluctantly complied, but one of them, once he was off the island, recorded what had happened.

Three days later, on May 9, 1821, Napoleon was buried in a valley on St. Helena, and 18 days later his followers embarked for

England. On July 25, the 59th day at sea, Louis Marchand, one of the executors of Napoleon's will, joined his two fellow executors, Count Henri-Gratien Bertrand, one-time grand marshal of Napoleon's palace, and Count Charles-Tristan de Montholon, for a reading of the will. Montholon and Bertrand were the only officers who had remained with Napoleon throughout the exile. During those difficult years, the two had been rivals for Napoleon's favor. In the last months Montholon, a handsome, polished aristocrat, had won out over the quiet, retiring Bertrand, even though Bertrand had spent many more years in Napoleon's service.

Aside from distributing all Napoleon's personal possessions as mementos, the will was a weapon aimed at public opinion. "I die prematurely," Napoleon wrote, "murdered by the English oligarchy and its hired assassin."

The exiles returning to their native land found a silent France. Passions about Napoleon were feverish, but little could be expressed in public under the Bourbon Restoration of King Louis XVIII. It was only six years since Napoleon had returned from his first exile on Elba and effortlessly overthrown the Bourbons. While he lived, it could happen again; during the St. Helena years the Bourbons had been constantly searching out Bonapartist conspiracies, most of which proved to exist only in their own fantasies.

Louis Marchand settled in the town of Auxerre. As the emperor's chief valet he still had duties to perform for his master. In a trunk was supply of hair that had been shaved from Napoleon's head after his death. Marchand enclosed the locks in gold medallions that he sent to the many members of the Bonaparte clan. To make sure that no other hair was substituted for Napoleon's, Marchand had all the work done at his home.

He kept one lock of hair for himself, and in time he left it to his daughter, along with his unpublished memoirs.

New Evidence

The seaport of Göteborg, Sweden, is a city of almost half a million people that looks out over the Kattegat Strait to Denmark and the mainland of Europe. On the outskirts of the city lived Sten Forshufvud, a tall, spare, blond man, who in the autumn of 1955 was in his early 50s. Forshufvud had divided his working career

between the practice of dentistry, at which he earned his living, and research in biology. He also had a keen interest in toxicology, the study of poison.

That Forshufvud had an interest beyond his scientific work was immediately evident to anyone entering his home. Napoleonic objects dominated the living room. Above the mantelpiece was an enamel portrait of the emperor in his coronation gown. In front of a huge, antique, gold-plated mirror was a bust of the young, long-haired Napoleon as First Consul. A statuette of Napoleon on horseback stood on the table clock, and in the cupboard was a set of china decorated with the bee, Napoleon's personal symbol. The etchings on the walls were all Napoleonic scenes.

That evening Forshufvud was reading the memoirs of Louis Marchand, the last of the eyewitness accounts of life at St. Helena to be published. Marchand had written his memoirs only for his daughter, in order, the valet said, "to show you what the emperor was for me." Not until well into this century did Marchand's grandson, his daughter's only child, give permission for the memoirs to be published. The second volume, covering the years at St. Helena, had just come out.

Forshufvud believed Napoleon's fall from power and premature death to be one of the great tragedies of all time. Accordingly, he had followed with particular interest the continuing, unresolved debates among specialists over how and why Napoleon died. Physicians and historians were still putting forth restatements of a dozen theories, all based on varying interpretations of the same autopsy reports and eyewitness accounts. Forshufvud found them unconvincing. He did not believe Napoleon had died of cancer, but he had not seen a conclusive case made for any other of the several explanations that had been argued. Perhaps Marchand could offer some new evidence.

That evening Forshufvud had come to Marchand's day-by-day account of January to May 1821, the last months of Napoleon's life. He told, with a convincing simplicity, how Napoleon was feeling on a given day; how the patient himself described his symptoms; what he ate on that date; how he reacted to it; how Napoleon responded to the medicines he was given.

Forshufvud began to sense a pattern. Marchand described Napoleon alternating between somnolence and insomnia; how his feet were swollen and how he complained that "my legs don't hold

me up." Then, in the very last days, Marchand described the dying man's response to a sequence of drugs he was given.

As he pondered these facts, something tugged at Forshufvud's memory from his own studies of poison. Could Napoleon after all have been poisoned? It seemed it could not have been done by a single lethal dose: the evidence would surely have shown up either in the autopsy or in eyewitness descriptions of his last moments. But what about a slow killing, stretched out over months or even years, by repeated small doses of poison – of which, in Napoleon's time, the most likely was arsenic?* The pattern became clear. The alternating somnolence and insomnia; the swollen feet; the general fatigue; an enlarged liver: all these Forshufvud took for symptoms of chronic arsenic poisoning.*

Arsenic was particularly popular in France in the centuries just before Napoleon, when it was known as the "inheritance powder," because it was so often used to speed up the settlement of an estate. Odorless and bland, it could be easily disguised by almost any food or drink. But it was also possible, with repeated small doses, to kill the victim slowly, over months or years.

The advantage of the slow method was that, until well after Napoleon's time, it was virtually impossible to diagnose chronic arsenic poisoning because its symptoms are similar to those of some common illnesses. If certain other drugs – notably tartar emetic* and calomel* – were administered, Forshufvud reasoned, death could be brought on with no trace of arsenic visible in the victim's stomach, should an autopsy be performed. Thus, since doctors at that time tended to prescribe those two drugs for almost any complaint, Forshufvud thought it was possible for the killer to get the doctor himself to finish off the victim – the perfect crime. Indeed, Napoleon had been given tartar emetic and calomel in the last days.

The arsenic theory would answer the most baffling of the many questions about Napoleon's death. The problem with the most common theory – cancer of the stomach – was that cancer victims grow emaciated as the disease progresses, but Napoleon got fatter and fatter almost to the end. Obesity has been observed among victims of slow arsenic poisoning.

Forshufvud spoke of his theory only to his wife and put the matter aside. It was not, after all, his line of work. Besides, the answer must be obvious to others. "Any pathologist or toxicologist is bound to see it," he said.

St. Helena, discovered in 1502 by the Portuguese and owned in the 19th century by the British East India Company,* lay 1750 miles from Cape Town in South Africa, 1800 miles from South America, 4000 miles from England. Ascension Island,* the nearest land, was 700 miles away and just another English-owned volcanic speck in the empty ocean. St. Helena's isolation was why the English had chosen it for Napoleon's second exile.

The little island – only $10^1/_2$ miles long by $6^1/_2$ wide – had a population of 4000, including a garrison of 1000 (now to be tripled thanks to Napoleon's presence). The emperor arrived on October 17, 1815, and at first stayed in a guesthouse belonging to William Balcombe, naval agent and purveyor for the East India Company. The family of six Balcombes lived comfortably in a villa called the Briars in the hills of the island. Years later in London, Betsy Balcombe published her account of the memorable days when she was 15 and Napoleon was their guest:

> How vividly I recollect my feelings of dread mingled with admiration, as I now first looked upon him whom I had learned to fear so much. His appearance on horseback was noble and imposing. The animal he rode was a superb one; his colour jet black; and as he proudly stepped up the avenue, I thought he looked worthy to be the bearer of him who was once the ruler of nearly the whole European world!
>
> I have never seen anyone with so remarkable and striking a physiognomy. The portraits of him give a good general idea of his features; but his smile, and the expression of his eye, could not be transmitted to canvas, and these constituted Napoleon's chief charm.

The girl Napoleon saw was a pretty, rosy-cheeked blonde whose skinny adolescent's body was rounding into womanhood. She usually wore a sunbonnet over unruly hair, a bodice with lace collar, and a short skirt over pantaloons down to the ankles – a fashion Napoleon so disliked, he later told her, that he would ban it were he governor of the island.

A remarkable friendship quickly grew up between the fallen ruler, only four months away from Waterloo, and the teen-age island girl. Across the gulf of age and nationality, Napoleon and Betsy found they shared a rough-and-ready sense of fun.

Shortly after his arrival, a little girl came to visit us. The poor child had heard such terrific stories of Bonaparte, that when I told her he was coming up the lawn, she clung to me in an agony of terror. Forgetting my own former fears, I was cruel enough to run out and tell Napoleon of the child's fright, begging him to come into the house. He walked up to her, and brushing up his hair with his hand, shook his head, making horrible faces, and giving a sort of savage howl. The little girl screamed so violently that mamma was afraid she would go into hysterics, and took her out of the room. Napoleon laughed a good deal at the idea of his being such a bugbear, and would hardly believe me when I told him that I had stood in the same dismay of him.

Napoleon's officers and retinue had ample reason to resent, perhaps envy, the free-spirited English girl. Their relationships with the emperor were defined by rigid imperial protocol. An officer could not enter Napoleon's presence unless summoned by a valet. He could not sit down or even speak to him unless invited to do so. And, of course, Napoleon was always addressed as "Your Majesty." None of these rules applied to Betsy. Her friend's name was "Boney."

Once Betsy was confined by her father to a cellar room "for some mischievous trick."

The emperor's great amusement during that time was to converse with me through my grated window, and he generally succeeded in making me laugh, by mimicking my dolorous countenance.

Napoleon said: "You see, we are both prisoners and you cry. I don't cry."

"You have cried."

"Yes, I have, but the prison remains nevertheless, so it is better to be occupied and cheerful."

Napoleon stayed at the Briars for almost two months. Then word came that Longwood, the residence five miles up the winding road into the interior, was ready. Napoleon was playing blindman's buff* with the Balcombe children when the news arrived. What was to prove the happiest time of his years on St. Helena was over.

Once a week or so the Balcombes rode up to Longwood and Betsy visited with the man that she would call "my old playmate."

She recalled that "gleams of his former playfulness shone out times," but for the most part he seemed "more subject to depression of spirits than when at the Briars."

A Single Strand

Four years had passed since the evening on which Forshufvud had found, in the memoirs of Louis Marchand, what he believed to be evidence that Napoleon had died of poisoning. During the years Forshufvud had followed the abundant flow of writing about Napoleon, from scholarly articles to popular biographies, watching for the inevitable revelation. It did not come.

Two articles on Napoleon's death in Swedish publications convinced Forshufvud at last that if the truth were ever to be known he would have to tell it. Neither author mentioned the possibility of arsenic or discussed Marchand's new evidence; it was as if the memoirs of Napoleon's valet had never seen the light of day.

Forshufvud began to spend all the time he could spare in his third-floor study, working on what he was now calling "the Napoleon case." The evidence he accumulated was overwhelming. Putting together the record of the autopsy, the casebook of Francesco Antommarchi, Napoleon's doctor, and Marchand's day-by-day description of the patient's condition, Forshufvud found that Napoleon in his last days showed no less than 22 of the 30 symptoms of arsenic poisoning that he had listed.

Yet there was no physical evidence at all. The obvious way to get that evidence was to test Napoleon's remains for arsenic. The body of Napoleon had been brought back to Paris 19 years after his death, and now was lying in state in the great tomb of Les Invalides – under 35 tons of highly polished porphyry. Forshufvud had to laugh as he pictured himself asking the French authorities to please move aside that huge slab so an unknown investigator, a foreigner at that, could test the body of the nation's hero for poison.

There was one other chance: Napoleon's hair. In Napoleon's day a lock of hair was a common souvenir of prominent people. Napoleon was known to have given many away. And hair could reveal the arsenic content of the body.

The method of analysis had been practised for decades. However, it required a comparatively large amount of hair – five grams, or approximately 5000 short strands. That Forshufvud

find, somewhere in the world, a lock or two of Napoleon's armed likely. That he could lay his hands on 5000 strands ...d as impossible a task as pushing the 35-ton slab off the ...on's tomb.

The break* came in November 1959, when Forshufvud went ... Göteborg Library and found in the journal **Analytical** ...istry a report on a new method of testing hair for arsenic ...quired only a single strand. The inventor of the new method ...r Hamilton Smith, a scientist in the department of forensic ...ine* at the University of Glasgow in Scotland.

Forshufvud next wrote a letter to Prince Napoleon, the curheir of the emperor's line. The prince replied, inviting him to ...t the questions he wanted to ask. In May 1960, Forshufvud ...eyed to Paris with his wife, Ullabritta.

He telephoned the prince immediately, but reached only inter...aries. After several days it became apparent that the prince ...ot want to see him. Forshufvud turned to Commandant ...ry Lachouque, a leading member of the Paris circle of ...oleon experts, former member of the board of directors of the ...y museum at Les Invalides and an editor of Louis Marchand's ...moirs. Telephoning, he asked if he and his wife might call to ...uss Napoleon.

In the commandant's Montmartre home, Forshufvud outlined ...s theory and described Hamilton Smith's method of arsenic de...tion. "That is what brings me here," he concluded. "I am looking for a strand of the emperor's hair."

"I have some," Lachouque said. "Come with me."

They entered Lachouque's private museum, a room filled with ...lics of the emperor, including Louis Marchand's *reliquaire,* the small wooden box in which the valet had left his mementos of the years at St. Helena. In the box was a small white envelope marked, in Marchand's handwriting, *"Les Cheveux de l'Empereur."* It contained a lock of silky, reddish-brown hair shaved from Napoleon's head the day after he died.

Lachouque offered the envelope to Forshufvud's wife. With a tweezer Ullabritta skilfully extracted a single hair from the several dozen that made up the lock and placed it in a plastic envelope held out by her husband. *"Allez-y, Madame*, take more!" Lachouque urged. But she politely declined, and her husband did not insist – a circumstance he would later regret.

Longwood was not a comfortable place. It was rainy on this upland plateau, and the house was constantly damp. Clothing soon mildewed; green mold covered the walls. Worst of all, Longwood was infested with rats.

Around him, wherever he looked, Napoleon saw the concentric rings of his captivity. In full view was a camp where 500 soldiers were stationed. Red-coated sentries were posted within sight of one another all along the stone wall that enclosed Longwood. Lookouts on the surrounding heights used semaphore flags to relay news of the captive's whereabouts. Between the armed peaks Napoleon could see five English warships guarding the island's water.

Napoleon's immediate goal was to keep his name from being forgotten in the world he had once dominated. For that, the exiles had to penetrate the censorship that governed all correspondence in and out of Longwood. Napoleon seldom left the residence. But the others would frequently ride the five miles down to the tiny port of Jamestown, where they picked up the news and mingled with sailors from passing ships. Franceschi Cipriani in particular – the dark, fearless Corsican who had been around the Bonaparte family since childhood – served as Napoleon's eyes and ears, while valet Louis-Etienne Saint-Denis was charged with copying messages that were smuggled out.

In midmorning, after Napoleon had been riding, Barry O'Meara, his doctor, was sometimes summoned. Napoleon felt no need for O'Meara's professional skills in these early days; his health was good. But O'Meara was valued as a source of local gossip.

Lunch, usually around 11, was either in Napoleon's room or, if the weather was good, in the garden. The food was prepared in the Longwood kitchens by cooks Napoleon had brought with him. But they did not serve it: that job was reserved to Louis Marchand and two trusted assistant valets. Napoleon would drink a glass or two of watered wine, rarely more, from his personal supply of *vin de Constance*, the highly regarded South African wine, the others at the table made do with whatever vin ordinaire was available.

Napoleon tried lunching with his officers, but their incessant quarreling wore on his nerves. He told them, "You are only a handful of people at the end of the world. At least you could love

each other." It did no good. The officers' problem was underemployment. There was too little work to go around. Only Count Emmanuel de las Cases, the oldest among them, who bore the brunt of Napoleon's dictating, was kept fairly busy. Las Cases had joined Napoleon in the last days of his reign, apparently with the objective of becoming his historian.

Grand Marshal Bertrand was unhappy because he was being superseded by Montholon; morose, he said little and stayed with his family when he could. Bertrand had been with Napoleon ever since Italy, and in Paris was grand marshal of the palace. By rights he should have been in charge of the household. But at the insistence of his tall blond wife, Fanny, who wanted to keep her distance from Napoleon, Bertrand had chosen to live apart from Longwood. Napoleon, piqued, put the household management in the hands of Montholon, the elegant curly-haired courtier who shared Napoleon's exile.

The appointment of William Balcombe, Betsy's father, as food supplier reassured Napoleon. He was certain the English would prefer him dead and suspected they might take measures to make that wish a reality. He considered the possibility of poison – he said doctors and chemists had warned him to be particularly wary of wine and coffee – but dismissed it under present circumstances: "There's no danger of poison. Balcombe supplies the food, and O'Meara and Poppleton (the resident English officer) are honest people who wouldn't lend themselves to such a thing."

Meeting in Glasgow

Back in Sweden from Paris, Forshufvud telephoned Hamilton Smith in Glasgow. Without asking any questions, Smith promptly agreed to test the hair.

Forshufvud carefully wrapped the strand of hair and mailed it to Scotland in a registered envelope. In July 1960, he had a reply:

> The sample gave a value of 10.38 micrograms of arsenic per gram of hair when analyzed by my method. This shows that the subject has been exposed to relatively large amounts of arsenic.

The normal amount of arsenic in human hair is about 0.8 parts per million. Napoleon's hair at the time of his death contained 13 times the normal amount of arsenic!

After a moment of self-congratulation, Forshufvud began to

ponder the future. A long road lay ahead. Already he could hear the voices of the skeptics: It was only a single test. The sample was too small. Maybe the hair had been contaminated. Maybe the arsenic came from the environment. Maybe the hair was not even Napoleon's.

Yes, there was still much work to be done. He needed more hair, more tests. He needed to know more about what could safely be concluded from the test, and what could not. Most of all, he needed to talk to Hamilton Smith face to face.

He flew to Glasgow in August, and after a tour of Smith's laboratory, the men sat, over the inevitable cups of tea, while the short, sandy-haired Glasgow scientist explained his technique. The hair was weighed and sealed in a polyethylene container. Then the sample and a standard arsenic solution were both irradiated for 24 hours. A comparison of the two samples showed the hair's arsenic content, indicating the presence of arsenic in the body. The new technique had been tested at length and was accurate. Unfortunately, however, the test destroyed the hair, so no further testing was possible.

Hamilton Smith had one question: "Can you tell me who was the victim of this crime?"

Forshufvud replied slowly, "The hair belonged to Emperor Napoleon the First."

Later Forshufvud recalled that Smith's face turned white: "pale like a corpse," as he put it. It occurred to Forshufvud that Smith must be thinking it was the English who had poisoned Napoleon. A Briton might well be dismayed by a foreign visitor's laying such a monstrous crime on his nation's doorstep. To reassure Hamilton, Forshufvud said, "I am quite sure it was not the English who poisoned him."

At that, Smith drew himself up in frank indignation. "What do I care about that?" he exclaimed. "I'm a Scot!" As they later recalled it, both men burst out laughing.

It was Forshufvud's turn now to ask a question: Could the arsenic have come from an external source? Smith then told Forshufvud about a recent improvement: he could now analyze a hair in sections. Thus, if arsenic was absorbed in a steady amount from the environment – something in the victim's room, say – the analysis would show a roughly constant amount from section to section. If, on the other hand, arsenic entered the body at intervals in large amounts, a graph would show jagged peaks and valleys.

Since hair grows about .014 inches a day, it would be possible to calculate the time between the peaks.

The implications were enormous: the doses of arsenic Napoleon consumed could be calculated backward along the length of his hair, and then compared with the existing written records of the dying man's symptoms day by day. The evidence would be conclusive.

Forshufvud needed more hair. Lachouque had offered it before; surely he would offer it again.

At a meeting on April 10, 1961, at the French army's historical section in Paris, Forshufvud presented his case. The group, which included two military doctors and the army's chief pharmacist, listened silently, and they seemed to him to be both interested in his thesis and sympathetic to it. Indeed, Lachouque was forthcoming, and Forshufvud made arrangements to have Napoleon's hair examined by a French expert. But before the test began, Lachouque unexpectedly reclaimed the sample.

Forshufvud thought he knew why. The French must have started thinking about the next question: Who was the assassin? It would be tempting to try to blame the English. But given the circumstances of life at St. Helena, it seemed unlikely that the English could have poisoned Napoleon without poisoning the whole household. The conclusion was inescapable. France's great hero was struck down by a traitor among those closest to him, an unappetizing prospect for a Frenchman to contemplate.

Against his better judgment, Forshufvud decided to publish his incomplete theory, to tell the world and pray that someone would come forward with more evidence. Dozens of locks had been collected during Napoleon's life and at his death. Among the present owners some must be willing to give up a few strands in the interests of science and history.

"A Murderous Climate"

On July 11, 1816, Napoleon and Gaspard Gourgaud, one of his officers, called on Albine de Montholon, who had given birth to a daughter a few weeks earlier. They found her reading the story of the Marquise de Brinvilliers, one of the most celebrated murder cases in the history of France.

In 1676, under the reign of Louis XIV, the marquise was convicted and executed for poisoning her father and both her brothers

with arsenic. Before she died, the marquise made a detailed confession, which, along with the confessions of two accomplices, became the raw material for the book Albine de Montholon was reading.

In effect, the book was a step-by-step description of how to kill people with arsenic in a way least likely to be discovered. Among the early symptoms the marquise's victims displayed were headache, loss of appetite, vomiting, itching and chest pains. When the marquise tried to poison her husband, he complained of weakness of the legs; he found it difficult to stand and painful to walk.

Gaspard Gourgaud was the most discontented of Napoleon's officers. Las Cases had his work. Bertrand and Montholon had their wives and children. But Gourgaud had no one. This big, swarthy man in his early 30s was full of energy and emotion that he could not expend.

Napoleon put Gourgaud in charge of the stable of 12 horses, but grooms did the work, so his duties took little time and even less energy. He rode furiously around Longwood plain. He quarreled, mostly with Montholon, complained to Napoleon and sulked.

Napoleon and Hudson Lowe, the new governor who had arrived in the spring of 1816, got on badly almost from the start. The anxiety-ridden governor was terrified that he would bungle his awesome responsibility and that Napoleon would escape, most likely by raising a revolt among the inhabitants and the garrison. To counter such improbable plans, he issued new rules and enforced old ones ignored by his more confident predecessor.

Most of the regulations were designed to restrict Napoleon's ability to talk with the islanders and write to the outside world. Aware that the exiles were regularly smuggling letters past his censors, Lowe proclaimed it a crime for islanders to deal with anyone at Longwood without his permission. He reduced the area in which Napoleon could ride without an escort, and revived a rule, never previously enforced, that an English officer must see Napoleon at least twice a day.

In the pettiest move of all, Lowe told the French exiles that Longwood's annual budget must be reduced from 12,000 to £ 8,000. Napoleon seized the opportunity to embarrass the English authorities: he ordered that the imperial silver be sold. Cipriani waited on the quay in Jamestown for a crowd to assemble before

displaying the platters and dishes. He responded to questions about the emperor's welfare by exclaiming, "He's well enough for someone who must sell his silverware to live." Napoleon could count on the news traveling to London, where he hoped to gain the sympathy of the English public.

Napoleon's response to Lowe's repressive rules was to frustrate the governor and, failing that, to use the regulations as a grievance against the English in general. When his riding area was reduced, Napoleon told his doctor, O'Meara, who he knew would tell the governor, that the English would bear the blame for killing him by depriving him of exercise. He nullified the rule that he must be seen twice a day simply by staying in his two rooms at Longwood for days at a time.

But Napoleon paid dearly for the feud with Lowe. The narrow circle of his captivity was shrinking. Visitors became rare because of a dispute over who should sign their passes. And the emperor's health was suffering. In May, Napoleon had complained of gout and told O'Meara that "my legs refuse to work for me." He was constantly cold and the sunlight gave him a headache. His gums began to bother him, and O'Meara found that they were "spongy, pale, and bled on the slightest touch." The recurring symptoms were attributed by O'Meara partly to "a murderous climate," a catchall interpretation* for whatever could not otherwise be explained.

Perfect Match

Forshufvud and Hamilton Smith, with Anders Wassen, a Swedish toxicologist, wrote an article detailing the results of the single test performed by Smith. It appeared in the October 14, 1961 issue of the British scientific journal **Nature**. The article named Napoleon as the victim. The first reactions came from Napoleon experts who denounced the whole theory. Forshufvud had expected no less.

Then, only two weeks after the article appeared, Forshufvud got a call from Clifford Frey, a Swiss textile manufacturer. Frey owned a lock of Napoleon's hair – 50 strands – that had originally belonged to Jean-Abraham Noverraz, the valet who shaved Napoleon's head the day after his death. Frey would be happy to provide a few strands for testing. He delivered the hair to Glasgow himself.

While waiting for Hamilton Smith's report, Forshufvud traced out a time line for the final seven months of Napoleon's life, from late September 1820, when his health deteriorated rapidly, to the end on May 5, 1821. He listed every symptom Napoleon suffered on the date it was reported by Dr Antommarchi, Marchand or one of the other witnesses. Once complete, the line was several feet long, and Napoleon's last illness fell into perspective. Symptoms did not appear spread out evenly along the line, but were clustered in groups between periods of partial recovery. The evidence was that in those seven months Napoleon suffered six episodes of acute arsenic poisoning, the last in March. After that, the nature of his symptoms seemed to change. He recovered somewhat in mid-April when he wrote his will; the final illness then started and lasted about two weeks.

Smith's report arrived early in December. He had extracted 20 hairs from the lock. He could see that one end of each hair had been shaved, not cut with scissors, just as Louis Marchand had reported. To some scraps of hair Smith had applied his old test, which measured only the total arsenic content. These showed levels of 3.27 and 3.75 parts per million – between four and five times the normal amount of arsenic in human hair.

Two hairs – one 13, the other 9 centimeters in length – had been long enough for sectional analysis. After being irradiated, they were returned to Hamilton Smith, who fixed them on paper and cut them into five-millimeter pieces. He then determined the arsenic content of each piece. The graph for the longer hair was a jagged line ranging from a low of 2.8 to a high of 51.2. The arsenic in the shorter hair ranged from 1.06, not much above normal, to a high of 11. All told, Smith performed 140 tests on this batch of hair. The graphs produced were the physical evidence that Napoleon was not accidentally killed by some source of arsenic in his environment.

Forshufvud took out his time line of taped-together sheets and laid it out on the floor. With Smith's graph, he calculated back along the line of growth of the hair from the day it was cut, May 6. Each five-millimeter section represented about 15 days of Napoleon's life. Forshufvud compared the peaks and valleys of Smith's graphs with the clusters of symptoms and periods of recovery on his time line. They matched – the peaks of arsenic in the hair coinciding with clusters of acute symptoms.

Forshufvud's effort to get more evidence bore further fruit a

short time later when he received a letter from Dame Mabel Brookes, an Australian author and, more important, Betsy Balcombe's grandniece. She had seen a report of the Nature article. Dame Mabel owned a lock of hair Napoleon had given Betsy during her farewell visit to Longwood on March 16, 1818. She was sending a sample to Glasgow. The hair, two strands analyzed in three one-centimeter sections, showed an arsenic content ranging from 6.7 to 26 parts per million, further evidence of deliberate poisoning. Since, according to Betsy's memoirs, the hair was cut on the day of Betsy's last visit to Longwood, it must have grown in 1817 or early 1818. This allowed Forshufvud to rule out as murder suspects those who came later to St. Helena, particularly Dr Antommarchi, who did not arrive until 1819.

Dame Mabel was most pleased with these results. She had grown up believing that Napoleon had been murdered. It was a family tradition that William Balcombe had suspected poison.

Departures

Napoleon's health had taken a turn for the worse. In October 1817 he complained to O'Meara of a dull pain immediately under the cartilages of the ribs, which never was there before. O'Meara thought this might be a symptom of hepatitis. Two weeks later the doctor reported that Napoleon was never free from an uneasy sensation in the right side; his appetite diminished; his legs still swelled, especially toward night.

When the Balcombes saw Napoleon at about this time, Betsy wrote of his illness: "The havoc and change it had made in his appearance was sad to look upon. His face was literally the color of yellow wax, and his cheeks had fallen in pouches on either side of his face. His ankles were so swollen that the flesh literally hung over his shoes; he was so weak that without resting one hand on a table, and the other on the shoulder of an attendant, he could not have stood. My mother observed, when we had left, that death was stamped on every feature."

At times Napoleon's repeated illnesses revived his fear of poison, which usually centered on the wine. In June, Gourgaud had found a strange flavor in a bottle of Napoleon's wine. Gourgaud advised him not to be the only one to drink his wine because no one would dare poison them all – it would attract too much attention.

Napoleon's health was only one of his worries. His entourage was slowly dwindling. In February 1818, after a year of increasing bitterness with the household, Gaspard Gourgaud left, the second of Napoleon's four officers to go. (Las Cases had sailed away in November 1816.) Young and hot-tempered, Gourgaud was unable to keep his mouth shut. When he complained that he had no woman, while Montholon and Bertrand had wives, Napoleon said, "Bah! Women! If you don't think about them, you don't need them. Be like me." But Gourgaud did not think his master did without women. He believed Albine de Montholon was Napoleon's mistress, and he let Napoleon know what he thought. On one occasion he surprised Albine going to visit Napoleon, who was not dressed, in his bedroom. When Gourgaud told this to her husband, Montholon stammered, "I don't know. I'm not saying no."

The end came at a stormy scene. The issue was the Montholons. Napoleon said he would treat them as he pleased, and so Gourgaud decided to leave St. Helena, giving bad health as the reason.

In late February Napoleon suffered another, much more serious loss. One evening during dinner Cipriani suddenly fell to the floor writhing in pain. Two days later he was dead – O'Meara said "of inflammation of the bowels." Cipriani was listed as a servant; there was no autopsy; no questions were asked about his abrupt death.

The next month the Balcombes sailed from St. Helena, ostensibly because Mrs Balcombe was in poor health, but in fact because Hudson Lowe thought they were entirely too friendly with Napoleon. In William Balcombe, Napoleon lost a valuable link to the outside world, and in the family, he lost his only friends among the English colony on the island.

Barry O'Meara was next. Napoleon was sorry to see the young doctor go. With Cipriani dead and Balcombe gone, O'Meara was one of his few remaining sources of information about the world outside, and their conversations helped while away the long days.

A year later, Albine de Montholon left, taking with her the three Montholon children, and leaving behind questions that would never be answered: Was she Napoleon's mistress, as Gourgaud had maintained? Was her daughter, Napoléone, born on the island, the emperor's child? Whatever her relationship to

Napoleon, it was certain that her departure made the slow days still more empty.

When he realized that Albine was determined to leave, Napoleon told her husband he could go with her, but Montholon refused. Montholon was now emerging as the dominant figure among Napoleon's followers. He had completely supplanted his rival, the retiring, morose Bertrand, who also wished to leave. With his family gone, Montholon could spend all his time at Napoleon's side, and he never complained.

Answers for Skeptics

Throughout his investigation, Sten Forshufvud had encountered many pointed questions – some asked by skeptics, some by himself – probing and refuting his theory of Napoleon's death. Finally in 1974, his research complete, he was ready to answer them with some certainty.

The evidence for arsenic poisoning is so clear. Why had no one before you made the diagnosis?

"I put that question to Henri Griffon, the poison expert at the Paris police laboratory. Griffon said that in no case of arsenic poisoning – and he has investigated many – did a physician diagnose arsenic correctly and in time. The symptoms are characteristic of several diseases more familiar to physicians; one must see them in their totality to make the right diagnosis. Certainly a doctor is more comfortable with disease than with the idea of poison."

But Dr Antommarchi was on the spot. And poisoning by arsenic was certainly a common enough method of murder in those days. Why didn't he suspect poison?

"We must remember the difference between acute and chronic arsenic poisoning. A chronic poisoning, the slow method to which Napoleon was subjected, causes symptoms that were not well understood by physicians of that time. In fact, the syndrome of chronic arsenic poisoning was not understood until 1930."

But how about the medical men and historians who have studied the problem in more recent years?

"Until Hamilton Smith invented and used his hair-analysis technique, there had been no direct physical evidence that Napoleon was poisoned. The memoirs that added so much detail to the story of Napoleon's last days – those of Bertrand and above all Louis Marchand – were only published in 1949 and 1955. The

question of arsenic was not raised, and so it had not been answered. Other theories of Napoleon's death were advanced and won their devoted supporters. Each specialist had taken his position.

"All of the people who most strongly attack the arsenic theory have written books or articles arguing the other theories. To my knowledge, no toxicologist or pathologist has disagreed with me, nor has any criminologist or expert in forensic medicine, and several of them have backed me up. But history is owned by the historians."

Your critics have questioned the origin of the hairs. How can we know they really belonged to the emperor?

"We know from the unusual appearance of the hair and its arsenic content that they all came from one person. The hair fits the description of the emperor's. But is it Napoleon's? Consider its origin – Lachouque in Paris, Frey in Switzerland, Dame Mabel in Australia, plus two others. If the hair is false, then hairs from *one person* would have to have gotten into the hands of each of those people, scattered around the world and all strangers to each other. The possibility is slim."

Why did the poisoning take so long? Why not kill Napoleon at once with one massive dose?

"To understand what happened, we must look at just what it was that the Bourbons feared. They feared Napoleon himself, of course, but even more they feared the Bonapartist movement. Even while the emperor was still alive, some of the conspirators against the Bourbons invoked the name of l'Aiglon, Napoleon's son, rather than the emperor himself.

"Suppose the Count d'Artois, the next in succession to the Bourbon throne, had ordered an assassin to kill Napoleon with a single dose. Poison would certainly be suspected, there would be an autopsy, and the evidence would reveal the presence of arsenic. Imagine what the Bourbons could expect when the news reached France: maybe a popular revolt, led by Napoleon's veterans, that would end their rule forever. It was essential that the poisoning be slow enough to make it seem that Napoleon died a natural death.

"A gradual poisoning also served the purpose of keeping Napoleon quiet. Finally there was a personal consideration of importance to the assassin. I would not have liked to have been at Longwood when it was discovered I had poisoned the emperor.

No doubt the assassin would have been torn to pieces by Napoleon's loyal followers, instead of sailing away unsuspected."

Closing the Net

Forshufvud was now ready to unmask the murderer. He had already eliminated as suspects those who did not actually live at Longwood because, while they could have poisoned the household, they could not have targeted Napoleon alone. That cleared the English, and Bertrand. He had also ruled out those who were not present for the entire exile, because the hairs had proved that Napoleon was poisoned throughout the $5^1/_2$ years on St. Helena. This exonerated Las Cases, Gourgaud, O'Meara, Albine de Montholon, Cipriani and Dr Antommarchi.

The standard way of administering arsenic was through food or drink. Pierron, the butler, was at Longwood throughout the exile. He could easily have poisoned Napoleon, but not Napoleon *alone*, Forshufvud reasoned. Pierron supervised the food preparation, but it was served by the valets; Napoleon would take food from no one else. Pierron could not know which portions would be eaten by the emperor.

What, then, about the three valets: Marchand, Saint-Denis and Noverraz? The latter two could be ruled out because they did not serve the food consistently. And Noverraz was sick in bed during one period when Napoleon was being poisoned.

That left only two suspects: Montholon and Marchand – Napoleon's two most faithful followers. This was ironic, but also quite natural: only the most faithful would have had the constant access to Napoleon required to carry out the assassin's mission.

Forshufvud examined the background of the two suspects and asked himself why each went to St. Helena. Marchand had served Napoleon his entire adult life. His mother had served in the palace, and during Napoleon's first exile went to Vienna to care for the emperor's son. Neither Marchand nor his family had any Royalist connection. It was natural that he would follow the emperor.

Montholon was from the old aristocracy. He was an officer who did no fighting. Napoleon had refused Montholon a promotion and denied him permission to marry Albine, then dismissed

him when he married her anyway. When Napoleon abdicated and went to Elba, Montholon sought to gain favor with the Bourbons.

Count de Sémonville, Montholon's stepfather, was close to the Count d'Artois, Louis XVIII's brother. No doubt through that connection Montholon was made a general during the first Bourbon Restoration.* Before he could assume his commission, he was charged with having stolen 5970 francs from his soldiers' pay a few months earlier – a serious crime. But Montholon was never courtmartialed.

Montholon next appeared in Napoleon's entourage after Waterloo,* in a court chamberlain's uniform. Why had this pleasure-loving young aristocrat suddenly joined a lost cause? Why was he eager to go to St. Helena? Why, Forshufvud asked, did he want to leave the good life in France, where his kind were now in power, to spend his best years on a remote island in the service of a man to whom he owed nothing?

Forshufvud considered Montholon's behavior at St. Helena: he had refused to react to Albine's intimacies with Napoleon, even when Gourgaud taunted him; he never complained, never asked to leave. Forshufvud saw only one explanation for such strange behavior – Montholon was sent for the single purpose of killing the emperor. Surely the man who gave the order was d'Artois, who had already masterminded other assassination plots on Napoleon's life. D'Artois might well have told Montholon that if he did not accept the mission, he could be sent to prison for his earlier theft.

The question of method provided Forshufvud with further evidence. Montholon was Longwood's wine steward – he held the key to the closet in which the wine was kept. The wine usually arrived at Longwood in casks. It would be simple for Montholon to put arsenic in the cask itself, before the wine was bottled. It would also be safe: Montholon was far less likely to be caught doing that than poisoning the food. Food would have to be poisoned each time, but one application in the cask would guarantee that Napoleon would be poisoned for weeks or months to come – and with a predictable dose, since Napoleon was a moderate drinker.

There was more. Napoleon once made a gift of a bottle of his wine to Gourgaud who became afflicted with symptoms similar to the emperor's.

The heart of the matter lay in the last phase of the emperor's life, those first months of 1821, when the assassin adopted the

classical method of killing his victim. He got a physician to prescribe drugs, otherwise harmless, that finish off the person already weakened by the slow arsenic poisoning. In eyewitness accounts of those last months, Forshufvud found that final proof that Napoleon was murdered, and that Montholon was his assassin.

The Final Blow

By the beginning of 1821, Napoleon was extremely weak, suffering from fits of depression and severe pains in the stomach. Throughout this period, Montholon repeatedly told Hudson Lowe that Antommarchi was not equal to saving Napoleon in the present state of his illness, and that he would like a doctor from Paris. He repeated this request to Antommarchi himself, adding, "It is up to the king to choose one."

Antommarchi was dangerous to the assassin in two ways. First, he was trained in anatomy and could do a better autopsy than most doctors. Second, since he was Corsican, he felt no loyalty to either the British or French monarchy and would not fear to disclose the finding of poison. A French doctor, chosen by the Bourbons, would know better than to diagnose poison.

Forshufvud found it impossible to believe that Napoleon, who was afraid of *English* doctors, would put his life in the hands of a physician handpicked by the Bourbons, when, as he frequently observed, the Count d'Artois had repeatedly tried to have him assassinated. Montholon had to be lying to Lowe. He, not Napoleon, wanted a French doctor.

By mid-February Napoleon felt better, but late in the month he had a sudden relapse. Antommarchi reported: "Dry cough. Vomiting. Sensation of heat in the intestines that is almost unbearable." (The hair analysis showed a peak arsenic content at this time.) Finally, in March, at the urging of Bertrand, Montholon and Antommarchi, the emperor took an emetic to combat the symptoms.

Physicians of the time hoped the emetic, by inducing vomiting, would rid the body of the ills for which they had no other treatment. Tartar emetic, the commonest medication, is a compound of antimony. The antimony irritates the interior mucous lining, eventually inhibiting the normal vomiting reflex with which the stomach protects itself. The stomach becomes unable to expel poisons.

Hamilton Smith tested some of Napoleon's hair cut at death for its antimony content. The results showed a relatively high antimony level. Equally important, a sectional analysis showed that the antimony content varied over time, evidence that the medication was continued, further weakening Napoleon's stomach.

Late in April Napoleon decided to switch from licorice* syrup to orgeat.* Orgeat was a drink made with sweet almonds, to which bitter almonds* were usually added for spice. Without the bitter almonds, orgeat was harmless. With them, and in combination with calomel, it could be a deadly poison.

During this time Napoleon improved slightly and worked on the final codicils of his will. Late in the month the governor sent a case of bitter almonds. The orgeat, which Napoleon went on drinking, was now potentially a fatal poison.

On May 3 Hudson Lowe sent two English doctors to examine Napoleon. Without even seeing the emperor (Montholon would not let them), they proposed to give Napoleon a purgative of calomel. Antommarchi cried out against the prescription; it would fatigue the patient for no purpose. The discussion was then referred to Montholon, who sided with the two English doctors, and the medicine was administered.

Calomel was the miracle drug of the time. Physicians prescribed it, as they did tartar emetic, for many kinds of illnesses they could not otherwise treat, and especially as a cathartic for constipation. By itself, it was rather harmless. In combination with the bitter almonds in the orgeat Napoleon was drinking, it could be fatal. The almonds contain hydrocyanic acid,* which releases poisonous mercurous cyanide* from the otherwise inert mercury in the calomel. The victim loses consciousness soon after drinking the lethal mixture. The voluntary muscles become paralyzed; the victim loses his sight and hearing.

The victim's stomach can protect itself against the calomel-orgeat poison if it promptly expels the substance by vomiting. Constant use of tartar emetic, however, prevents this, and death can result. The dosage of calomel given Napoleon – ten grains – can only be called heroic, or insane. Normal practice at the time was one or two grains divided into several doses. Napoleon suffered a complete collapse. He was extremely weak and could not move from his bed. His stools had turned black, a sign that his stomach was corroded and bleeding. Two days later, at 5:49 p.m. on May 5, he died.

Sten Forshufvud stood alone at the empty grave. All was silence here in the valley where the emperor's poisoned body had lain for 19 years. The grave was an unmarked stone slab surrounded by a simple metal fence. He was the only visitor that day in June 1974.

Forshufvud had arrived at St. Helena a week before and was due to depart the next day. The voyage had not been easy to arrange, for the island is in some ways less accessible now than it was in Napoleon's time. In 1869, with the opening of the Suez Canal, St. Helena lost its function as a stopping place on the sea route to the Orient. The present population is heavily subsidized by the British government. It has no airport; the only way to reach the island is by an English passenger-cargo ship shuttling between Bristol and Cape Town.

As Forshufvud stood gazing in silence at the stone slab, his thoughts turned to October 1840 when, at this place, Napoleon's body provided the last piece of evidence in his case. Earlier that year King Louis-Philippe,* under pressure from the Bonapartist tide then rising in France, had decided to fulfill the dying emperor's wish by bringing his remains back to lie in glory on the banks of the Seine. All the surviving companions of the captivity were invited to accompany their master's body to its final resting place.

Most had accepted and came to the grave at St. Helena. Bertrand, 67, gray and weary, was there with one of his sons. Las Cases was nearly 80 and blind; his son Emmanuel went in his place. Gourgaud, hot-tempered as ever, quarreled with Emmanuel instead of his father. Marchand was now middle-aged and, thanks to Napoleon's legacy, a comfortable member of the bourgeoisie. He was there with his two former assistants, Saint-Denis and Noverraz. The two doctors, O'Meara and Antommarchi, were both dead by then.

Montholon was not there. He was in jail.

Montholon's life after his return from exile had been as puzzling as his earlier career. He had collected over a million francs from Napoleon's legacy – a huge amount – but managed to lose it all by 1829. He was in and out of the army, always on the fringe, never seeming to belong anywhere. It was known that in 1827 he was received in secret by King Charles X, the former Count

d'Artois. Charles never publicly rewarded Montholon, but the governments seldom reward those who do their dirty work.

In 1840 Montholon attached himself to Louis Napoleon, the future Napoleon III.* In August Montholon headed a hairbrained expedition from England to conquer France for his new master. French troops, evidently forewarned, were waiting on the beach at Boulogne, and the invaders were quickly captured. Montholon was sentenced to 20 years but served only 6. He would die 11 years later, without having said a recorded word about his crime.

It was just as well for Montholon, Forshufvud reflected, that he was not there when the companions of the exile watched workmen open the emperor's grave, for the witnesses might have understood the meaning of the startling sight they saw. Napoleon's body had not been embalmed, but merely buried after the autopsy within four coffins, two of them metal. When the innermost coffin was opened, the witnesses expected to see a skeleton.

But Napoleon's body was perfectly preserved; he looked as if he were asleep. His face had changed less in those 19 years than the faces of those who were gazing down into the grave. Forshufvud's explanation for this seeming miracle – arsenic. Arsenic the destroyer also prevents tissue from decomposing; museums often use it to preserve specimens, and a human corpse will decay much more slowly if the person was exposed to chronic arsenic poisoning.

Forshufvud's conclusion: Napoleon's body was mutely testifying to his own murder.

THE INCREDIBLE DR BELL

One evening, about the turn of the last century, after enjoying a weekend shoot in Scotland, a dozen guests sat around a dinner table discussing human monsters, famous murders, and unsolved crimes. One of the guests, Dr Joseph Bell, the eminent Edinburgh surgeon and medical instructor, had the others wide-eyed with his deductive acrobatics.

"The trouble with most people," he said, "is that they see, but do not observe. Any really good detective ought to be able to tell, before a stranger has fairly sat down, his occupation, habits, and past history through rapid observation and deduction. Glance at a man and you find his nationality written on his face, his means of

blood on his hands, and the rest of his story in his gait, manisms, tattoo marks, watch chain ornaments, shoelaces and in lint adhering to his clothes."

The guests were skeptical. One challenged Dr Bell to give an mple of applied observation. Promptly, Dr Bell obliged.

"A patient walked into the room where I was instructing the dents, and his case seemed to be a very simple one. I was lking about what was wrong with him. 'Of course, gentlemen,' I happened to say, 'he has been a soldier in a Highland regiment,* and probably as a bandsman. But the man insisted he was nothing but a shoemaker and had never been in the army in his life. This was rather a floorer, but being absolutely certain, I told two of the strongest clerks to remove the man to a side room and strip him.

"Under his left breast I instantly detected a little blue D branded on his skin. He was an army deserter. That was how they used to mark them in the Crimean days. You can understand his evasion. However, this proved my first observation correct. He confessed having played in the band of a Highland regiment in the war against the Russians. It was really elementary, gentlemen."

Most of the guests were impressed. But one listener jocularly remarked, "Why, Dr Bell might almost be Sherlock Holmes.*"

To which Dr Bell snapped, "My dear sir, I *am* Sherlock Holmes."

Dr Bell was not jesting. He was, indeed, the original Sherlock Holmes, the real-life inspiration for the immortal detective of fiction. "It is most certainly to you that I owe Sherlock Holmes," A. Conan Doyle wrote Dr Bell in May, 1892. Thirty-two years later, still grateful to Dr Bell, author Doyle publicly admitted, "I used and amplified his methods when I tried to build up a scientific detective who solved cases on their own merits."

Unlike the detective, Dr Bell wore neither deerstalker cap nor ankle-length Inverness cape, and used neither magnifying glass nor cocaine. Where Sherlock Holmes was the eccentric bachelor in his cluttered rooms at No 221B Baker Street, Dr Bell was entirely the family man with a son, two daughters, and two sprawling multi-gabled homes of his own. Where Sherlock Holmes dwelt in a shadow world bounded by Moriarty and Watson, Dr Bell was a surgeon whose courage won compliments from Queen Victoria, whose crusades for nurses earned the friendship of Florence Nightingale,* whose classroom sorcery influenced five decades of

Edinburgh University undergraduates ranging from A. Conan Doyle to Robert Louis Stevenson* and Sir James Barrie.*

However, the one unique thing which the detective and the doctor held in common overshadowed all their differences. Just as Sherlock Holmes was the foremost fictional practitioner of what he termed "the science of deduction and analysis," so his real life model, Dr Joseph Bell, was perhaps the most brilliant master of observation the world has seen in the last one hundred years.

Many of Dr Bell's views on the science of observation became household words, after the character of Sherlock Holmes mouthed them through sixty classic stories. "Let the inquirer begin," advised Sherlock Holmes, "by mastering more elementary problems. Let him, on meeting a fellow-mortal, learn at a glance to distinguish the history of the man, and the trade or profession to which he belongs. ... By a man's finger-nails, by his coat-sleeve, by his boots, by his trouser-knees, by the callosities of his forefinger and thumb, by his expression, by his shirt-cuffs – by each of these things a man's calling is plainly revealed."

In story after story, Sherlock Holmes reiterated his rules for deduction and analysis. "It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts. ... You know my method. It is founded upon the observation of trifles. ... It is a curious thing that a typewriter has really quite as much individuality as a man's handwriting. ... I have frequently gained my first real insight into the character of parents by studying their children. ... I always put myself in the other man's place, and, having first gauged his intelligence, I try to imagine how I should myself have proceeded under the same circumstances."

These rules merely echoed the real-life gospel* of Dr Joseph Bell. "I always impressed over and over again upon all my scholars the vast importance of little distinctions, the endless significance of the trifles," Dr Bell once told a reporter. "The great majority of people, of incidents, and of cases resemble each other in the main and larger features. For instance, most men have apiece a head, two arms, a nose, a mouth, and a certain number of teeth. It is the little differences, in themselves trifles, such as the droop of the eyelid or what not, which differentiate men."

In an essay on crime, penned a half century ago, Dr Bell wrote, "The importance of the infinitely little is incalculable. Poison a well at Mecca with the cholera bacillus, and the holy water

which the pilgrims carry off in their bottles will infect a continent, and the rags of the victims of the plague will terrify every seaport in Christendom."

What were some of these "infinitely little" factors Dr Bell regarded as important in observation? "Nearly every handicraft writes its sign-manual on the hands," contended Dr Bell. "The scars of the miner differ from those of the quarryman.* The carpenter's callosities are not those of the mason. ... The soldier and sailor differ in gait. Accent helps you to district and, to an educated ear, almost to county. ... With a woman, especially, the observant doctor can often tell, by noticing her, exactly what part of her body she is going to talk about."

While Dr Bell felt that the development of observation was a necessity to doctors and detectives, he felt equally strongly that it was a thrilling sport for laymen. The vain Sherlock Holmes disagreed, holding little hope for the common man. "What do the public, the great unobservant public, who could hardly tell ... a compositor* by his left thumb, care about the finer shades of analysis and deduction?" bemoaned Sherlock Holmes. But Dr Bell felt the unobservant public might care a good deal, once let in on the game.

Every man, argued Dr Bell, can transform his world from one of monotony and drabness into one of excitement and adventure by developing his faculty of observation. For this reason – though once he complained in exasperation, "I am haunted by my double, Sherlock Holmes!" – Dr Bell heartily approved of A. Conan Doyle's detective stories that popularized his ideas. "Doyle shows how easy it is, if only you can observe, to find out a great deal as to the works and ways of your innocent and unconscious friends, and, by an extension of the same method, to baffle the criminal and lay bare the manner of his crime. ... His stories make many a fellow who has before felt very little interest in his life and daily surroundings think that, after all, there may be much more in life if he keeps his eyes open." Once aware of the entertainment and instruction to be had from careful observation, the average man will find his workaday world much the richer. Like Sherlock Holmes, he will be able to detect from a man's hat that his wife does not love him, from a man's cane that he fears being murdered, from a man's pipe that he is muscular, left-handed, careless, and wealthy.

Throughout his life, Dr Bell continued to amaze his circle with

the observation game. "When the family traveled in a train," his surviving daughter, Mrs Cecil Stisted, recalls, "he would tell us where all the other passengers in the carriage were from, where they were going to, and something of their occupations and their habits. All this without having spoken to them. When he verified his observations, we thought him a magician."

His students also thought him a magician. Years after Dr Bell's death, A. Conan Doyle told an interviewer, "Dr Bell would sit in his receiving room, with a face like a red Indian, and diagnose people as they came in, before they even opened their mouths. He would tell them their symptoms, and even give them details of their past life, and hardly ever would he make a mistake."

Inside the spired Royal Infirmary of Edinburgh, in the packed lecture amphitheater beneath the flickering gaslights, Dr Bell daily tried to prove to his pupils that observation was not a form of magic but a science. According to one former pupil, Dr Harold Emery Jones, writing in *Collier's* in 1904, Dr Bell's standard demonstration of this, its running commentary given in a voice full of dry humor before each new group of medical students, involved taking up a tumbler filled with an amber-colored liquid. "This, gentlemen, contains a very potent drug," Dr Bell would explain. "To the taste it is intensely bitter. Now I want to see how many of you gentlemen have educated your powers of perception. Of course, we might easily analyze this chemically, but I want you to test it by smell and taste; and, as I don't ask anything of my students which I wouldn't be willing to do myself, I will taste it before passing it around."

Dr Bell would then dip his finger into the liquid, put the finger to his mouth, suck it, and grimace. He would then pass the tumbler around. Each student would dip his finger into the vile concoction, suck it, and promptly make a sour face. When the tumbler had made the rounds, Dr Bell would gaze at the assembly and begin laughing. "Gentlemen," he would say, "I am deeply grieved to find that not one of you has developed this power of perception, which I so often speak about, for, if you had watched me closely, you would have found that, while I placed my forefinger in the bitter medicine, it was the middle finger which found its way into my mouth!"

Students of Dr Bell's would remember, for years after, some of the master's deductive feats. Dr Harold Emery Jones recalled

that Dr Bell would summon his charges up front to try their own hand at observing. "What is the matter with this man, sir?" Dr Bell once asked of a quaking student. "No, you mustn't touch him. Use your eyes, sir. Use your ears, use your brain, your bump of perception,* and use your powers of deduction." At sea, the confused student blurted, "Hip-joint disease, sir." Dr Bell scowled, shook his head. "Hip-nothing! The man's limp is not from his hip, but from his foot. Were you to observe closely, you would see that there are slits, cut by a knife, in those parts of the shoes where the pressure of the shoe is greatest against the foot. The man is a sufferer from corns, gentlemen, and has no hip trouble at all. But he has not come here to be treated for corns, gentlemen. His trouble is of a much more serious nature. This is a case of chronic alcoholism, gentlemen. The rubicund nose, the puffed, bloated face, the bloodshot eyes, the tremulous hands and twitching face muscles, with the quick, pulsating temporal arteries, all show this. These deductions, gentlemen, must however be confirmed by absolute and concrete evidence. In this instance my diagnosis is confirmed by the fact of my seeing the neck of a whiskey-bottle protruding from the patient's right-hand coat pocket ... never neglect to ratify your deductions."

But the most famous example of Dr Bell's skill was the one A. Conan Doyle told in his autobiography. A civilian outpatient, a total stranger to Dr Bell, came into his ward. In silence, Dr Bell studied the visitor, then spoke:

"Well, my man, you've served in the army."

"Aye, sir."

"Not long discharged?"

"No, sir."

"A Highland regiment?"

"Aye, sir."

"A non-com officer?"*

"Aye, sir."

"Stationed at Barbados?"

"Aye, sir."

Dr Bell turned to his students. "You see, gentlemen, the man was a respectful man, but he did not remove his hat. They do not in the army, but he would have learned civilian ways had he been long discharged. He has an air of authority and he is obviously Scottish. As to Barbados, his complaint is elephantiasis, which is West Indian and not British."

Years after, A. Conan Doyle was still sufficiently impr[illegible] this incident ("very miraculous until it was explained," he t[illegible]ted) to reproduce it closely in his Sherlock Holmes story Greek Interpreter."

A. Conan Doyle, after five years as a struggling medical s[illegible]dent, graduated from Edinburgh University in 1881. He had his oculist shingle and waited for patients. Six years later, h[illegible] still waiting. Lacking a practice, desperate for any kind of m[illegible] Doyle turned to writing. After one false start, and under the [illegible]ence of Gaboriau* and Poe,* he decided to try a detective [illegible] And for it he wanted a new kind of detective. "I thought of my teacher Joe Bell, of his eagle face, of his curious ways, of his tricks of spotting details," Doyle recollected in his autobiography. "If he were a detective, he would surely reduce this fascinating but unorganized business to something nearer to an exact science. It was surely possible in real life, so why should I not make it plausible in fiction? It is all very well to say that a man is clever, but the reader wants to see examples of it – such examples as Bell gave us every day in the wards. The idea amused me. What should I call the fellow?"

He called him Sherlock Holmes after an English cricketer named Sherlock and Oliver Wendell Holmes.*

In describing the detective, Doyle again remembered his old instructor. Dr Bell had been forty-four when Doyle last saw him. "He was thin, wiry, dark, with a high-nosed acute face, penetrating grey eyes, angular shoulders, and a jerky way of walking. His voice was high and discordant." With this as Doyle's model, Sherlock Holmes became the familiar tall, stooped, hawk-faced, intense, and inscrutable human bloodhound. His first appearance in *Beeton's Christmas Annual*, with "A Study in Scarlet" in 1887, was inauspicious. But as a result, an American editor, three years later, ordered more Sherlock Holmes stories and the detective was on his way to literary immortality.

Sherlock Holmes's deductive tricks thrilled readers on both sides of the Atlantic. Each Holmes stunt was discussed and admired by fans everywhere. In "The Adventure of the Norwood Builder," when a frantic young man burst into the rooms on Baker Street and announced himself as John McFarlane, Sherlock Holmes lazily replied, "You mentioned your name, as if I should recognize it, but I assure you that, beyond the obvious facts that

ur a bachelor, a solicitor, a Freemason, and an asthmatic, I nothing whatever about you."

This fictional witchcraft, made so plausible by Doyle's deft became an international fad. But very often an Edinburgh mate would recognize from whom Doyle had derived this ge-

In 1893, the year before his death, Robert Louis Stevenson, meeting the "ingenious and very interesting" Sherlock ues in print for the first time, asked A. Conan Doyle in a letter Samoa, "Only one thing troubles me. Can this be my old ul, Joe Bell?" A. Conan Doyle was quick to tell Stevenson, the and the world that the prototype for Sherlock Holmes was ed Dr Bell. As Doyle wrote to Dr Bell, "I fear that one effect our identity being revealed will be that you will have ample portunity for studying lunatic letters, and that part at least of the am that pours upon me will be diverted to you. You will hear from the youth in the south of Portugal, from the American dy with the curved spine, from the Liverpool merchant who hurns to know who Jack the Ripper* is, from many folks who believe that their neighbors are starving maiden aunts to death in hermetically sealed attics."

Even though, in speaking of his Edinburgh mentor, A. Conan Doyle pointed out that "it was toward the detection of disease rather than of crime that his remarkable talents were directed," Dr Bell could never resist dabbling in a first-class murder. This was his primary extracurricular activity. The Crown* welcomed Dr Bell's detecting genius. As an amateur detective, without official status, Dr Bell worked hand in hand for twenty years with Sir Henry Littlejohn, professor of medical jurisprudence, and police surgeon to the city of Edinburgh. Dr Bell's greatest success, in the years before he became known as Sherlock Holmes, was the part he played in the sensational Chantrelle case.

Eugene Chantrelle, a onetime Paris medical student, was a powerful, handsome man with mutton-chop whiskers. He had come to Edinburgh in 1866, to teach languages, and within a year had seduced a fifteen-year-old pupil named Elizabeth Dyer and been forced to marry her. The marriage was a singularly unhappy one.

In October, 1877, fearing that his fragile wife might meet with an accident, Chantrelle thoughtfully insured her life for $5,000. Early one morning, about ten weeks later, the housemaid heard a moaning from one of the upstairs bedrooms. Rushing to Madame

Chantrelle's room, the maid found her unconscious. Beside h bed were a partially filled glass of lemonade, some orang and a few leftover grapes. After calling Monsieur Chantrell maid ran out for a doctor. Returning, the maid found Cha hurriedly stepping away from the window. The lemonad was empty, the orange slices and grapes gone. When the d arrived, Chantrelle told him he thought his wife had bee come by a gas leakage. At once, the doctor sent a note t Henry Littlejohn: "If you would like to see a case of coal-ga soning, come up here at once."

Littlejohn, accompanied by Dr Bell, studied the bedroom the ailing woman, and then removed her to the Royal Infirm There, after several hours, she died. Chantrelle was told she had died of narcotic poison. He protested, "But you know we have had an escape of gas!" Nevertheless, he was arrested for murder.

Littlejohn and Dr Bell had indeed found evidences of poison There were many green-brown vomit spots on her pillow, and two on her nightgown. These contained opium in solid form, mingled with grape seed fragments – matching a smaller portion of the same contents which were found in her alimentary canal. Check ing with chemists, Dr Bell found Chantrelle had recently pur chased thirty doses of opium.

Chantrelle loudly insisted his wife had died accidentally from leaking gas. Investigating, the gas company located a broken gas pipe behind Madame's window shutter. The maid, claiming there had been no smell of gas in the room when she discovered the body but a faint smell when she returned to find Chantrelle mov ing away from the window, thought Chantrelle himself had wrenched the pipe loose to make the death appear accidental. To this, Chantrelle replied he could not have broken the pipe, since he did not even know it existed. Suspicious, Dr Bell began snoop ing about, and finally located a gas fitter who admitted repairing the pipe behind the shutter for Chantrelle only a year before, while "Chantrelle watched with interest the operation." With this evidence, plus proof that Chantrelle had been in serious financial difficulties, the Crown brought the French schoolmaster to the dock. The trial lasted four days. The jury was out one hour and ten minutes. The verdict: "Guilty of murder as libelled."

Despite all his publicity as the original of Sherlock Holmes, Dr Bell abhorred the spotlight. He was a reticent man, and interview ers actually learned little about his background or his private life.

Joseph Bell, product of five generations of surgeons, was the [illegible] son of a devout and renowned physician. At the age of [illegible]ty-two, Bell took his medical degree at Edinburgh University, and two years later became house surgeon in the Royal Infirmary. His courage was amazing. On one occasion, at a time when diphtheria was a little-understood disease, an ailing child suffering from diphtheria was wheeled into surgery. After the operation, pus accumulated and, since there were no mechanical means of suction, the child was given little chance to live. Without a moment's hesitation Dr Bell put his lips to the child's, sucked the poison from its throat, and saved its life. As a result, Dr Bell himself caught diphtheria, which permanently impaired his voice.

In company, Dr Bell expressed very definite opinions on all matters. "Hysterical people are generally liars," he would say. Or, "I have no patience with bigots. There is always some hypocrisy in conjunction with bigotry." Or, after visiting the remains of Wellington and Nelson, "I should not have liked to know them. One should not see a hero too near." He was Empire-minded, defending the Boer War to a friend: "You surely don't want us to be kicked out of South Africa. Once a nation begins to give in, it is a dying nation, and soon will be a dead one." He liked parables and Sir Walter Scott* and pitied "poor Dreyfus."* Like all amateur detectives, he regarded policeman as flatfoots. "You cannot expect the ordinary policeman to stand eight hours on his legs and then develop a great mental strength."

Above all, he had a sense of humor. When visitors begged him to recount tales of his deductive prowess, he enjoyed relating the story of his visit to a bedridden patient. "Aren't you a bandsman?" Dr Bell asked, standing over the patient. "Aye," admitted the sick man. Dr Bell turned cockily to his students. "You see, gentlemen, I am right. It is quite simple. This man had a paralysis of the cheek muscles, the result of too much blowing at wind instruments. We need only inquire to confirm. What instrument do you play, my man?" The man got up on his elbows. "The big drum, Doctor!"

Dr Bell died in October, 1911, at the age of seventy-four. His funeral was impressive, attended by the Seaforth Highlanders, by a deputation of nurses, by endless influential medical men, and by swarms of poor people he had treated.

COMMENTARY

PART ONE

Stories in Stone

p. 6 **the Vikings** ['vaɪkɪŋz] – викинги. На Руси их называли варягами, в Западной Европе – норманнами (Normans). С конца 8 в. эти выходцы из Скандинавии – искусные морс плаватели – постоянно совершали грабительские набеги на соседние племена и народы Европы, смело пускались в дальние морские путешествия на запад, достигли Северной Америки. Походы викингов прекратились около серединны 11 в.

the Great Lakes – Великие Озера. Эти озера, расположенные в США и Канаде, ледникового происхождения, располагают самым большим запасом пресной воды на Земле. Это: Верхнее озеро (Superior [su'pɪərɪə]), Гурон (Huron ['hjurən]), Мичиган (Michigan ['mɪʃɪgən]), Эри (Erie ['ɪərɪ]), Онтарио (Ontario [ɔn'tɛərɪəu]).

rune writing – руническая письменность, применялась скандинавскими и германскими народами во 2 – 13 вв.

Goths – готы, группа германских племен, вторгшихся, а затем осевших в Восточной (остготы) и Западной (вестготы) Европе в 3 – 5 вв.

Vinland – Винланд (страна винограда). Название было дано норманнами части северо-восточного побережья Северной Америки, открытой Лейфом Эйриксоном (Leif Erics/s/on) по прозвищу «Счастливый» около 1000 г. Скандинавские поселения просуществовали там приблизительно до середины 12 в.

p. 7 **early Norse** – древнескандинавский язык

Wyoming's Mystery Mummy

p. 9 **Harvard** – Гарвардский университет в г. Кембридже, вблизи г. Бостона – административного центра штата Массачусетс (США)

the Pliocene ['plaɪəsiːn] **Age** – плиоцен; плиоценовый период, последняя эпоха неогенового (Niocene ['naɪəsiːn]) периода геологической истории Земли, когда моря и континенты приняли привычные для нас очертания, обно-

шился состав млекопитающих, появились растения и беспозвоночные, близкие к современным

The Abominable Snowman

p. 11 **Sinkiang province** – провинция Синьцзян, КНР, в 1955 г. была преобразована в Синьцзян-Уйгурский автономный район

Sherpa ['ʃɜ:pə] – шерпы (шерпа), одна из восточных народностей Тибета, живущая высоко в горах на южных склонах Гималаев

p. 12 **Everest** – Эверест, высочайшая вершина на Земле, в Гималаях (8848 м). Ныне пику возвращено его тибетское название – Джомолунгма (*букв.* Богиня – мать Земли) (Chomolungma – Goddess Mother of the Earth).

Johns Hopkins – Университет Джонса Хопкинса в г. Балтиморе, штат Мэриленд, США

Oddest Spot on Earth

p. 13 **"Oregon Vortex"** – «Орегонская магнитная аномалия»

an assay office – государственная пробирная палата

Midnight at Noon

p. 16 **explain away** – объяснять, приводя неубедительные доводы

The Killer Comets

p. 17 **the Black Death** – «черная смерть», эпидемия чумы в Европе в 1347 – 1353, унесшая ок. 25 млн. человеческих жизней

p. 18 **Daniel Webster** – Дэниэл Уэбстер (1782 – 1852), американский государственный и политический деятель

Post-Mortem Explorer

p. 20 **Point Barrow, Alaska** – мыс Барроу, самая северная оконечность Аляски, 71°23′ северной широты и 156°12′ западной долготы

The Case of the Very Strange Shipwreck

p. 20 **Lloyd's** – «Ллойд», ассоциация страховщиков; занимается преимущественно морским страхованием. Создана в Лондоне в 1688 г.

p. 21 **the Straits of Torres** – Торресов пролив (Торреса

пролив), между Новой Гвинеей и Австралией; назван в честь испанского мореплавателя Луиса Ваэса де Торреса (1560 – 1614?)

The Riddle of the Rainmaker

p. 23 **With Hatfield, the rains came COD.** – Хетфилд поставлял дождь по требованию. COD ['si:ou,di:] = collect on delivery, cash on delivery (*букв.* уплата при доставке) здесь означает, что разработанная Хетфилдом технология действовала безотказно.

the San Joaquin [ˌsænwə'ki:n] **valley** – до́лина Сан-Хоакин (Сан-Джоакуин), на Западе США

The Treasure in the Well

p. 24 **may be the end of the rainbow for you.** – может оказаться заветной золотой жилой. Согласно старинному поверью, если быстро добраться до места, где радуга уходит в землю, и начать там копать, то непременно найдешь горшок, доверху наполненный золотом.

p. 25 **Nova Scotia** ['nouvə'skouʃə] – Новая Шотландия, провинция на Юго-Востоке Канады

Teach (Thatch) – Тич, Эдуард (? – 1718), английский пират по кличке «Черная борода»

Morgan – Морган, Генри (1635? – 1688), пират, уроженец Уэльса, промышлял, главным образом, в Карибском бассейне. В 1666 г. пираты избрали его своим «адмиралом». Под предводительством Моргана только за период с 1655 по 1671 г. подверглись нападению и разграблению не менее 57 испанских городов от Венесуэльского залива до Гибралтара. Впоследствии Морган, возведенный в рыцарское звание, был назначен губернатором Ямайки. Награбленное пиратом богатство позволило его потомкам основать банковский дом Морганов.

The Man From Nowhere

p. 32 **Whit-Monday** – «духов день», второй день церковного праздника «пятидесятница» (Pentecost or Whitsunday), или «Троица», который начинается на пятидесятый день после пасхи. Содержание праздника составляет почерпнутый из новозаветной книги «Деяния апостолов» миф о сошествии «святого духа» на апостолов в пятидесятый день после воскресения Христа, вследствие чего они «заговорили на разных языках, никогда им не учившись». В богословии этот миф толкуется как указание нести весть о христианстве

всем народам и языкам» и поэтому пятидесятница среди католиков и протестантов празднуется как день рождения христианской церкви.

p. 34 **Von Feuerbach, Anselm** – Фейербах, Ансельм (1775 – 1833), немецкий криминалист, представитель классической школы уголовного права

Who Planned the Murder of Abraham Lincoln?

p. 34 **John Wilkes Booth** – Джон Уилкес Бут (1839 – 1865), американский актер, выстрелом из пистолета нанесший смертельную рану президенту Аврааму Линкольну в Вашингтонском театре Форда 14 апреля 1865 г.

p. 36 **Teddy (Theodore) Roosevelt** – Теодор Рузвельт (1858 – 1919), 26-й президент США (1901 – 1909)

A Dream That Shook the World

p. 38 **the Straits of Sunda** ['sʌndə] – Зондский пролив, разделяет острова Ява и Суматра; в проливе находится действующий вулкан Кракатау

The Riddle of Loch Ness

p. 39 **a plesiosaurus** [ˌpli:siə'sɔ:rəs] – плезиозавр. Плезиозавры относятся к подотряду вымерших морских пресмыкающихся мезозойской (Mesozoic [ˌmesou'zouik]) эры, отличавшиеся длинной шеей, маленькой головой и толстым туловищем с сильно развитыми ластообразными конечностями, выполнявшими роль плавников. Мезозойская эра – четвертая эра в геологической истории Земли, когда господствовали гигантские пресмыкающиеся, появились костистые рыбы, птицы и плацентарные млекопитающие.

a dinosaur ['dainousɔ:z] – динозавр. Динозавры (*лат.* ужасные пресмыкающиеся) – самый многочисленный надотряд сухопутных пресмыкающихся с очень маленьким головным мозгом, отличался гигантскими размерами – до 30 м в длину. Некоторые виды этих сухопутных хищников имели короткие передние конечности и передвигались на задних ногах, другие же – на четырех. Позже появились растительноядные динозавры, часть которых перешла к жизни в воде. Древние динозавры вымерли в конце мелового (Cretaceous [kri'teiʃəs]) периода, т.е. около 80 млн. лет назад.

p. 40 **Gaelic** ['geilik] – гэльский (гаэльский) (о языке, мифологии и т.д. кельтского происхождения в Шотландии)

Adamnan – Адамнан (624? – 704), ирландский священник, настоятель монастыря (679 – 704) на острове Иона

St Columba – Колумба (521 – 597), миссионер из Ирландии, прозванный «апостолом Каледонским»; в 563 г. основал монастырь на острове Иона

a Pict – пикт, представитель племени, составлявшего древнее население Шотландии; в 9 в. пикты были завоеваны скоттами, одним из кельтских племен

was granted perpetual freedom of the loch. – получил право свободного (т.е. безопасного и беспрепятственного) передвижения по озеру (что-то вроде почетного гражданства)

West Country Legends

p. 41 **Wotan** – Вотан (Водан), у древних германцев верховный бог, бог войны. Вотан соответствовал в скандинавской мифологии Одину.

p. 43 **the Duke of Monmouth** – Герцог Монмут (1649 – 1685), побочный сын английского короля Карла II. После смерти Карла II в начале 1685 г. была предпринята попытка возвести его на престол, свергнув брата короля Иакова II, успевшего к тому времени занять престол. В июне 1685 г. претендент высадился в Англии, но, не найдя поддержки у населения, потерпел полное поражение в битве при Седжмуре, был взят в плен, а затем казнен. Битва при Седжмуре была последней крупномасштабной битвой на территории Великобритании.

Lyonesse [ˌlaɪəˈnes] – Лайонесс, страна, которая, по преданию, находилась в юго-западной Англии, но исчезла, поглощенная морем; родина легендарного короля Артура – героя рыцарских романов «Круглого стола»

Land's End – Лэндс-Энд, мыс на юго-западной оконечности полуострова Корнуолл (Cornwall); крайняя юго-западная точка острова Великобритании

Arthur – Король Артур, герой кельтских народных преданий. Согласно легенде, он родился в Тинтаджеле (Tintagel) и в своем дворце в Камелоте (Camelot) основал орден рыцарей «Круглого стола» (Knights of the Round Table), призванного олицетворять нравственные идеалы рыцарства. Предполагается, что у этого образа был реальный прототип – вождь кельтов-бриттов, который в конце 5 и начале 6 вв. возглавил выступления против германских племен англо-саксов, вторгшихся в Британию с континента. Постепенно кельтский воин-предводитель превращается в мудрого короля Артура и становится центральным персонажем средневековых «артуровских легенд», повест-

ующих о его собственных подвигах и подвигах рыцарей «Круглого стола».

Tristram and Iseult [iːˈzuːlt] – «Тристан и Изольда», французский рыцарский роман о трагической любви рыцаря Тристана и Изольды – жены корнуоллского короля

44 **According to legend, St Decuman retrieved his own severed head and walked away with it.** – Такой невероятный исход события, когда казненный уходит с места казни, унося собственную голову, должен был, очевидно, свидетельствовать о «святости» персонажей легенд и широко использовался в описаниях жития святых. По преданию, так же поступил и св. Даниил, основатель собора Парижской богоматери, будучи обезглавлен римскими легионерами.

Yesterday

44 **he never backed off his story.** – он ни разу не отступил от своей версии.

45 **In short, Gloucester** [ˈglɔstə] **was a hard sell.** – Словом, убедить жителей Глостера в том, что они поддались оптическому обману, было почти невозможно.

46 **requires not merely the club of a Hercules, but the cunning contrivance of a Vulcan.** – для этого потребуется не просто дубина (т.е. физическая мощь) Геркулеса, а хитроумное приспособление (т.е. хитрость и смекалка) Вулкана. **Hercules** [ˈhɜːkjuliːz] в римской мифологии Геркулес, соответствует греческому Гераклу **Heracles** [ˈherəkliːz], обладавшему исполинской физической силой и прославившемуся своими двенадцатью подвигами. **Vulcan** [ˈvʌlkən] в римской мифологии Вулкан – бог огня, покровитель кузнечного ремесла. В греческой мифологии соответствует Гефесту **Hephaestus** [həˈfiːstəs].

47 **Faneuil** [ˈfænl] **Hall** – Фэньюэл-холл, здание торговых рядов, которое является одним из наиболее значительных достопримечательностей Бостона, так как именно там накануне Войны за независимость (1775 – 1783) собирались патриоты, и именно по этой причине Фэньюэл-холл часто называют «Колыбелью свободы» (the Cradle of Liberty)

the Linnaean [lˈniːən] **Society** – Общество имени Карла Линнея (1707 – 1778), шведского естествоиспытателя, создателя системы растительного и животного мира

Rumford Professor of Materia Medica – профессор фармакологии. Эта ставка профессора при кафедре химии Гарвардского университета была учреждена в знак признания научных заслуг известного естествоиспытателя графа

Румфорда (1753 – 1814), американца по происхождению, чье настоящее имя Бенджамин Томпсон (Benjamin Thompson).

p. 48 **Ichthyosaurus** [ˌɪkθɪəˈsɔːrəs] – ихтиозавры, подкласс вымерших хищных морских пресмыкающихся с рыбообразным телом, длиной до 10 – 13 м. Жили в мезозое.

UFOs

p. 48 **UFO** [ˌjuːˈfou] (Unidentified Flying Object) – НЛО (неопознанный летающий объект)

p. 49 **flying saucer** – летающая тарелка (*букв.* летающее блюдце)

p. 50 **Matthew of Paris** – Мэтью Парижский (1200? – 1259), английский монах-летописец

p. 51 **John Evelyn** – Джон Ивлин (1620 – 1706), английский государственный служащий, который вел подробный дневник своих путешествий, а также наиболее значительных событий своего времени

p. 52 **a Roman Candle** – «римская свеча», вид пороховой пиротехнического изделия

p. 56 **FBI** [ˌefbiːˈaɪ] (Federal Bureau of Investigation) – ФБР (Федеральное бюро расследований), в США; ведомство, созданное в 1908 г. для расследования нарушений федеральных законов. Сочетает функции уголовной и тайной политической полиции.

The Improbable World of the Unexplained

p. 58 **the plain of Nazca** – пустыня Наска, песчаная равнина на побережье Перу. Неизвестный народ более двух тысячелетий назад сделал здесь гигантские рисунки, чье истинное предназначение остается загадкой и по сей день. Древние обитатели Наска изобразили на поверхности равнины птиц, рыб, обезьян и других животных. Открытие рисунков состоялось только благодаря авиации, так как фигуры и рисунки можно увидеть лишь с высоты.

Inca roads – см. комм. на с. 220

Ancient Imagination and Legends, or Ancient Facts?

p. 60 **the Tzolkin** – цолькин, священный календарь майя, который представлял собой 260-дневный цикл; по нему определялись благоприятные даты магических обрядов и ритуалов

the Pleiades [ˈplaɪədiːz] – Плеяды (*греч.* семь сестер), рас-

сонное звездное скопление в созвездии Тельца (Taurus ['tɔ:rəs]). Есть несколько вариантов мифа о Плеядах. По одному из них, Плеяды (дочери Атланта (Atlas) и океаниды Плейоны (Pleione)), преследуемые охотником Орионом (Orion [ə'raiən]), обратились к богам с мольбой о спасении и были превращены в голубей, а затем в звезды. По другому мифу, огорченные участью своего отца, поставленного подпирать небесный свод за участие в борьбе титанов против олимпийских богов, покончили с собой и были взяты на небо.

cuneiform ['kju:nifɔ:m] – клинопись, письменность из групп клинообразных черточек, возникшая около 3000 г. до н. э. в Шумере. Сложность клинописи состоит в том, что большинство клинописных знаков имеет по несколько слоговых значений; почти все знаки являются также обозначениями целых слов, т.е. идеограммами, причем достаточно большое число знаков обозначает каждый по нескольку слов; определенные сочетания нескольких знаков, независимо от их слоговых значений, зачастую обозначают целые слова. Таким образом, только контекст дает возможность определить, какое значение имеет знак.

the Mahabharata – Махабхарата или «Сказание о великой битве бхаратов», величайший памятник древнеиндийского героического эпоса, отражающий ранний этап в становлении индуистской мифологии. «Махабхарата» состоит из 18 книг, насчитывает 100 тысяч двустиший. Авторство «Махабхараты» приписывают легендарному мудрецу Вьясе. «Махабхарата» – древнейший памятник человеческой культуры, ему более 25 веков.

Ramayana – Рамаяна, древнеиндийская эпическая поэма на санскрите, повествующая о подвигах Рамы – мудрого, добродетельного царя-героя. Автором «Рамаяны» считают легендарного поэта Вальмики.

Ancient Marvels or Space Travel Centers

p. 62 **the pyramid of Cheops** ['ki:ɔps] – пирамида-усыпальница Хеопса, египетского фараона IV династии (27 в. до н.э.), в Гизе, является крупнейшей в Египте – ее высота достигает 146,6 м. Мумия Хеопса до сих пор не обнаружена.

on a camel called Wellington or Napoleon, depending on his nationality – на верблюде по кличке Веллингтон или Наполеон, в зависимости от национальности туриста. Таким образом, если турист англичанин, то верблюд будет носить имя герцога Веллингтона – командующего англо-голландской армией в битве при Ватерлоо (Waterloo, 1815),

нанесшей поражение французам, если же турист француз — верблюд будет непременно зваться Наполеоном.

Ra/Re – Ра, в древнеегипетской мифологии бог солнца. Согласно одному из мифов, днем Ра, освещая землю, плывет по небесному Нилу в барке Манджет, вечером пересаживается в барку Месектет и спускается в преисподнюю, где, сражаясь с силами мрака, плывет по подземному Нилу с тем, чтобы утром вновь появиться на горизонте.

The Earth's Experience of Space

p. 63 **Asaph** ['æsəf] **Hall** – Асаф Холл (1829 – 1907), американский астроном, определивший период вращения Сатурна (1876), а также открывший спутники Марса (1877).

Johannes [jou'hænɪs] **Kepler** – Иоганн Кеплер (1571 – 1630), немецкий астроном. Кеплер открыл законы движения планет, заложил основы теории затмений.

Jonathan ['ʤɔnəθən] **Swift** – Джонатан Свифт (1667 – 1745), английский писатель и политический деятель. «Путешествие Гулливера» (1726) – гротескное осмеяние общественного строя и политики господствующих классов. В той части книги, где он повествует о путешествии Гулливера в Лапуту, он едко высмеивает философствующих невежд и всякого рода лже- и псевдоученых.

p. 64 В отношении утверждения великого английского сатирика, что вокруг Марса обращаются два маленьких спутника, И.С. Шкловский, известный советский астрофизик, в книге «Вселенная Жизнь Разум» (М., 1965. С. 178 – 179) пишет следующее: «Приходится только удивляться, как хорошо угадал Свифт. О причинах столь поразительного прогноза в литературе было высказано немало суждений. Нам лично представляется, что гениальная догадка Свифта была вполне закономерной. По-видимому, он исходил из того хорошо известного факта, что Земля имеет одного спутника, а Юпитер – 4 ... . Так как Марс находится между Землей и Юпитером, то, исходя из геометрической прогрессии, Свифт предположил, что у Марса должно быть два спутника. Из того факта, что никто из астрономов в существовавшие тогда телескопы спутников Марса не обнаружил, Свифт справедливо предположил, что последние должны быть достаточно маленькие. Гениальность Свифта проявилась в том, что он отнес спутники Марса на сравнительно небольшое расстояние от планеты, так как, по-видимому, понимал, что даже очень маленькие спутники на достаточно большом расстоянии вполне могли быть наблюдаемыми. Между тем, если они близки к планете, то

...ы довольно интенсивного рассеянного света от яркого ...ара их очень трудно наблюдать с Земли».

p. 68 **I.S. Shklovskii** – Иосиф Самуилович Шкловский (1916 – 1985), советский астрофизик

Carl Sagan ['seɪgən] – Карл Саган (1934), американский астрофизик

the Moscow Sternberg Astronomical Institute – Государственный астрономический институт им. П.К. Штернберга, создан на базе обсерватории МГУ. В 1931 г. институту было присвоено имя Павла Карловича Штернберга (1865 – 1920), выдающегося астронома.

The Bermuda Triangle: A Mystery of the Air and Sea

p. 68 **coelacanth** ['si:ləkænθ] – целакант. Первый экземпляр этой рыбы (другое ее название – латимерия) был выловлен в 1938 г. и вызвал настоящую сенсацию. Кистеперые рыбы, потомком которых является целакант, обитали на Земле 300 миллионов лет назад и до 1938 г. были известны только в виде окаменелостей.

the Benguela Current – Бенгельское течение, холодное течение Атлантического океана у западных берегов Африки

seiche [seɪʃ] **waves**—волны, вызванные сейшем – специфическим колебанием уровня воды

p. 69 **Atlantis** – Атлантида, по древнегреческому преданию, некогда существовавший огромный остров в Атлантическом океане. За непомерную гордость ее обитателей по ведению Зевса (Zeus [zjus]) Атлантида была поглощена океаном. «Загадка Атлантиды» продолжает будоражить умы ученых – идут споры как о существовании Атлантиды, так и о причинах ее гибели.

Easter Island – остров Пасхи, вулканический остров в восточной части Тихого океана. Сами островитяне называют его Рапануи, или «Взгляд в небо». Островом Пасхи его назвал голландец Роггевен, который первым пришел туда со своими спутниками на двух парусниках в 1722 г. в день пасхи. Остров Пасхи – остров нераскрытых тайн: не установлено, откуда туда пришли первые поселенцы, кто создал грандиозные каменные изваяния (моаиты), что написано на ронго-ронго – дощечках с письменами.

p. 70 **the Sargasso** [sɑ'gæsou] **Sea** – Саргассово море, в центральной части Атлантического океана

The Sea of Lost Ships

p. 70 **Phoenician** [fi'nɪʃiən] – финикийский (см. также комм. на с. 219)

Carthaginian [ˌkɑːθəˈdʒɪnɪən] – карфагенский

p. 72 **the Pillars of Hercules** – Гибралтарский пролив, у римлян Гибралтар назывался Геркулесовыми столбами, у греков – Столбами Геракла

Is There a Logical Explanation?

p. 75 **Edgar Allan Poe** – Эдгар Аллан По (1809 – 1849), американский писатель-романтик, классик новеллы, родоначальник детективной литературы. В книге цитируется отрывок из рассказа «Низвержение в Мальстрем».

p. 77 **CAT** (Clear Air Turbulence) – внезапное завихрение воздуха в безоблачном небе, связанное со струйным течением

the G factor – фактор перегрузки

A Suggestion from the Ocean's Past

p. 78 **Noah** [ˈnouə] – Ной, герой библейского мифа о всемирном потопе, спасенный праведник и строитель ковчега (Ark), спаситель мира зверей и птиц. (См. также комм. на с. 214.)

Deucalion [djuːˈkeɪljən] – Девкалион, сын Прометея (Prometheus [prəˈmiːθjuːs]), и его жена Пирра (Pyrrha [ˈpɪrə]) спаслись во время всемирного потопа, устроенного Зевсом, который на Парнасе (Parnassus) на вопрос Девкалиона и Пирры, как возродить человеческий род, ответил, что им надо бросать через плечо «кости своей праматери». Девкалион понял, что камни – это кости общей матери людей Земли. Камни, которые бросал Девкалион, превратились в мужчин, брошенные Пиррой – в женщин. Сын Девкалиона и Пирры Эллин стал родоначальником греческих племен. В греческой мифологии потоп как бы знаменует начало Эллинской (Hellenic) цивилизации.

Ut-napishtim – Ут-Напиштим, герой вавилонского мифа о потопе. Рассказ Ут-Напиштима, прародителя Гильгамеша (Gilgamesh), входит в «Сказание о Гильгамеше» – жемчужину вавилонско-ассирийской литературы. История потопа в том виде, как она излагается в эпосе, оказалась древнейшим вариантом библейской легенды о Ное, которая заимствовала сказание о потопе полностью, со всеми подробностями – вплоть до ворона и голубя, которых, как известно, посылал Ной, чтобы выяснить, достаточно ли обсохла земля.

p. 79 **Tiahuanaco** – Тиауанако, самый древний центр культуры индейцев (I тысячелетие н.э.) на Севере современной Боливии. Археологи справедливо считают Тиауанако са-

мым значительным городом доинкской Южной Америки. Тиуанако расположен в 21 км от озера Титикака (Titicaca) на высоте почти 4 тысяч метров. Первоначально город этот называли, как предполагают, Виньаймарка (Вечный город). Тиауанако – сравнительно новое название (оно означает «Мертвый город» и восходит к инкским временам).

tachylyte ['tækılaıt] – тахилит, базальтовое стекло

the Third Glaciation [ˌglæsı'eıʃn] – третий ледниковый период

p. 80 **diatom** ['daıətəm] – диатомея, диатомовая водоросль, микроскопическая одноклеточная водоросль с силикатированными стенками

Plato ['pleıtou] – Платон (428 или 427 до н.э. – 348 или 347), древнегреческий философ-идеалист, ученик Сократа (Socrates ['sɔkrəti:z]). Свои произведения Платон писал в форме диалогов. В их числе «Тимей» (Timaes [taı'mi:əs]), «Критий» (Critias [kraı'ti:əs]), в которых он поведал об Атлантиде, легендарной цивилизации атлантов, которая в один день и бедственную ночь исчезла, погрузившись в море. (См. также комм. на с. 207.)

Solon ['soulən] – Солон (между 640 – 635 – ок. 559 до н.э.), афинский архонт (высшее должностное лицо в древнегреческих полисах)

Sais ['seııs] – Саис, древнеегипетский город в дельте Нила, столица Египта в 663 – 525 до н.э.

a mastodon – мастодонт, крупное ископаемое хоботное млекопитающее; некоторые мастодонты имели две пары бивней (верхние и нижние)

Pleistocene ['plaıstousi:n] – плейстоцен, наиболее продолжительная эпоха четвертичного (Quaternary [kwə'tɜ:nərı]) периода, охватывающая ледниковые и межледниковые отрезки времени; характеризуется появлением относительно большого количества новых форм жизни

p. 81 **Stonehenge** [ˌstoun'henʤ] – Стоунхендж/Стонхендж (*гэльск.* изогнутый камень), один из самых больших и известных в мире доисторических сооружений, предположительно относящихся к неолиту или бронзовому веку, состоит из огромных отдельно стоящих каменных глыб в виде круглых столбов, которые некогда образовывали три обширных концентрических круга. Стоунхендж находится на Солсбери Плейн (Salisbury Plain) в графстве Уилтшир (Wiltshire ['wıltʃə]) в Англии.

Cyclopean [saı'kloupjən] **walls of Minoan** [mı'nouən] **Greece** – стены из огромных тесаных каменных глыб без связующего раствора, которые были характерны для ми-

Carthaginian [ˌkɑθəˈʤɪnɪən] – карфагенский

p. 72 **the Pillars of Hercules** – Гибралтарский пролив римлян Гибралтар назывался Геркулесовыми столбами греков – Столбами Геракла

Is There a Logical Explanation?

p. 75 **Edgar Allan Poe** – Эдгар Аллан По (1809 – 1849), американский писатель-романтик, классик новеллы, родоначальник детективной литературы. В книге цитируется отрывок из рассказа «Низвержение в Мальстрем».

p. 77 **CAT** (Clear Air Turbulence) – внезапное завихрение воздуха в безоблачном небе, связанное со струйным течением

the G factor – фактор перегрузки

A Suggestion from the Ocean's Past

p. 78 **Noah** [ˈnouə] – Ной, герой библейского мифа о всемирном потопе, спасенный праведник и строитель ковчега (Ark), спаситель мира зверей и птиц. (См. также комм. к с. 214.)

Deucalion [djuːˈkeɪljən] – Девкалион, сын Прометея (Prometheus [prəˈmiːθjuːs]), и его жена Пирра (Pyrrha [ˈpɪrə]) спаслись во время всемирного потопа, устроенного Зевсом, который на Парнасе (Parnassus) на вопрос Девкалиона и Пирры, как возродить человеческий род, ответил, что им надо бросать через плечо «кости своей праматери». Девкалион понял, что камни – это кости общей матери людей Земли. Камни, которые бросал Девкалион, превратились в мужчин, брошенные Пиррой – в женщин. Сын Девкалиона и Пирры Эллин стал родоначальником греческих племен. В греческой мифологии потоп как бы знаменует начало Эллинской (Hellenic) цивилизации.

Ut-napishtim – Ут-Напиштим, герой вавилонского мифа о потопе. Рассказ Ут-Напиштима, прародителя Гильгамеша (Gilgamesh), входит в «Сказание о Гильгамеше» – жемчужину вавилонско-ассирийской литературы. История потопа в том виде, как она излагается в эпосе, оказалась древнейшим вариантом библейской легенды о Ное, которая заимствовала сказание о потопе полностью, со всеми подробностями – вплоть до ворона и голубя, которых, как известно, посылал Ной, чтобы выяснить, достаточно ли обсохла земля.

p. 79 **Tiahuanaco** – Тиауанако, самый древний центр культуры индейцев (I тысячелетие н.э.) на Севере современной Боливии. Археологи справедливо считают Тиауанако са-

...им значительным городом доинкской Южной Америки. ...ауанако расположен в 21 км от озера Титикака (Titicaca) ...высоте почти 4 тысяч метров. Первоначально город ...ли называли, как предполагают, Виньаймарка (Вечный ...род). Тиауанако – сравнительно новое название (оно оз...чает «Мертвый город» и восходит к инкским временам).

tachylyte ['tækılaıt] – тахилит, базальтовое стекло

the Third Glaciation [ˌglæsı'eıʃn] – третий ледниковый период

30 **diatom** ['daıətəm] – диатомея, диатомовая водоросль, микроскопическая одноклеточная одноклеточная водоросль с силикатизированными стенками

Plato ['pleıtou] – Платон (428 или 427 до н.э. – 348 или 347), древнегреческий философ-идеалист, ученик Сократа (Socrates ['sɔkrəti:z]). Свои произведения Платон писал в форме диалогов. В их числе «Тимей» (Timaes [taı'mi:əs]), «Критий» (Critias [kraı'ti:əs]), в которых он поведал об Атлантиде, легендарной цивилизации атлантов, которая в один день и бедственную ночь исчезла, погрузившись в море. (См. также комм. на с. 207.)

Solon ['soulən] – Солон (между 640 – 635 – ок. 559 до н.э.), афинский архонт (высшее должностное лицо в древнегреческих полисах)

Sais ['seıs] – Саис, древнеегипетский город в дельте Нила, столица Египта в 663 – 525 до н.э.

a mastodon – мастодонт, крупное ископаемое хоботное млекопитающее; некоторые мастодонты имели две пары бивней (верхние и нижние)

Pleistocene ['plaıstousi:n] – плейстоцен, наиболее продолжительная эпоха четвертичного (Quaternary [kwə'tɜ:nərı]) периода, охватывающая ледниковые и межледниковые отрезки времени; характеризуется появлением относительно большого количества новых форм жизни

p. 81 **Stonehenge** [ˌstoun'hendʒ] – Стоунхендж/Стонхендж (*гэльск.* изогнутый камень), один из самых больших и известных в мире доисторических сооружений, предположительно относящихся к неолиту или бронзовому веку, состоит из огромных отдельно стоящих каменных глыб в виде круглых столбов, которые некогда образовывали три обширных концентрических круга. Стоунхендж находится на Солсбери Плейн (Salisbury Plain) в графстве Уилтшир (Wiltshire ['wıltʃə]) в Англии.

Cyclopean [saı'kloupjən] **walls of Minoan** [mı'nouən] **Greece** – стены из огромных тесаных каменных глыб без связующего раствора, которые были характерны для ми-

нойской культуры бронзового века (3 – 2 тысячелетие н.э.) на острове Крит (Crete)

artifactual – *зд.* выполненное руками древнего человека; искусственного происхождения

dolmen – дольмен, погребальное сооружение эпохи бронзы и раннего железного века в виде камней огромного размера, поставленных вертикально и покрытых сверху массивной плитой

p. 83 **Weltanschauung** – *нем.* мировоззрение

The Surprises of Prehistory

p. 84 **trilobites** ['trailəbaits] – трилобиты, класс вымерших морских членистоногих

Paleozoic [ˌpæliou'zouik] – палеозойский, относящийся к палеозойской эре, продолжительность – 340 – 350 млн. лет. В палеозойскую эру животный мир развился от примитивных морских позвоночных до наземных пресмыкающихся, а растительный – до хвойных растений. Палеозойская эра делится на шесть периодов: кембрийский (Cambrian), ордовикский (Ordovician), силурийский (Silurian), девонский (Devonian), каменноугольный (Carboniferous) и пермский (Permian).

p. 86 **petroglyphs** – петроглифы, наскальные рисунки

gila monster ['hi:lə'mənstə] – ящерица-ядозуб

a stegosaur – стегозавр, ископаемое пресмыкающееся из группы четвероногих динозавров; до 10 м в длину; по всей спине имел двойной гребень из костяных пластин высотой до метра

a tyrannosaur [tiˌrænə'sɔ:] – тираннозавр, крупный хищный двуногий ящер, живший в меловой (Cretaceous [kri'teiʃəs]) период

a brachiosaur – брахиозавр, огромное (до 24 м в длину) ископаемое пресмыкающееся из группы динозавров. Этот вид динозавра вел полуводную, полуназемную жизнь.

the dragon of St. George – дракон св. Георгия, мифологический дракон, обычно изображался в виде крылатого змея, сочетавшего части различных животных – с одной или несколькими головами, туловищем змеи, ящера или крокодила и крыльями птицы. Церковная легенда рассказывает о св. Георгии, победившем дракона и освободившем плененную им принцессу. В христианстве эта средневековая легенда трактуется как победа христианского героя-рыцаря над злом, воплотившимся в образе дракона.

the dragon of China – китайский дракон, символ власти, покровитель земледелия, божество воды

sirrush – Сирруш, знаменитый Вавилонский
мой – фантастический зверь с головой змеи, с высуну
и пасти раздвоенным языком, с рогом на плоском че
Все тело его было покрыто чешуей, а на задних нога
них же высоких, как и передние, были когти как у пт
Они украшали ворота, замыкавшие «дорогу процесси
открывавшие вход в древний Вавилон.

p. 87 **the Tertiary** ['tɜ:ʃərɪ] **era** – третичный период, пер
период кайнозойской эры (Cenozoic)

Jurassic – юрский, относящийся ко второму пер
мезозойской эры. Морские отложения этого периода б
впервые изучены в Юре (Jura ['ʤuərə] Mountains), го
цепи вдоль французско-швейцарской границы, отку
произошло название.

The Stonehenge Connection

p. 88 **Stonehenge** – см. комм. на с. 209

sarsen stones – валуны песчаника (в меловых дюна

Hawkins, Gerald – Хокинс/Хоукинс, Джеральд, анг
ский ученый-астроном, сотрудник Смитсоновской ас
физической лаборатории в США. Ему принадлежит с
открывателя нового направления в археологии – астр
хеологии. Немало исследователей до Хокинса теряли
догадках, пытаясь понять, для чего четыре тысячи лет
му назад был возведен Стоунхендж. Тщательно изу
расположение каменных столбов, Хокинс высказал п
положение, что Стоунхендж ни что иное, как своеобраз
астрономический календарь. Многотонные каменные а
сооружения, по его мнению, служили визирами: они ф
сировали все важнейшие точки восходов и заходов Сол
и Луны.

p. 89 **the "Slaughter Stone"** – «жертвенный камень»
the "Heel/Hele Stone" – «пяточный камень»
UFOs – см. комм. на с. 204

p. 90 **trilithon** – трилитон, сооружение в виде арки из д
каменных столбов, перекрытых третьим, по форме на
минает греческую букву π

Aubrey holes – ямы, углубления, названные по име
Джона Обри (1626 – 1697), английского собирателя древ
стей (так именовались археологи-любители в те времен
их первооткрывателя

p. 92 **Arthur C. Clarke** – Артур Кларк (р. 1918), видный английский ученый, председатель Британского астронавтического общества, член Британской астрономической ассоциации, автор научно-популярных и научно-фантастических произведений, пользующихся известностью во всем мире. На русский язык переведены «Черты будущего», «Сокровище большого рифа», «Лунная пыль» и др.

Robert Fulton – Роберт Фултон (1765 – 1815), американский инженер, изобретатель; построил первый в мире колесный пароход «Клермонт» (Clermont, 1807).

p. 93 **Vespasian** [ve'speɪʒjən] – Веспасиан (9 – 79), римский император (69 – 79), основатель династии Флавиев

Eisenhower, Dwight David ['aɪznˌhauə] – Эйзенхауэр, Дуайт Дейвид (1890 – 1969), 34-й президент США (1953 – 1961)

Martin van Buren – Мартин ван Бурен (1782 – 1862), 8-й президент США (1837 – 1841)

Andrew Jackson – Эндрю Джексон (1767 – 1845), 7-й президент США (1829 – 1837)

p. 94 **Ptolemy** ['tɔlmɪ] – Птолемей Клавдий (ок. 90 – ок. 160), древнегреческий астроном; создатель геоцентрической системы мира; разработал математическую теорию движения планет вокруг неподвижной Земли, позволявшую предвычислять их положение на небе

Prince Henry the Navigator of Portugal – Генрих Мореплаватель (1394 – 1460), португальский принц, организатор морских экспедиций к северо-западным берегам Африки, положивших начало португальской экспансии на этот материк. По его инициативе начался вывоз африканских рабов в Португалию.

Simon Newcomb – Саймон Ньюком (1835 – 1909), американский астроном и математик; автор «Популярной астрономии», «Астрономии для всех» и др.

Orville and Wilbur Wright [raɪt] – Райт, братья: Уильбер (1867 – 1912), Орвилл (1871 – 1948), американские авиаконструкторы, пионеры авиации; первыми в мире 17 декабря 1903 г. совершили полет продолжительностью 59 сек. на построенном ими самолете с двигателем внутреннего сгорания

William H. Pickering – Уильям Генри Пикеринг (1858 – 1938), американский астроном, открыл Фебу (Phoebe ['fi:bɪ]), девятый спутник планеты Сатурн

p. 95 **Worcester** ['wustə] – г. Вустер, штат Массачусетс, США

Robert Goddard – Роберт Годдард (1882 – 1945), американский ученый, один из пионеров ракетной техники. В ... г. произвел первый в мире запуск ракеты с жидкостным ракетным двигателем; автор трудов по теории космонавтики, жидкостным ракетам.

Neil Armstrong – Нил Армстронг (р. 1930), космонавт США, в июле 1969 г. – командир «Аполлона-11», выполнявшего полет к Луне; первый человек, ступивший на Луну (21 июля 1969 г.)

Cape Kennedy – Мыс Кеннеди (до 1964 г. – мыс Канаверал (Canaveral)), в 1973 г. ему вернули прежнее название. На мысе (полуостров Флорида, США) находится Восточный испытательный полигон, на котором производятся испытания ракетной техники и запуск космических кораблей.

McKinley – Уильям Мак-Кинли (1843 – 1901), 25-й президент США (1897 – 1901)

Rutherford ['rʌðəfəd] – Эрнест Резерфорд (1871 – 1937), английский физик, один из создателей учения о радиоактивности и строении атома, основатель научной школы

р. 96 **Marconi** ['mɑ:kouni] – Гульельмо Маркони (1874 – 1937), итальянский радиотехник и предприниматель. В 1897 г. получил патент на изобретение радиоприемника (принципиально тождественного созданному в 1895 г. радиоприемнику А.С. Попова).

Alexander Graham ['greiəm] **Bell** – Александер Грейам Белл (1847 – 1922), один из изобретателей телефона. По национальности шотландец, в США с 1871 г. В 1876 г. получил патент на первый практически пригодный телефон.

Kelvin – Кельвин, английский физик; за научные заслуги получил титул барона в 1892 г. Настоящее имя Уильям Томсон (1824 – 1907). Автор трудов по многим разделам физики (термодинамика, теория электрических и магнитных явлений и др.), предложил абсолютную шкалу температур.

р. 98 **Götterdämmerung** – *нем.* Сумерки богов. По древнегерманскому преданию, по пророчеству зловещей Волы погибнут сперва светлые боги северного Олимпа, погибнут и враждебные им темные силы, погибнет весь мир, охваченный пламенем, но затем возродится новый мир, возникнет новая земля.

Tiberius ['tai'biərəs] **Caesar** – Тиберий (42 до н.э. – 37 н.э.), пасынок Августа (см. комм. на с. 215), римский император в 14 – 37 гг.; отличался мстительностью, коварством и жестокостью

Euripides [juə'ripidi:z] – Еврипид (ок. 480 – 406 до н.э.),

древнегреческий поэт-драматург, автор трагедий «Ме[illegible] «Ипполит», «Геракл» и др.

Nero ['nɪərou] – Нерон (37 – 68), римский импера[illegible] г. Согласно источникам, был жесток и коварен; ему при[illegible] сывают поджог Рима.

Suetonius [swi:'tounjəs] – Гай Суэтонис Транквилл, [illegible] ский историк; основной труд «Жизнь Цезарей» (Lives of Caesars)

Ilium = Ilion – Троя

The Famous Fossil Hoax

p. 100 **Prince Bishop**—курфюрст; в данном случае не просто владетельный князь, а князь в сане епископа, имевший право участвовать в выборе императора в так называемой «Священной Римской империи», существовавшей до 19[illegible] г.

the Flood – всемирный/вселенский потоп. Сюжет мифов, легенд и преданий о потопе, которых, кстати сказать, великое множество и которые имеют достаточно обширную географию, в общих чертах заключается в следующем: бог насылает на людей потоп в наказание за проступки, причиненные ему обиды и т.п., не забыв, однако, своевременно известить какого-либо «праведника» об уготованном людям бедствии с тем, чтобы он и его семья могли заблаговременно построить корабль, ковчег, плот или что другое или укрыться на горе, высоком дереве и т.д., запастись продовольствием, животными, семенами растений и пр., чтобы в послепотопный период вновь заселить обновленную землю и начать новую, более праведную жизнь. (См. также комм. на с. 208.)

p. 101 **magnum opus** [ˌmægnəm'oupəs] – *лат.* выдающееся произведение; *зд.* самый значительный труд всей его жизни

insectiform – насекомообразный

History is a Many-Layered Cake

p. 102 **a many-layered cake** – слоеный пирог

outposts of the Roman Empire – отдаленные поселения Римской империи. Впервые римляне появились на Британских островах в 55 г. до н.э., но кельты оказали пришельцам упорное сопротивление и Юлию Цезарю с остатками войска пришлось отступить. Юлий Цезарь вернулся на следующий год во главе двадцатипятитысячной армии. И хотя римляне одержали победу, покорить мужественных кельтов им не удалось. Завоевание Британии Римом

закрепилось лишь к концу 60-х гг. н.э. Однако ни Уэльс, ни Шотландию римляне подчинить себе так и не смогли.

Claudius ['klɔ:djəs] – Клавдий (10 до н.э. – 54 н.э.), стал римским императором в 41 г. н.э. после того, как был отравлен его племянник Калигула; считается основателем Лондона

Lincoln ['liŋkən] – Линкольн, город в графстве Линкольншир (Lincolnshire) ['liŋkənʃə])

Augustus [ɔ'gʌstəs] – Август (до 27 г. до н.э. Октавиан) (63 до н.э. – 14 н.э.), внучатый племянник Юлия Цезаря, с 27 г. до н.э. римский император. В 31 г. до н.э., одержав победу над римским полководцем Марком Антонием и египетской царицей Клеопатрой, положил конец гражданским войнам, начавшимся после смерти Цезаря.

Colchester ['koultʃəstə] – Колчестер, город в графстве Эссекс (Essex)

Gloucester ['glɔstə] – Глостер, город в графстве Глостершир (Gloucestershire)

Honorius [hou'nɔ:riəs] – Гонорий (384 – 423), император Западной Римской империи. При Гонории был взят и подвергнут разграблению Рим вестготами (см. комм. на с. 198) под предводительством Алариха I (Alaric the Goth), при нем же в 407 – 410 гг. происходили восстания в провинциях.

the Saxons – саксы, группа германских племен, которая обитала между нижними течениями рек Рейн (Rhine) и Эльба (Elbe). В 5 – 6 вв. в завоевании Британии вместе с саксами участвовали и англы, давшие название и стране, и народности. В результате англосаксонского завоевания кельтской Британии к концу 6 в. там образовался ряд англосаксонских королевств: Кент (Kent), Уэссекс (Wessex), Суссекс (Sussex), Эссекс (Essex), Восточная Англия (East Anglia), Нортумбрия (Northumbria), Мерсия (Mersey ['mɜ:zi]). В 7 – 10 вв. сложилась англосаксонская народность, впитавшая и кельтские элементы.

the Danes – датчане (скандинавские викинги). К концу 9 в. скандинавские племена захватили всю восточную Англию к северу от Темзы. Эта территория получила название Danelaw (область датского права). Борьба англосаксов с завоевателями шла с переменным успехом. Особенно прославился в битвах со скандинавами Альфред Великий (Alfred the Great, 871 – 899), король Уэссекского королевства. Тем не менее, к 1016 г. Англия была завоевана скандинавами и во главе страны встал датский король Канут (Canute, 1016 – 1035). Он присоединил к Дании Англию, Норвегию и часть Швеции, но после его смерти королевство распалось.

the **Normans** – норманны («северные люди» комм. на с. 198). 14 октября 1066 г. нормандские [illegible] главе с герцогом Нормандии Вильгельмом, высадившие в Англии, разгромили войско англосаксонского коро[illegible] рольда II (Harold II) в битве при Гастингсе (Hastings) рольд пал в бою, и Вильгельм стал королем Англии Ви гельмом I (William I). В истории он больше известен Вильгельм Завоеватель (William the Conqueror). Оконч тельное господство норманнов было установлено к 1071

p. 104 **Theodosius** [θɪə'dousjəs] – Феодосий I или Вели (ок. 346 – 395), римский император с 379 г. В 380 г. утверд господство ортодоксального христианства; при нем бы отменены Олимпийские игры, сожжена Александрийск библиотека, разрушены многие языческие храмы.

Arcadius [ˌɑ:'keɪdjəs] – Аркадий (377? – 408), сын Фео сия I, император Восточной Римской империи

Victorian period – Викторианская эпоха; период, когда Великобританией правила королева Виктория (1837 – 1901). В этот период Британия становится самой крупной колониальной державой мира.

p. 105 the **Franciscan order**—Орден францисканцев, пер вый нищенствующий орден, основанный в Италии в 1207 – 1209 Франциском Ассизским (Francis of Assisi [ə'si:zɪ]) (1182? – 1226), итальянским проповедником

Stonehenge

p. 105 **Stonehenge** – см. комм. на с. 209

the Pyramid of Cheops – см. комм. на с. 205

John Aubrey – см. комм. на с. 211

the Stuart period – период, когда Англией правила династия Стюартов (1603 – 1714). Стюарты – королевская династия Шотландии (1371 – 1714) – сменила династию Тюдоров в Англии после смерти Елизаветы I в 1603 г.

p. 106 the **Druids** – друиды, жрецы у древних кельтов. По преданию, именно по их велению был воздвигнут Стоунхендж. Если учесть, что по свидетельству античных авторов их могущество было беспредельным, то такое предположение в те времена представлялось весьма правдоподобным. Легенда наделила их чудодейственными способностями. Они умели предсказывать будущее, лечить и исцелять, обеспечивать плодородие, предсказывать затмения и многое другое, т.е. были не только жрецами – служителями могущественных богов, но и судьями, врачами и учителями.

Charles II – Карл II (1630 – 1685), вступил на престол после реставрации монархии в Англии в 1660 г.

Julius Caesar ['si:zə] – Гай Юлий Цезарь (102 или 100 – 44 до н.э.), римский полководец; сосредоточив в своих руках ряд важнейших республиканских должностей, стал фактическим монархом; был убит в результате заговора республиканцев

Chartres – Шартр, город на Севере Франции

Pliny ['plɪnɪ] – Плиний Старший (23 или 24 – 79), римский писатель и ученый. Единственный сохранившийся труд «Естественная история» в 37 книгах.

Diodorus Siculus – Диодор Сицилийский (ок. 90 – 21 до н.э.), древнегреческий историк. Его сочинение «Историческая библиотека» состояло из 40 книг, но до нас дошли полностью книги 1 – 5 и 11 – 20, остальные – во фрагментах. В труде синхронно излагается история Древнего Востока, Греции и Рима с легендарных времен до середины 1-го века до н.э.

Tacitus ['tæsɪtəs] – Тацит (ок. 58 – ок. 117), римский историк; главные труды – «Анналы» и «История»

William Stukeley ['stjuklɪ] – Уильям Стьюкли (1687 – 1765), организатор Общества собирателей древностей в Англии, он же был учредителем общества «Древнейший орден друидов». За интерес к культу друидов был прозван «Великим друидом» (Archdruid).

p. 107 **the Great Pyramid** = the Pyramid of Cheops – см. комм. на с. 205

p. 108 **the Hele Stone** – см. комм. на с. 211

the "altar stone" – «алтарный камень»

Norman Lockyer – Норман Локьер (1836 – 1920), английский астрофизик; он первый обратил внимание на астрономические аспекты археологических памятников, т.е. попытался увязать в единое целое астрономию и археологию.

the beaker folk – иберы, древние племена Испании, которые, как полагают, были первыми пришельцами на Британские острова где-то в третьем тысячелетии до н.э. При раскопках древних захоронений этого периода были найдены кувшины с носиком, отсюда и название – beaker folk.

A North American Stonehenge

p. 109 **the Medicine Wheel** – Шаманское колесо. Американский астроном Джон Эдди еще в 30-х годах занялся изучением «колес», которые в великом множестве имеются на

всей территории Великих равнин (Great Plains). Проводя исследования, он проверял размещение лучей «спиц» относительно центра и определял точки горизонта, на которые они указывают. Он выяснил, что на рассвете в день летнего солнцестояния солнце восходит в створе луча радиуса и центральной пирамидки. Количество «спиц» – 28 – объясняется тем, что луна, а не солнце, была основной единицей исчисления у североамериканских индейцев.

the rising points of various bright stars – имеются в виду точки восхода трех ярчайших звезд северного полушария – Сириуса (Sirius/Dog-Star; созвездие Большого Пса Canis Major), Ригеля (Rigel ['raɪgəl]; созвездие Ориона constellation Orion) и Альдебарана (Aldebaran [æl'debərən]; созвездие Тельца constellation Taurus)

Palenque: A Mayan City Inspired by the Ancient East?

p. 110 **Palenque** – Паленке, условное название развалин большого города в штате Чьяпас (Мексика), политического и культурного центра майя в 3 – 8 вв. н.э.

p. 111 **the Temple of the Inscriptions** – Храм надписей
the Temple of the Foliated Cross – Храм лиственного креста

the Buddhist "lotus position" – «поза лотоса», одна из поз в системе физических упражнений хатха-йоги

Angkor Wat – Ангкор-Ват, крупнейший из «храмов-гор» в виде ступенчатой пирамиды, отличается богатством скульптурного оформления; входит в архитектурный комплекс Ангкор, грандиозный комплекс храмов, дворцов, водохранилищ, расположенных близ г. Сием-Реап (Камбоджа)

a two-headed jaguar throne – трон со спинкой, украшенной двуголовым ягуаром. Следует заметить, что мотив ягуара был свойствен культуре ольмеков, предшественников майя. Как полагают, центром их культуры была Ла-Вента, где повсюду встречается изображение стилизованного ягуара. Таким образом, ягуар был не только основной темой ольмекских творцов, но и главным героем весьма развитого ольмекского культа. Согласно легенде, племя «ягуарьих индейцев», как называют иногда ольмеков, возникло от связи божественного ягуара со смертной женщиной. Из всего этого можно сделать вывод, что ольмеки отождествляли себя с ягуарами и украшение спинки трона навеяно местной, а не индейской традицией.

p. 112 **Hernán Cortés** – Эрнан Кортес (1485 – 1547), испанский конкистадор. В 1519 – 1521 гг. он возглавил завоевательный поход в Мексику, который привел к установлению там испанского господства. Успеху разбойничего похода Кортеса находят объяснение в том, что в их приходе ацтеки увидели возвращение Кецалькоатле (Quetzalcoatl) из древней легенды. Легенды о рослом боге-человеке с белым лицом, обрамленным темной бородой, повествуют о том, как Кецалькоатле, прибыв из «страны восходящего солнца», научил народ наукам, установил мудрые законы, создал государство и, выполнив свою миссию, удалился, пообещав, однако, вернуться, когда настанет час. Ацтеки жестоко поплатились за свое простодушие.

Votan = Wotan (см. комм. на с. 202)

p. 113 **Phoenicia** [fɪ'nɪʃɪə] – Финикия, древняя страна на восточном побережье Средиземного моря. Города-государства Финикии (Библ, Тир и др.) вели активную морскую и сухопутную торговлю, основали ряд колоний в Средиземноморье, в том числе Карфаген (Carthage ['kɑ:θɪdʒ]). В 6 в. до н.э. Финикия была завоевана персами, в 332 г. до н.э. – Александром Македонским (Alexander the Great) (см. комм. на с. 224).

Alberto Ruz Lhullier – Альберто Рус, крупнейший мексиканский археолог. Паленке изучается уже свыше 200 лет, но только в 1951 г. удалось сделать открытие, которое имело исключительное значение. Ведь до 1951 г. повсеместно считалось, что американские пирамиды, в отличие от египетских, не являются усыпальницами. Захоронение, найденное Русом в Храме надписей, заставило ученых радикально изменить свое мнение.

p. 114 **hit the jackpot** – (*букв.* сорвать банк) *зд.* найти свою Эльдорадо; поймать жар-птицу

quetzal ['kwetsl] **bird** – священная птица кецаль/кетсал. Эта экзотическая золотисто-зеленая птица водится в тропических лесах Центральной Америки.

p. 115 **the Aztecs** ['æzteks] – ацтеки, крупнейший индейский народ Мексики. До 16 в. на территории современной Мексики существовало государство ацтеков со столицей Теночтитлане. Государство ацтеков было одним из самых могущественных. История его падения – это печальное повествование о трусливом Монтесуме, о мужественном Куатемоке, о ненасытных завоевателях и их предводителе Эрнане Кортесе.

the Mayas – майя, индейский народ в Мексике. Майя – создатели одной из древнейших цивилизаций

Америки. Нет ни малейшего сомнения в том, что ге-
гениальные достижения доколумбовой индейской циви-
зации, науки и искусства принадлежат прежде всего м
Наиболее великими из всех достижений гения ма
майя были письменность и связанная с ней эпигра
математика и астрономия, на которых основывался са
совершенный для того времени календарь. Среди наи
лее значительных открытий майя следует упомянуть и
бретение нуля.

the Incas – инка/инки, индейское племя, обитавшее
11 – 13 вв. на территории современного Перу. Во второй
ловине 15 в. инки основали государство Тауантинсуйу и
точнее, Тау-ан-тин-суйу, что означает «Земля четырех ч
тей». Империя инков была чудом организации и порядк
Сердцем Тауантинсуйу был город Куско. Из всех сооруж
ний инков наибольшего восхищения заслуживают их д
роги. В Тауантинсуйу существовала и государственная по
та, еще одно замечательное нововведение инков.

p. 116 **University computers have been at work trying to crack the Maya glyphs.** – Бьются над разгадкой тайны письменности майя университетские компьютеры. Следует заметить, что еще в середине 50-х годов советским ученым Ю.В. Кнорозовым была частично расшифрована иероглифическая письменность майя, а в 1963 г. опубликована книга «Письменность индейцев майя». Ю.В. Кнорозов перевел три майяских иероглифических кодекса: Парижский, Дрезденский и Мадридский, получившие свое название по месту, где они хранятся. Перевод на русский язык этих хроник был опубликован в 1975 г.

Golden Clues to the Mystery of the Andes

p. 116 **they began melting the golden art works into formless ingots** – они занялись переплавкой произведений искусства из золота, превращая их в бесформенные слитки. – Истинную гордость Куско составлял великолепный ансамбль храмов, называвшийся Кориканча (Золотой двор). Главным сооружением Кориканча был храм бога солнца — Инти. Это и было воспетое поэтами «золотое изумление» юга. Здесь находилось изображение Инти – огромный диск из чистого золота, украшенный крупными изумрудами. Весь обрядовый инвентарь в храме тоже был из чистого золота. К храму солнца примыкало несколько часовен, и главная из них в честь луны, где все убранство было из серебра. Храм Инти, часовня луны и остальные часовни обрамляли внутренний двор ансамбля Золотого двора – Интипампа (Солнечное поле). Это Солнечное поле

было самым удивительным из всего созданного высокими культурами доколумбовой Южной Америки: по золотому полю бродили золотые олени и ползали золотые змеи, а на фоне золотых деревьев сидели золотые птички и бабочки. Ветерок раскачивал золотые початки кукурузы, и двадцать золотых лам, поедавших золотые стебли трав, паслись под присмотром золотых пастухов, изваянных в натуральный рост. И все эти, и многие другие произведения искусства были безжалостно переплавлены алчными испанцами завоевателями.

Ил. 118 **Nazca** – наска, важная местная культура в древнем регионе на территории современного Перу. С этой культурой связаны два удивительных памятника. Первый из них – загадочная постройка, которую перуанцы называют Ла-Эстакериа, а археологи – Деревянным Стоунхенджем. В среднем течении реки Наска совершенно правильными рядами стоят сотни стволов альгарробы (сладкого стручечника). Центром памятника является четырехугольник, образуемый 12 рядами стволов по 20 «колонн» в каждом. Второй памятник располагается в долине Пампа-де-Пальпа. С самолета взору предстают огромные изображения птиц, пауков, рыб, змей, обезьян, лисиц и других животных. Паудь Козок и немецкий математик Мария Райхе, которая посвятила изучению этой пустыни всю жизнь, высказали предположение, что это «астрономический календарь». Связь некоторых линий и фигур с астрономией доказана, но нельзя не учитывать и того, что подавляющее большинство линий и фигур с астрономией никак не связаны. Есть версия, отчасти исключающая утилитарное предназначение рисунков, как полагают ее авторы, произведение древних мастеров – дар богам, которым они поклонялись.

Ил. 119 **Moche** – мочика, культура индейцев Северного Перу, названная по реке Моче. Носители этой культуры оставили после себя храмы, пирамиды, самая примечательная из которых – пирамида, посвященная солнцу. После завоевания Перу конкистадорами эта пирамида оставалась самым крупным сооружением на всем перуанском побережье. Христианским священникам это не нравилось, так как пирамида превосходила все построенные в то время католические храмы. В 1602 г. они попытались разрушить пирамиду, направив на нее поток запруженной реки. К счастью, им это не удалось. Исключительно большой интерес для исследователей представляют рисунки на керамике мочика, в которых запечатлена вся их многогранная культура.

Chimu – чиму, культура, выросшая на почве традиций мочика. Государство Чиму, или Чимор, распространило свою власть на прибрежную полосу протяженностью в тысячу километров, от города Тумбес на севере до границ города нынешнего Перу – Лимы. Эта историческая эпоха иногда обозначается в американистике как эпоха строительней городов. В это время на побережье выросли десятки прекрасных городов. Строились и пирамиды, и крепости и настоящие, монументальные дороги. Самым же удивительным памятником, сохранившимся с тех времен, является стена шириной 5 м, высотой около 3 м и длиной в 60 км, которая охраняла государство Чиму от нападений извне. Наряду с архитектурой наибольших успехов чиму достигли в металлургии – они первыми в Америке открыли секрет производства бронзы.

Chan Chan – Чан-Чан, столица империи Чиму. Город был заложен по точному плану на площади примерно 1 кв. км. В доинкскую эпоху Чан-Чан был, бесспорно, крупнейшим и самым красивым городом индейской Южной Америки. Особый интерес представляет способ украшения внутренних стен домов. Настенный рисунок, обычный для индейцев периода мочика, в Чан-Чане заменяют отлитые фризы. В одном из строительных комплексов был найден фриз 7 м в длину и 14 м в ширину, изображающий людей-птиц, которые держат во рту-клюве рыб или крабов.

The Light in the Tomb

p. 120 **the stygian** ['stɪʤɪən] **gloom** – (*букв.* адский мрак) *зд.* тьма кромешная. Слово Stygian, производное от Styx [stɪks] Стикс (*букв.* отвращение), – название реки, окружавшей подземное царство. Река, носившая название Стикс, протекала в Аркадии и падала с высокой скалы в глубокое ущелье, уходя затем под землю. Вода ее считалась ядовитой, что, по-видимому, и послужило основанием для легенды о Стиксе как одной из рек царства мертвых.

Ramses III – Рамсес III, один из двенадцати Рамсесов, которые правили Египтом с 1315? до 1090 г. до н.э. Как известно, гробницы в Долине царей (Царские гробницы Бибан аль-Мулука (Biban el-Muluk)) неоднократно подвергались разграблению и поэтому мертвые цари, чьи мумии должны были пребывать в вечном покое, начали путешествовать. Так случилось и с Рамсесом III. Его мумию трижды переносили с одного места на другое.

p. 121 **cubit** ['kju:bɪt] – локоть (мера длины)

p. 123 **Thebes** [θi:bz] – Фивы, древнеегипетский город, по-

литический, религиозный и культурный центр. Со времени фараонов XI династии (22 – 20 вв. до н.э.) – столица Египта. В 8 – 1 вв. до н.э. сохранял значение религиозного центра.

p. 123 **"savants"** – *зд.* так называемые ученые (кавычки в данном случае указывают на то, что слово следует понимать не в прямом, а в противоположном значении)

the Sphinx – сфинкс, в древнем Египте статуя фантастического существа с телом льва и головой человека, реже – животного (барана или сокола)

the zodiac ['zoudıæk] – зодиак. Годовой круг, образуемый месяцами, имеет свой завершенный образ в виде «пояса животных» – зодиака с 12 отмеченными точками – «домами», обозначаемыми в основном зооморфным кодом (Овен Aries ['eəri:z], the Ram; Телец Taurus ['tɔ:rəs], the Bull; Близнецы Gemini ['ʤemınaı], the Twins; Рак Cancer ['kænsə], the Crab; Лев ['li:ou], the Lion; Дева Virgo ['vɜ:gou], the Virgin ['və:ʤın]; Весы Libra ['laıbrə], the Balance; Скорпион Scorpio ['skɔ:pıou], the Scorpion; Стрелец Sagittarius [ˌsæʤı'teərıəs], the Archer; Козерог Capricorn ['kæprıkɔ:n], Goat [gout]; Водолей Aquarius [ə'kweərıəs], the Waterbearer; Рыбы Pisces ['pısi:z], the Fishes). Зодиак во всей совокупности составляющих его знаков сложился в вавилонской культуре к 8 в. до н.э. Символическая соотнесенность месяцев с зодиакальными знаками особенно наглядна в солнечном календаре, созданном в Древнем Египте и лежащим в основе летоисчисления Старого Света. Годовой путь солнца по замкнутому кругу, или «Борозде Неба», с 12 «домами» соотносился с 12 месяцами года, которые через «дома» находились в соответствии и с 12 созвездиями, носящими те же названия, что и «дома». В разных традициях каждый зодиакальный знак имел своего стража (хранителя) или повелителя.

p. 124 **Eudoxus** [ju:'dɔksəs] – Евдокс (ок. 406 – ок. 355 до н.э.), греческий ученый, ученик Платона. Прожил много лет в Египте, постигая тайны жреческой науки. Известен своими работами по астрономии и математике.

abbe ['æbeı] – *фр.* аббат

Ptolemy – см. комм. на с. 212

Jean-Francois Champollion – Жан Франсуа Шампольон (1790 – 1832), французский египтолог, основатель египтологии. Изучив трехъязычную надпись на Розеттском камне (Rosetta [rou'zetə] Stone), разработал основные принципы дешифровки древнеегипетского иероглифического письма. Розеттский камень с параллельным текстом на грече-

...ющих Галактику – исполинскую звездную систему, ...рой наше Солнце лишь рядовая звезда

Big Dipper (*лат.* Ursa Major) – Большой Ковш ...ая Медведица). В древнем Египте созвездие назы... Мескету и изображалось в виде передней ноги быка. ...менем названия созвездий, известных в глубокой ...сти, забылись и небо «заселили» легендарные персо... древнегреческих мифов. Так случилось и с созвезди... Большой Медведицы. В греческой мифологии Каллис... дочь правителя Аркадии, была столь прекрасна, что ...ее чарами не смог устоять сам Зевс. Охваченная ре... ею, супруга Зевса Гера отомстила Каллисто, превра... безобразную Медведицу. Юный Аркад, сын Каллис... Зевса, вернувшись однажды домой после охоты, уви... дверей дома Медведицу. Он поднял руку, чтобы ...ее, но Зевс удержал руку Аркада, Каллисто же взял к ... небо, превратив ее в красивое созвездие.

Sirius, Dog-Star – см. комм. на с. 218

Isis ['aisis] – Исида, в древнеегипетской мифологии суп... и сестра Осириса; олицетворение супружеской верно... и материнства; богиня плодородия, воды и ветра, вол...ебства, мореплавания, охранительница умерших; изо...ражалась женщиной с головой или рогами коровы

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the "opening of the mouth"— «отверзание уст»

Tutankhamon [,tu:təŋkɑ'mu:n] – Тутанхамон, египетский ...рлон (ок. 1400 — 1392 до н.э.) XVIII династии Нового цар...ва. Г. Картер, английский археолог, раскопав в 1922 г. ...робницу Тутанхамона, обнаружил нетронутую мумию мо...одого фараона. Открытие Картера явилось мировой сен...ацией. В 1969 г. под руководством профессора Ливерпуль...ого университета Р. Харрисона было произведено вскры...ие, а затем рентгеновская съемка останков фараона. По ...нению специалистов, смерть наступила в результате кро...излияния в мозг, наступившего после сильного удара по ...репу.

cover all bets – (*букв.* поставить сразу на всех лошадей, ...оманды и т.п., по поводу которых заключается пари) *зд.* ...ключить любую случайность, действовать наверняка, пе...страховаться

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ском и древнеегипетском языках был найден в 1799 г. сол датом армии Наполеона близ г. Розетты (ныне г. Рашид АРЕ). Первая надпись, в 14 строк, была выполнена иерог лифическим письмом, вторая, в 32 строки – демотиче ским, или скорописью, и третья, в 54 строки, была написа на по-гречески.

Claudius – см. комм. на с. 215

Nero – см. комм. на с. 214

the Middle Kingdom – Среднее царство (2100 – 1700 до н.э.) было основано фиванскими правителями. Этот период – время царствования XI – XII династий и правлени четырех фараонов. В этот период расцвета культуры были созданы многие выдающиеся произведения зодчества.

Thutmose and Ramses – Здесь имеются в виду египет ские фараоны Тутмос III (XVIII династия) и Рамсес II (XIX династия), чье правление приходится на период Нового царства (1555 – 1090 до н.э.). Если в период царствования Тутмоса III Египет достигает наибольшего усиления политической мощи, то в период правления Рамсеса II были воздвигнуты поражающие воображение монументальные строения в Абу-Симбеле (Abu Simbel), Карнаке (Karnak), Луксоре (Luxor), Абидосе (Abydos), Мемфисе (Memphis), Фивах (Thebes).

Alexander the Great – Александр Македонский (356 – 323 до н.э.), воспитанник Аристотеля, царь Македонии. Выдающийся полководец, он создал крупнейшую мировую монархию древности, которая, впрочем, просуществовала недолго, распавшись почти сразу же после его смерти на несколько государств.

p. 125 **timekeeping group** – времядержащая группа, или декан. Объединив 10 – 12 созвездий из числа восходящих и заходящих звезд, египтяне делили их на 36 равных частей таким образом, чтобы на протяжении года каждые десять дней (или одна египетская неделя) одно созвездие сменяло другое, что позволяло древнеегипетским жрецам определять время в ночные часы. Первые упоминания «звезд-часов» встречаются в период до 2400 г. до н.э.

Hippo = Hippopotamus – гиппопотам; **Croc** = Crocodile – крокодил – примеры типа морфологического словообразования, которое называется *сокращением*

ecliptic – эклиптика, большой круг небесной сферы, по которому происходит видимое годичное движение Солнца; пересекается с небесным экватором в точках весеннего и осеннего равноденствия

the Milky Way – Млечный Путь, главная часть звезд,

образующих Галактику – исполинскую звездную систему в которой наше Солнце лишь рядовая звезда

the Big Dipper (*лат.* Ursa Major) – Большой Ковш (Большая Медведица). В древнем Египте созвездие называлось Мескету и изображалось в виде передней ноги быка. Со временем названия созвездий, известных в глубокой древности, забылись и небо «заселили» легендарные персонажи древнегреческих мифов. Так случилось и с созвездием Большой Медведицы. В греческой мифологии Каллисто, дочь правителя Аркадии, была столь прекрасна, что перед ее чарами не смог устоять сам Зевс. Охваченная ревностью, супруга Зевса Гера отомстила Каллисто, превратив ее в безобразную Медведицу. Юный Аркад, сын Каллисто и Зевса, вернувшись однажды домой после охоты, увидел у дверей дома Медведицу. Он поднял руку, чтобы убить ее, но Зевс удержал руку Аркада, Каллисто же взял к себе на небо, превратив ее в красивое созвездие.

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Canis Major (*лат.*), the Greater Dog – Большой Пё созвездие Южного полушария

p. 127 **Ship decan** – декан, часть небесной сферы шириной около 10°, где находится созвездие Корабля Арго(навтов)

the Great Square of Pegasus ['pegəsəs] – Большой Квадрат созвездия Пегаса

"hack up the celestial mansion" – «рвать, раздирать на части небесный дом»

Draco – Дракон, околополюсное созвездие

Ursa Minor, the Little Dipper – Малый Ковш, Малая Медведица

Smiter – Бьющий человек

Bootes [bou'outi:z] (*лат.*) – Волопас, созвездие Северного полушария

Historic Cometary Tales

p. 127 **cometary tales** [teilz] – невероятные истории, небылицы и т.д., связанные с появлением комет. В заголовке обыгрывается созвучие tales и tails [teilz] – *хвосты*. Как известно, при приближении к Солнцу у комет появляются «голова» (ядро) и «хвост», чья длина может достигать десятков миллионов километров. Интересно и то, что само слово «комета» от греческого komētēs означает «длинноволосый». В то же время, появление кометы всегда порождало всякого рода слухи, россказни, суеверие.

Halley's comet – комета Галлея. Названа по имени Эдмунда Галлея (Edmund Halley, 1656-1742), английского астронома и геофизика. Составил первый каталог звезд Южного неба, открыл собственное движение звезд (1718). Вычислил орбиты свыше 20 комет, предсказал время нового появления в 1758 г. кометы 1682, которая с тех пор носит его имя.

p. 128 **Aristotle** ['æristɔtl] – Аристотель (384 – 322 до н.э.), древнегреческий философ и ученый. Его сочинения охватывают все отрасли тогдашнего знания. Маркс называл его «величайшим мыслителем древности».

Flavius Josephus – Флавий Иосиф (37 – после 100), древнееврейский историк. Он изменил восставшим и сдался римлянам во время Иудейской войны (66 – 73) против Рима. Автор «Иудейской войны», «Иудейских древностей» и др. книг.

Attila ['ætilə] **the Hun** – Аттила (? – 453), предводитель гуннов – кочевого народа, чье массовое передвижение на Запад, начиная с 70-х годов 4 века, дало толчок Великому переселению народов. Возглавив в 434 г. гуннский союз

племен, он предпринял ряд опустошительных походов в Восточную Римскую империю, Галлию, Северную Италию.

Flavius Aëtius [aɪˈɪəʃəs] – Флавий Этиус (396? – 454), римский полководец, успешно защищавший владения Рима в Галлии от нашествия гуннов. Его самая крупная победа – разгром Аттилы и его войска на Каталаунских полях в июне 451 г.

Charlemagne [ˈʃɑləmeɪn] – Карл Великий (742 – 814), франкский король с 768 г., с 800 г. – император, из династии Каролингов. Его завоевания в Италии и Центральной Европе привели к созданию обширной империи, которая распалась вскоре после его смерти.

Giotto (di Bondone) – Джотто ди Бондоне (1266 или 1267 – 1337), итальянский живописец, архитектор и скульптор, представитель Проторенессанса. Джотто внес в религиозные сцены земное начало, изображая евангельские легенды с жизненной убедительностью.

nativity scene – картина на тему евангельского мифа о рождении Христа девой Марией

the star of Bethlehem [ˈbeθlɪhem] – вифлеемская звезда. Вифлеем, город в Палестине, где согласно Библии родился Иисус Христос. С Вифлеемом связана и евангельская легенда о вифлеемской звезде, возвестившей о рождении Христа и указавшей путь волхвам к дому, где родился младенец Иисус.

Increase Mather – Инкрис Мезер (1639 – 1723), американский священник и богослов крайних пуританских убеждений. Мезер сыграл весьма неприглядную роль в инспирировании судилища над «ведьмами», которое проходило в Сейлеме, штат Массачусетс, в 1692 г. Из 150 человек, обвиненных в колдовстве, 19 были казнены через повешение за «связь с дьяволом». Психологическую почву для сейлемской вспышки изуверства Мезер подготовил в своей книге «Замечательные умыслы Провидения» (Remarkable Providences), в которой четыре главы из двенадцати посвящены колдовству.

p. 129 **Francis Crick** – Фрэнсис Харри Комптон (р. 1916), английский биофизик. В 1953 г. совместно с Джемсом Уотсоном (р. 1928), американским биохимиком, создал модель пространственной структуры ДНК (двойной спирали).

Luis Alvarez – Луис Альварес (р. 1911), американский физик, лауреат Нобелевской премии (1968)

Will the Universe Expand Forever?

p. 129 **T(homas) S(tearns) Eliot**—Томас Стернз Элиот (1888 – 1965), английский поэт. В его произведениях ощу-

щается трагическая исчерпанность созидательной энергии человечества, как в следующих строках его поэмы «Полые люди» (The Hollow Men, 1925):

This is the way the world ends
Not with a bang but a whimper.

Robert Frost – Роберт Фрост (1875 – 1963), крупнейший из современных американских поэтов, продолжатель традиций английского поэта «озерной школы» Вордсворта (William Wordsworth, 1770-1850), американского философа и поэта Эмерсона (Ralph Waldo Emerson, 1803-1882), американской поэтессы Эмили Дикинсон (Emily Dickinson, 1830-1886). В статье ссылка на широко известное стихотворение Роберта Фроста «Пламя и Лед».

Fire and Ice

Some say the world will end in fire,
Some say in ice.
From what I've tasted of desire
I hold with those who favor fire.
But if it had to perish twice,
I think I know enough of hate
To say that for destruction ice
Is also great
And would suffice.

p. 130 **adiabatically** [ˌædɪəˈbætɪkəlɪ] – в результате адиабатного/адиабатического, т.е. термодинамического процесса, при котором исключается теплообмен, столь необходимый для нормального состояния и функционирования атмосферы

the Smithsonian Astrophysical Observatory – Астрофизическая обсерватория (основана в 1890 г.) Смитсоновского института, одного из старейших государственных научно-исследовательских и культурных центров, Вашингтон, США, учрежденного в 1846 г. на средства английского ученого Джеймса Смитсона (James Smithson, 1765-1829).

Princeton University – Принстонский университет, Принстон (штат Нью-Джерси), один из старейших университетов в США (основан в 1746 г.), крупный научно-исследовательский центр в области физики, математики, аэронавтики и космических исследований

M/L = mass-to-luminosity

p. 131 **to get a handle on the density.** – *зд.* получить данные, которые позволили бы определить плотность

reduction – *зд.* приведение к общему знаменателю

Hubble, Edwin – Эдвин Хаббл (1889 – 1953), американ-

ский астроном. Ему удалось доказать звездную природу внегалактических туманностей (галактик). В 1929 г. Хаббл установил закономерность разлета галактик.

was always redshifted. – неизменно происходило красное смещение линий в спектрах. Как принято считать, такого рода смещение происходит при удалении источника света.

a Doppler shift – смещение линий в спектрах при удалении или приближении источника света. Этот принцип был сформулирован в 1842 г. австрийским математиком, физиком и астрономом Кристианом Доплером/Допплером (Christian Doppler, 1803-1853).

devil's advocate – (*букв.* адвокат дьявола) *зд.* специалист, который выдвигает контраргументы или задает каверзные вопросы с тем, чтобы выявить либо слабые стороны, либо доказать несостоятельность какой-либо идеи, теории и т.д.

this emperor has no clothes. – *зд.* этот постулат не выдерживает критики, полностью несостоятелен. Выражение «король гол» пришло из сказки Андерсена «Новое платье короля» (Hans Christian Andersen (1805-1875) "The Emperor's New Clothes").

The problem on which he chooses to bite – *зд.* Острие своей критики он направил против

is all wet. – *зд.* не имеет под собой никакой почвы.

p. 132 **Mt. Palomar** – имеется в виду обсерватория, расположенная на горе Паломар в Южной Калифорнии, США

Astronomers Seek 'Nemesis' to Back up Extinction Theory

p. 132 **Nemesis** ['nemɪsɪs] – Немезида, так ученые назвали предполагаемую звезду-спутник Солнца – в честь древнегреческой богини возмездия. Первым гипотезу о существовании «компаньонки» у Солнца выдвинул советский ученый И.С. Шкловский.

p. 134 **the Oort Cloud** – «облако Оорта» (рассеянное скопление комет на окраине Солнечной системы). Хотя ни в один из существующих телескопов это «облако» увидеть еще не удалось, ученые не сомневаются в том, что оно существует. «Облако», или как его еще называют «сейф», названо именем нидерландского астронома Яна Оорта (р. 1900), который первым опубликовал данные, позволившие сделать вывод о том, что на самых границах Солнечной системы находится огромное облако комет.

the University of California's Leuschner Observatory – обсерватория Калифорнийского университета, носящая имя профессора Отто Лойшнера (1868 – 1953), крупного специалиста в области теоретической астрономии

How Dumb was the Dinosaur, Anyway?

p. 135 **behemoth** [bɪ'hi:məθ] – *зд.* громоздкое, неповоротливое чудовище

p. 136 **a tyrannosaur** – см. комм. на с. 210

brontosaurus [ˌbrɔntə'sɔ:rəs] – бронтозавр, вымершее гигантское пресмыкающееся из отряда ящеротазовых динозавров. Длина до 20 м.

Yale = Yale University – Йельский университет, одно из старейших и наиболее престижных учебных заведений в США

p. 137 **a cantaloupe** ['kæntəlu:p] – канталупа, сорт мелкой дыни

the Rockies – (*амер. разг.*) Скалистые горы (Rocky Mountains)

a duckbilled dinosaur – утконосый динозавр

critter (*амер. разг.*) = creature

p. 138 **moot** – спорный

p. 139 **an explanation that's literally out of this world** – объяснение (ключ к разгадке), которое в буквальном смысле слова пришло из иного мира. Автору пришлось добавить слово literally, так как выражение out of this world обычно употребляется в значении «божественный, восхитительный, невиданный, замечательный, необыкновенный».

Lawrence Berkeley Laboratory – физическая лаборатория Калифорнийского университета в Беркли, пригороде Сан-Франциско; носит имя известного американского физика, лауреата Нобелевской премии Эрнеста Орландо Лоренса (1901 – 1958).

pack too little punch – слишком маломощны

Language Evolving Part Two

p. 139 **Neanderthal** [nɪ'ændətɑ:l] – неандерталец. Неандертальцы, древние ископаемые люди, чьи останки были обнаружены в долине Неандерталь (ФРГ) в 1856 г.

p. 140 **australopithecines**—подсемейство австралопитеков;

зд. австралопитеки, ископаемые высшие человекообразные приматы, передвигавшиеся на двух ногах, которые жили около 2,6 млн. лет назад

p. 141 **sequelae** (*мн. ч. от* **sequela**) – *зд.* изменения

Broca's area – центр Брока, двигательный центр речи, открытый в 1863 г. французским анатомом и антропологом Полем Брока (Paul Broca, 1824-1880)

the frontal lobe – лобная доля

Wernicke's area – центр Вернике (Карл Вернике, 1848-1905, немецкий ученый-невролог)

the fissure of Sylvius – борозда, разделяющая полушария головного мозга, открытая Якобусом Сильвиусом, французским анатомом, который одним из первых начал анатомические исследования на человеческих трупах. Якобус Сильвиус – латинизированное имя Жака Дюбуа (Jacques Dubois, 1478-1555).

p. 142 **La-Chapelle-aux-Saints** – Ла-Шапель-о-Сен, позднепалеолитическая пещерная стоянка близ деревни того же названия во Франции, где было найдено погребение неандертальца

hominid – относящийся к семейству гоминидов, семейства отряда приматов, включающего как ископаемого человека (питекантропа, синантропа, неандертальца и, вероятно, австралопитека), так и современного человека

p. 144 **Rutgers University** – университет Ратгерс, находится в г. Нью-Бранзвик, штат Нью-Джерси, США

the Middle Pleistocene – см. комм. на с. 209

a saber-toothed tiger – махайрод, или саблезубый тигр, крупный хищник неогенового периода (см. комм. на с. 198) с огромными верхними кинжаловидными клыками, относится к роду вымерших млекопитающих семейства кошачьих

A New Ice Age?

p. 146 **upstate** – в США обычно обозначает территорию штата, находящуюся к северу от столицы штата

"Some say the world will end in fire ..." – см. комм. на с. 228

p. 147 **Mikhail I. Budyko** – Михаил Иванович Будыко (р. 1920), советский геофизик

"greenhouse effect" – тепличный/парниковый эффект

the Statue of Liberty – статуя Свободы, установлена у входа в нью-йоркскую гавань, получена США в дар от Франции (1886)

the Sahel disaster – имеется в виду засуха в Сахели (переходная полоса (ширина до 400 км) от пустыни Сахары к саваннам Западной Африки, где преобладают полупустыни и опустыненные саванны, количество осадков не превышает 200 – 600 мм в год)

the CIA (Central Intelligent Agency) – ЦРУ (Центральное разведывательное управление), координирующий центр гражданской и военной разведки США. Создан в 1947 г.

p. 148 **Sikkim** – Сикким, штат Индии в Восточных Гималаях

p. 149 **headline-grabbing hyperbole** [haɪˈpɜːbəlɪ] – *зд.* сенсация, задуманная с целью попасть на первые полосы газет (западная пресса преподносит сенсации броскими заголовками, набранными крупным шрифтом)

Is Antarctica Shrinking?

p. 150 **fossil fuels** – природное топливо

"greenhouse effect" – см. комм. на с. 231

p. 152 **Byrd Station**—Бэрд, американская внутриконтинентальная полярная станция, основанная в 1957 г. на Земле Мэри Бэрд

p. 153 **prudence means erring on the pessimistic side** – благоразумие диктует необходимость подстраховаться и предположить худшее

Crazy Rains or Animals That Fall from the Sky?

p. 153 **R.I.** = Rhode Island [ˌroudˈaɪlənd] – Род-Айленд, штат на Востоке США

oldster – *разг.* старик, дед

p. 154 **Athenaeus** [ˌæθɪˈniːəs] – Афиней, греческий ученый (конец 2 – начало 3 в. н.э.). Большую часть жизни провел в Египте в г. Наукратисе.

Faeroe [ˈfeərou] **Islands** – Фарерские острова, расположены на Северо-Востоке Атлантического океана, являются автономной областью Дании

"whittings and sprats" – хек и мелкая сельдь

minnows – мелкая рыбешка

perch and bulltrout – окунь и морская форель

S.C. = South Carolina [ˌkærəˈlaɪnə] – Южная Каролина штат на Юго-Востоке США

p. 155 **Ala.** = Alabama [ˌæləˈbæmə] – Алабама, штат на Юге США

La. = Louisiana [luˌiːzɪˈænə] – Луизиана, штат на Юге США

Conn. = Connecticut [kəˈnektɪkət] – Коннектикут, штат на Северо-Востоке США

Wiltshire [ˈwɪltʃə] – Уилтшир, графство в Англии

Montreal [ˌmɔntrɪˈɔːl] – Монреаль, город в Канаде

larvae [ˈlɑːviː] (*мн. ч. от* **larva**) – личинки

Tenn. = Tennessee – Теннесси, штат на Юге США

p. 156 **The biblical narrative of a shower of quail (Numbers XI, 31)** – в Библии о «дожде» из перепелов повествуется в Числах – одной из пяти хроникально-законодательных книг Ветхого завета (Пятикнижия), приписываемых пророку Моисею: **11:31** «И поднялся ветер от Господа, и принес от моря перепелов, и набросал их около стана, на путь дня по одну сторону и на путь дня по другую сторону около стана, на два почти локтя от земли». "And there went forth a wind from the Lord, and brought quails from the sea, and let *them* fall by the camp, as it were a day's journey on this side, and as it were a day's journey on the other side, round about the camp, and as it were two cubits *high* upon the face of the earth."

neuropteroids – сетчатокрылые

the plagues [pleɪgz] **of Egypt** – египетские казни. В тексте Библии нет выражения «египетские казни». Оно возникло как обобщение развернутого библейского сюжета, в котором говорится о десяти бедствиях, насланных богом на фараона Египта за то, что он не хотел отпустить из плена еврейский народ. Подробное описание этих казней можно найти в различных главах книги Ветхого завета «Исход». В современном русском языке выражение «египетские казни» выступает в значении: «невыносимо тяжелое положение, беда, бедствие».

Homer – Гомер, легендарный древнегреческий эпический поэт, которому со времен античности приписывается авторство «Илиады» (Iliad), «Одиссеи» (Odyssey) и других произведений

p. 157 **Virgil** – Вергилий (70 – 19 до н.э.), римский поэт, автор «Энеиды»

Gregory of Tours – Грегори из Тура (538? – 593), священнослужитель и историк, епископ г. Тура. Его «История франков» является основным источником сведений о культуре Меровингов – первой королевской династии во франкском государстве (конец 5 в. – 751), названной по имени основателя рода – Меровея (Mérovée).

brimstone [ˈbrɪmstən] – самородная сера; по народному поверью запах серы сопровождает появление дьявола

old salt – *разг.* опытный, бывалый моряк; «морской волк»

Can the Air Absolve Man's Sins of Emission?

p. 157 **CFC gases** – фреоны/хладины, химические соединения, в состав которых входят хлор, фтор и углерод

innards – *разг.* внутренности

p. 158 **zap** – *разг. зд.* расщепить

acid rain – кислотный дождь

nitrogen ['naɪtrəʤən] **oxides** – окислы азота

hydrocarbons [ˌhaɪdrou'kɑ:bənz] – углеводородные соединения

p. 159 **minute** [maɪ'nju:t] – ничтожный, незначительный (по количеству)

Christ under the Microscope

p. 160 **the Turin** [tju'rɪn] **Shroud** – (*букв.* саван) Туринская плащаница (плащаница – ткань с изображением Христа в гробу, используемая в церковном обряде)

Little that the scientists have done has shaken the legend of the shroud, but little they have done has helped to explain how the image of a man got there. – То немногое, что ученым удалось установить, помогло определить происхождение отпечатка человеческого тела на ткани и, в то же время, поставило под сомнение легенду о плащанице.

p. 161 **sindonologist** – (sindon – *итал.* кусок ткани, в который заворачивают тело покойника) синдонолог, специалист по туринской плащанице

Odessa [ou'desə] – Следует заметить, что в 6 в. н. э. г. Одессы, как такового, еще не существовало. Одесса была основана в 1795 г. на месте турецкой крепости Хаджибей.

p. 162 **Constantinople** – Константинополь (Царьград), столица Византийской империи; после взятия его турками в 1453 г. был переименован в Стамбул (Istanbul)

rigor mortis ['raɪgə:'mɔ:tɪs] – трупное окоченение

Barbet – Пьер Барбэ, французский хирург и анатом, в 1930 г. провел ряд экспериментов на трупах и в результате установил, что казнь распятием осуществлялась именно так, как о том свидетельствуют отпечатки на плащанице

The Murder of Napoleon

p. 167 **arsenic** ['ɑ:snɪk] – мышьяк

arsenic [ɑ'senɪk] **poisoning** – отравление мышьяком
tartar emetic [ɪ'metɪk] – рвотный камень
calomel ['kæləmel] – хлористая ртуть

p. 168 **the British East India Company** – Ост-Индская компания, английская компания (1600 – 1858), которая имела монопольное право торговли с Ост-Индией (название территории Индии и ряда других стран Южной и Юго-Восточной Азии), а затем взяла на себя и функцию управления колониальными владениями Великобритании в этом регионе

Ascension [ə'senʃn] **Island** – Остров Вознесения

p. 169 **was playing blindman's buff** [ˌblaɪndmænz'bʌf] – играл в жмурки

p. 171 **the break** (*амер. разг.*) – *зд.* счастливый случай
forensic [fə'rensɪk] **medicine** – судебная медицина

p. 177 **a catchall interpretation** – *зд.* шаблонное объяснение

p. 184 **the first Bourbon Restoration** – первая реставрация Бурбонов с возведением на престол Людовика XVIII, брата казненного Людовика XVI, произошла в марте-апреле 1814 г., когда войска антифранцузской коалиции вступили в Париж, и Наполеон был вынужден отречься от престола, после чего был отправлен в ссылку на остров Эльба

Waterloo – Ватерлоо. 20 марта 1815 г. Наполеону удалось бежать с острова Эльба, высадиться во Франции и снова воцариться на престоле, где он, однако продержался всего сто дней. В битве при Ватерлоо (18 июня 1815) Наполеону было нанесено окончательное поражение войсками антифранцузской коалиции.

p. 186 **licorice** ['lɪkərɪs] – лакрица
orgeat ['ɔ:ʒɑ(t)] – *оршад*
almonds ['ɑ:məndz] – миндаль
hydrocyanic [ˌhaɪdrousaɪ'ænɪk] **acid** – синильная кислота
mercurous cyanide ['saɪənaɪd] – ртутный цианид

p. 187 **Louis-Philippe** – Луи Филипп (1773 – 1850), французский король в 1830 – 1848, был возведен на престол после Июльской революции 1830 г. и свергнут Февральской революцией 1848 г.

p. 188 **Napoleon III** – Наполеон III (1808 – 1873), французский император в 1852 – 1870. Племянник Наполеона I. В декабре 1848 г., используя благоприятную ситуацию, добился своего избрания на пост президента, а в декабре 1851 г. с помощью военщины совершил государственный перево-

рот, в 1852 г. провозглашен императором. Низложен сентябрьской революцией 1870 г.

The Incredible Dr Bell

p. 189 **a Highland regiment** – шотландский полк

Sherlock Holmes – Шерлок Холмс, сыщик-любитель, главное действующее лицо в детективных повестях и рассказах английского писателя Артура Конан Дойла (1859 – 1930)

Florence Nightingale – Флоренс Найтингейл (1820 – 1910), английская медсестра, организатор и руководитель отряда санитарок во время Крымской войны (1853 – 1856)

p. 190 **Robert Louis Stevenson** – Роберт Льюис Стивенсон (1850 – 1894), английский писатель, мастер приключенческого романа; автор «Острова сокровищ» (Treasure Island), «Похищенного» (Kidnapped), «Странной истории доктора Джекиля и мистера Хайда» (the Strange Case of Dr Jekyll and Mr Hyde) и др.

James Barrie – Джеймс Барри (1860 – 1937), английский писатель, драматург; автор популярной детской сказки «Питер Пэн» (Peter Pan)

gospel – *зд.* взгляды, убеждения

p. 191 **quarryman** – рабочий каменоломни

a compositor – наборщик

p. 193 **bump of perception** – шишка восприятия, термин френологии, антинаучной теории, согласно которой на основании формы черепа якобы можно судить о психических или умственных способностях человека. Эта «школа» в психологии была основана в 1800 г. двумя немецкими врачами Францем Иозефом Галлом (Franz Josef Gall, 1758-1828) и Иоганном Каспаром Спурцхаймом (Johann Kaspar Spurzheim, 1776-1832).

a non-com (non-commissioned) **officer** – сержант; унтер-офицер

p. 194 **Gaboriau** – Эмиль Габорио (1832 – 1873), французский писатель, один из зачинателей детективного жанра

Poe – см. комм. на с. 208

Oliver Wendell Holmes – Оливер Уэнделл Холмс: отец (1809 – 1894), американский писатель; сын (1841 – 1935), американский юрист

p. 195 **Jack the Ripper** – Джек-Потрошитель, убийца-садист, совершавший жестокие убийства в беднейшем районе Лондона – Ист-Энде в 1888 – 1889 гг. Личность убийцы так и не была установлена.

the Crown – корона, королевская власть (как сторона в судебном процессе)

p. 197 **Walter Scott** – Вальтер Скотт (1771 – 1832), английский писатель, создатель жанра исторического романа. Его перу принадлежат «Уэверли» (Waverley), «Айвенго» (Ivanhoe), «Роб Рой» (Rob Roy), «Квентин Дорвард» (Quentin Durward).

Dreyfus – Альфред Дрейфус (1859 – 1935), ложно обвиненный в 1894 г. в шпионаже в пользу Германии, был приговорен к пожизненной каторге, несмотря на отсутствие доказательств вины. Борьба вокруг дела Дрейфуса привела к политическому кризису. Под давлением общественного мнения Дрейфус был помилован (1899), а позже реабилитирован (1906).

CONTENTS

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