

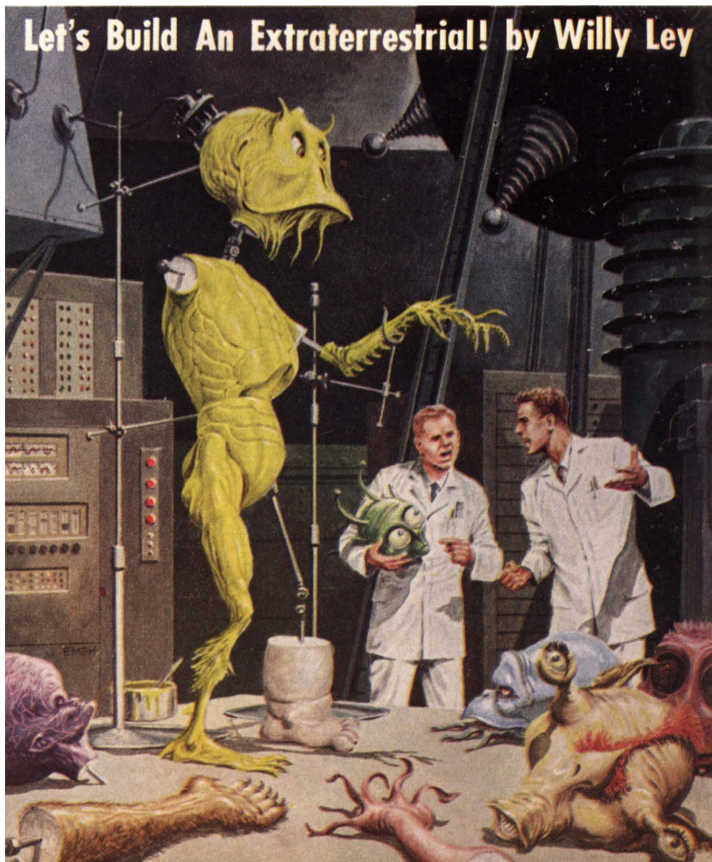
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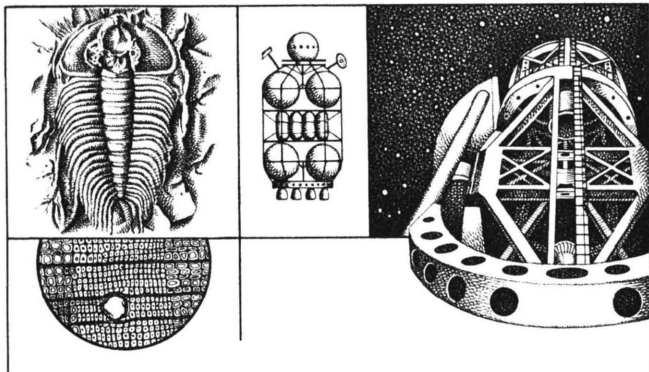
SCIENCE FICTION

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Let's Build An Extraterrestrial! by Willy Ley

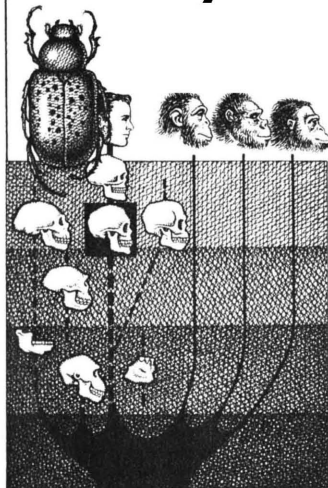




for your information

By **WILLY LEY**

**LET'S BUILD
AN EXTRATERRESTIAL!**



FOR at least the last three decades, a large number of science fiction writers have been confronted, at one time or another, with the problem of constructing extraterrestrial life-forms. Naturally the professional chemists and biologists who write science fiction on the side did best, not so much because their professional knowledge led them for long distances on hitherto un-

trodden paths, but because it made them stop at the right moment.

As regards those who were primarily writers, the results make one suspect that they at first tried to apply what biology they knew. Since this apparently did not get them very far, they presumably threw overboard whatever it was they had not quite arrived at and wrote things like this: "Surprisingly, the aliens were quite human in shape, the only major differences, or at any event the ones which were easily visible, being a strong tail and a bluish complexion."

Or else, if the actual contact with the aliens could be fleeting, they resorted to saying that the forms the Earthmen beheld were so alien, so outside of all terrestrial experience, that it was impossible to describe them.

ALL this refers to recent science fiction, of course. Now let's take a quick look back to the forerunners of modern science fiction and see whether they did any better.

The first man who seriously attempted to think up life-forms of another heavenly body (the Moon, in this case) was the great Johannes Kepler, when wrestling with his book *Somnium*, which he never really finished. The planetary conditions he had in mind

consisted of a rocky surface with many caves, large and small, and broiling sunshine through a thin atmosphere. Hence the creatures of the Moon mostly have the shape of terrestrial snakes, to be able to escape the deadly sunshine quickly and thoroughly.

Of the science fiction writers of the nineteenth century, I am selecting three and naturally the list has to be headed by Jules Verne. I think that I have read all of Verne and, unless a minor work escaped me, I can only report that he refrained from building any extraterrestrials whatever.

Jules Verne's compatriot and contemporary Achille Eyraud (in his *Voyage à Vénus*) and his English contemporary Percy Greg (in his novel about a trip to Mars *Across the Zodiac*) were both proficient in describing pretty girls, but the only alien creature I remember is a flying snake in Greg's book.

As for Sydney Whiting's *Heli-ondé: or, Adventures in the Sun*, published in London in 1855, which is based on Sir William Herschel's notion that the Sun is a dark body with a luminous atmosphere, it can hardly be considered science fiction. But even if it is, it does not offer much in the line of extraterrestrial creatures; a fairly typical example of the things you encounter is a bush which does not grow seed pods

but cakes of perfumed soap.

Unlike Jules Verne, H. G. Wells went in quite heavily for extraterrestrials in his earlier years. When the engineer Cavor goes to the Moon, he finds gigantic moon calves and a ruling race modeled both in bodily and in social organization after the ants or termites of Earth. I think that Wells is the original inventor of the giant insects which have plagued science fiction editors ever since. But, as you also know, when Wells' Martians come to Earth, they turn out to be air-breathing octopi in shape — not, as has been said on many occasions, a very likely shape.

HOWEVER, the occasional science fiction writer of the past was not the only type of creative genius who did, or could have, exerted ingenuity in the building of an extraterrestrial. There were many others who engaged in a very similar line of endeavor for the purpose of representing gods, demons or just outlandish creatures, somewhat along the line of the Midnight Marvels to which I devoted a column some months ago.

To put it bluntly, nobody showed much imagination and the method was standardized at an early age:

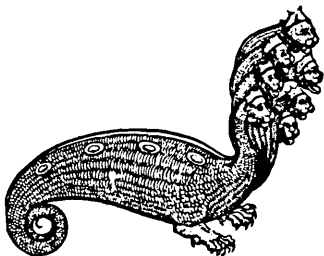
Combine the features of various kinds of living creatures into

something that could be drawn, painted or sculptured and the job was done. Put a woman's head on a feline body and you had a sphinx. Add the head of a bird to the body of a man and you had ibis-headed Thoth. Take a horse and supply it with the wings of an eagle and Pegasus was ready for flight, though with lateral stability only. Take another horse, cut off its head and graft the upper half of a man's body to it and the centaur was ready.

Christianity brushed away these particular examples, but the method must have remained, for at one point St. Bernard had harsh words to say about decorations he encountered in monasteries:

"What business have those ridiculous monstrosities, those amazingly freakish beauties and marvelously beautiful freaks in the cloisters right in front of the eyes of the monks who are supposed to be reading or meditating? You see one head with many bodies or one body with many heads. Here you have a serpent's tail attached to a quadruped and there a mammal's head attached to a fish's body. There you have a creature that is half horse and half goat and here one with horns and the rear end of a horse."

Just what business such creations had in a cloister is a still unanswered question, but artists



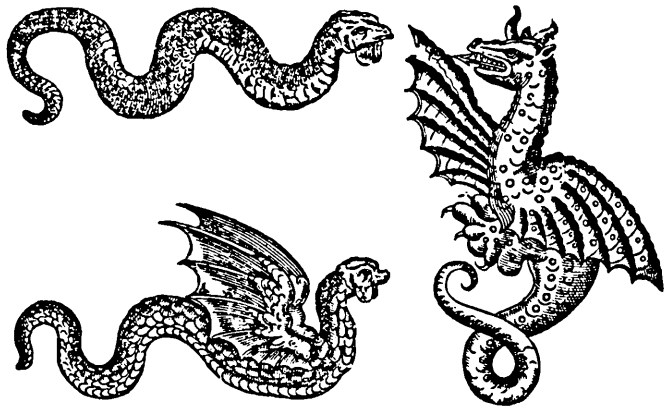
The Hydra which was removed from the Mediterranean landscape by Hercules

fairly late invention—was a woman from forehead to waist and a fish below that. (Virgil Partch, in a recent cartoon, put the left-over halves together as an alternate choice.) And the traditional picture of the devil was that of a man with two small goat's horns, one goat leg and a tail. Demons differed from devils by having a few more incongruous parts added to an improbable anatomy.

just could not think of another method.

The fabulous unicorn was drawn as a horse with the feet of a goat and a narwhale's tusk on its forehead. The mermaid—a

EVEN when it came to something as simple, comparatively speaking, as the legendary Hydra, the extirpation of which was one of the feats of Hercules, the artists stuck to their formula.



Flying snakes from Gesner



The Forest Devil, said to have been caught in Switzerland

The story spoke of a seven-headed snake and this should not be a very hard task for an artist. What he did draw was the body of an exceedingly well-nourished snake with seven heads that might be described as humanized lion faces and with two, just two, lion paws with six toes.

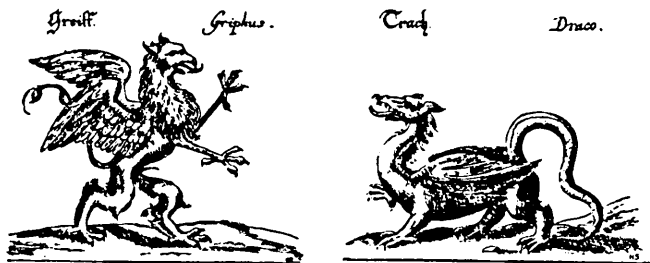
We do not know who made this drawing; it was preserved for us by Konrad Gesner in his *Historia animalium* with a warning that his readers should not take the Hydra to have been historical reality. But the same book contained "flying snakes," since classical authors had vouchsafed their existence. Some just had wings. Others had wings and feet.

A far more complicated creature was the Forest Devil, also from Gesner, an unclassified and unclassifiable beast caught just

once in a Swiss forest. Here the artist went all out: the body is that of a mammal with a tail, the legs are human but with bird feet, the arms human with lion's paws. The creature has a beard and the masculine article is used throughout in the description — but there are pronounced pendulous breasts.

And then you had the really complicated creatures, the griffin, the dragon and the basilisk. In the case of the basilisk, the legend was definite on a few things: the basilisk was the king of the serpents and came into being when a seven-year-old rooster laid an egg which was hatched either by a toad or by the Sun. In appearance, then, it had to have both characteristics, those of serpents and those of the rooster.

I offer two attempts to combine these characteristics.



Left: The griffin, old German drawing
 Right: The dragon, from the same source

The artist who drew the picture for Sebastian Munster's *Cosmographia* more or less settled for a lizard's body with a long tail. The head—wearing a crown—was mostly that of a rooster and there were eight rooster's feet, four on each side.

The other picture (artist also unknown) is from an old German natural history book. In this design, the rooster largely won out, except for the long reptilian tail and the wings, which are not bird wings. The griffin is a wild mixture of bird and mammal all the way through, while the dragon is, in this case, a comparatively tame creature. More often, it appeared as an enormous crocodile with gigantic bat wings.

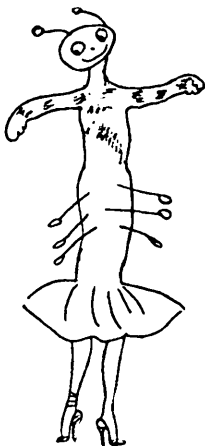
THAT a random combination can do almost as well is proven by Fig. F, which is the

outcome of a game my wife used to play with our two daughters. In that game, one of the three participants would start by drawing a head, which could be either human or animal. Then the head was folded under, leaving only the lines of the neck visible, and the next player could go on from there, knowing only that it was a neck. And so forth.

In this particular case, resulting in a bug-eyed monster which could quite easily have graced (if that's the word) the cover of certain magazines at a certain period, the daughter who drew the head obviously had some sort of fairy tale caterpillar in mind. The mind of the next player was on cats, but the first still stuck to caterpillars. The one who had cats in mind produced the skirt of which the hem remained visible, so that the dancer's legs resulted.

So you obviously cannot produce a biologically possible or even believable creature by the (random or artistic) combination of separate parts. Fine — but how can you go about it? All I can say offhand is that it isn't easy; so much depends on so many different circumstances.

There is, in the first place, the planetary environment, consisting of such factors as either much water or very little water; temperature which depends mainly but not only on the distance of the planet from its sun; seasonal changes which depend on the inclination of the axis of rotation of a planet to the plane of its orbit



Not an extraterrestrial but the result of a game. Same method, though



around the sun.

It depends on the presence or absence of a large moon (or moons) because, with a large and nearby moon, you get pronounced tides, while without a moon, or only very small moons, you only have the solar tide, which is likely to be unimpressive.

The relative abundance of the chemical elements in the outer crust and in the atmosphere certainly also plays a role.

LET us, for a first test, take our two neighbors in the Solar System, Venus inside the Earth's orbit and Mars outside it.



Top: The basilisk,
from Munster's *Cosmographia*
Bottom: The basilisk,
hatched from a rooster's egg

When I started reading books on science, as a schoolboy, Venus, in most of them, was firmly declared to be a *panthalassa*, the technical term for a planet completely covered by water without any land showing. This, after various attempts to be "different," has recently been revived by Whipple and Menzel as the most likely concept.

Now such a shoreless ocean — I am avoiding all other consideration and am concentrating on just the one fact that it is an ocean — can harbor virtually everything in abundance. But with limitations; you can't just mix the fauna of the equatorial Pacific Ocean of today with equatorial seas of the Jurassic and Cretaceous periods and obtain a believable or even possible picture.

You can have, if you want to, most of the arthropods, lobsters and sea spiders, trilobites and, if you insist, something like a sea-going centipede. But you must specify that there are shallow areas in this ocean if you want to have clams, for they don't grow too far down. You can have jellyfish in fantastic numbers of species as well as individuals.

You can have octopi and all sorts of fishes. But you can't have a turtle, for example, because when, in Earth's past, some fishes went up on land, they first produced what we now call amphibia

— say, primitive salamanders — and the reptiles, the birds and the mammals came afterward. They all are creatures of the land, even though some reptiles, like the turtles and the sea snakes, and some mammals, like the whales and the seals, returned to the ocean at a later date.

And don't make anything more intelligent than the most intelligent fish — I don't know which fish that is or could be — for the open sea is a region of steady movement and no intelligence is needed for that. The exceptions to the statement that this is a region of movement are armored forms like clams, but a perfectly sessile creature which relies on its armor for individual protection and on numerous offspring for survival of the species also is not going to develop intelligence. It doesn't need any.

So a shoreless Venusian ocean — I repeat I am concentrating on no other fact than that it is a shoreless ocean — might harbor a very varied life and some forms may be rather pretty. But I challenge anybody to think up an aquatic form of life, especially among the invertebrates, which would look radically different from what we have in our oceans. The multitude of forms on our own planet is so overwhelming that one always gets the impression that anything that can sur-

vive with the shape it has is also in existence.

ONE thing is absolutely needed in this shoreless ocean if it is to have any life at all. There must be plants, microscopic or otherwise, because animal life alone is an impossibility.

You know the old tall tale about the man who made a living by having a mouse and cat farm. The cats, of course, ate the mice, and when the cats were big enough, he killed and skinned them, sold the pelts and fed the cat's bodies to the mice. Even if the mice were carnivorous, this just wouldn't work. Somewhere at the beginning of such a cycle, there has to be the original food producer, the plant, which makes living (and edible, as a rule) tissue out of dissolved minerals, carbon dioxide and sunlight for energy.

I might as well, at this point, present two strong hints at caution. If, in that sea, you have a tribe of *Kraken*, octopi a mile in circumference and the largest thing in the ocean, don't make them smart. If they are the largest thing in the ocean, immune to all danger except an occasional outburst of the elements, such as a submarine volcano opening up, and, of course, old age, they don't have to be intelligent. What has been said about oysters a while

ago applies also to the invulnerable life-form.

Likewise, don't make something one millimeter in diameter into an intelligent life-form. Some time ago, somebody wrote a story in which the main character, who was not a hero, caught what he thought to be a shiny wasp. It stung him so hard that he had to let go—and then noticed to his surprise that the wasp sting made his Geiger counter chatter wildly. The implication was, of course, that this was a tiny spaceship with atomic drive.

Though I liked the story, I knew that this could never happen. In order to be intelligent enough to even discover atomic energy, a being has to have a rather large number of brain cells. These brain cells must be nourished, which needs organs for eating and digesting food. The digestive tract must be protected by some covering and this package must be moved around in some manner so that it can find food. It must also move around to avoid being eaten, at least until it has attained the intelligence that splits atoms and controls what they do after splitting.

IT has been said and bolstered with many pounds of statistics that, in a modern army, 98 men are needed to enable two men to shoot at the enemy. This relation-

ship must apply also to the number of cells needed to support the brain cells that do the thinking. Since a cell, in order to function as a cell, must consist of a very large number of molecules and since the size of molecules is a given fact, there must be a minimum size for a functioning cell.

L. Sprague de Camp, who was to my knowledge the first to present this chain of reasoning (in a two-part article in *Astounding*, May and June issues of 1939), came to the conclusion that an overall body weight of around 40 pounds would be needed if you want intelligence on the human level.

It is possible that a few facts permit a little more stretching, so that the minimum weight could be less. But the reasoning itself is valid and the reduction cannot be very much. Whether the first interstellar hero has to establish relations with something weighing 45 or only 30 pounds does not make much of a difference.

But I did not want to slip out of our solar system yet.

Now if we look at Mars, we are helped no end by the fact that we know a great deal about it. Here is a small planet with very little water and a thin atmosphere consisting mostly of inert nitrogen. It is generally a cold planet, but during the summer the equatorial regions can attain tempera-

tures between 60 and 70 degrees Fahrenheit at noon. To make our problem still easier, we are virtually certain that we see plant life.

The dark greenish patches which all bear nice classical names due to Signor Schiaparelli of half a century ago cannot just be mineral discolorations. When covered up by yellow dust from the deserts, they manage to break through again and just during the last close approach of Mars, in 1954, Dr. Earl C. Slipher, working at Bloemfontein, South Africa, found a new one almost the size of Texas under about 15° northern Martian latitude and about 235° Martian longitude, which means about halfway between the northern end of *Syrtis major* and *Trivium Charontis*, two well-known Martian markings.

THERE has been a lot of discussion recently in learned journals on whether any terrestrial plant could grow on Mars, and if so, which one. Naturally any suggestion made by anybody was countered with heavy arguments by somebody else. But the fact remains that we see something growing on Mars which is, in our terminology, plant life. If we do not understand their biochemistry under the conditions we are forced to assume from astronomical observations, this can only mean one of two things:

Either we cannot observe all the conditions and something which we have missed, or are bound to miss with present instrumentation, is a perfectly fine explanation; or else we don't know enough biochemistry and there is a way of living and growing under these conditions.

The reasoning that forced us to say that there must be plant life in the Venusian oceans, if we want animal life of any kind, almost forces us to say that, since there are plants on Mars, there must be something that we would call animals.

Some biologists with whom I discussed this stated with professional caution that this reasoning does not necessarily hold true. I don't agree. Speaking in the largest sense, the animals of Earth, from sow bugs to elephants, are parasitic on plants. Now life, at least on Earth, behaves in such a manner that *if* there is something to be parasitic on, something else will be happy to take over the role of the parasite.

Something feeding on these Martian plants must have the power of movement because it needs so much plant tissue for its own sustenance that the rate of the plant growth cannot furnish the necessary amount. Hence it must be capable of locomotion.

Whether this supposed Martian plant-eater is built along the lines

of a locust, or along the lines of a desert tortoise, or along those of a rabbit is something entirely different again. One can assume that it simply freezes into a death-like state during the cold Martian night and remains in that state until thawed out by the Sun. In that case, it could be insectlike in organization.

One can assume with equal justification that the "animal," at the first sign of cold in the evening, burrows into the ground for a few feet and goes to sleep normally in an environment where the temperature may be quite cold, but where there is very little deviation from whatever temperature it may have. In that case, it could be something comparable to a desert tortoise.

Or you can make the assumption that it has an internal mechanism like the birds and mammals of Earth, something producing heat. Then it does not have to dig itself in. All it needs is an effective heat insulator around its body, which might be hairlike, or featherlike, or, if this sounds more "alien," something like bark or sponge rubber.

SO far, I have mostly talked about extraterrestrial animal life in order to show some of the difficulties. When it comes to an extraterrestrial *intelligent* life-form, the difficulties rapidly in-

crease in number and kind.

It may come as a surprise, but the first tentative recipe for the construction of an intelligent extraterrestrial was written by the Dutch physicist, philosopher and astronomer Christian Huyghens. The title of the book is *Kosmotheoros* and it appeared posthumously, in 1692, at first in Latin. Nobody seems to know just when Huyghens wrote the major portion of the book.

He said there that an extraterrestrial must have eyes and ears — that is, senses “and pleasure arising from his senses.” He must know the art of writing to remember things, arithmetic and geometry to understand relationships, hands to make things — and he must be upright.

It does not become quite clear from Huyghens' book why he must be upright. It sounds as if Huyghens made this condition to free the forelimbs from the task of locomotion so that there are “hands to make things.”

The insistence struck me as amusing because Sprague de Camp, in the articles mentioned, also was insistent on that point, but more for mechanical reasons. The brain must be protected against shock as much as possible and the more bone, cartilage and tissue there is between the feet, which take the shocks, and the brain, the better.

All this is sound logic and it is obvious that the body of the extraterrestrial must be such that it functioned well as an animal body before it grew to be intelligent. Of course, one can postulate that accidental environmental conditions of the past helped along.

Around the turn of the century, a number of biologists and zoologists toyed with the idea that Man had evolved in what they called an asylum, an area accidentally free from large predatory animals and with a gentle climate. They obviously did not think much of the human body as a well-functioning animal. We now know that they were wrong and that the idea of the “asylum” is not needed. But it may conceivably have happened somewhere else, for the Galaxy must be full of planets and possibilities.

TH**ERE** is just one major difficulty in imagining a believable intelligent extraterrestrial — we have never seen one. What I mean by this remark is this:

We know the organization of living animal tissue on Earth. We know that the organization of the mammal is superior. True, it “wastes” food by making its own heat, but this fact makes it climatically independent. And though a reptile can do quite well in the proper climate, it is very limited. When the air grows too

cold, it must be inactive, though it usually survives. When the air grows too hot, it dies of heat stroke, for, lacking a temperature-regulating mechanism, it not only cannot keep warm, it also cannot keep cool.

Now this vertebrate body, whether mammalian or reptilian, has two pairs of limbs and usually a tail. What we don't know is whether it *has* to be built that way.

To use a classical example: we don't know whether the centaur shape is possible or not. On Earth, it doesn't exist; that much is certain. But is this due to an anatomical necessity for which we

don't know the reason or did it just happen that way here?

As for comparatively minor matters, we do know that they just happened. Genus Homo is tailless and almost hairless. But it doesn't *have* to be hairless and tailless to invent writing, to build and ride cars and to engage in research, politics and crime.

If we had fur and a tail, our fashions, habits and morals would be different, but if brain and senses and hands were unchanged, we'd still write books and symphonies, build houses, ships and airplanes — and try to build an extraterrestrial.

— WILLY LEY

