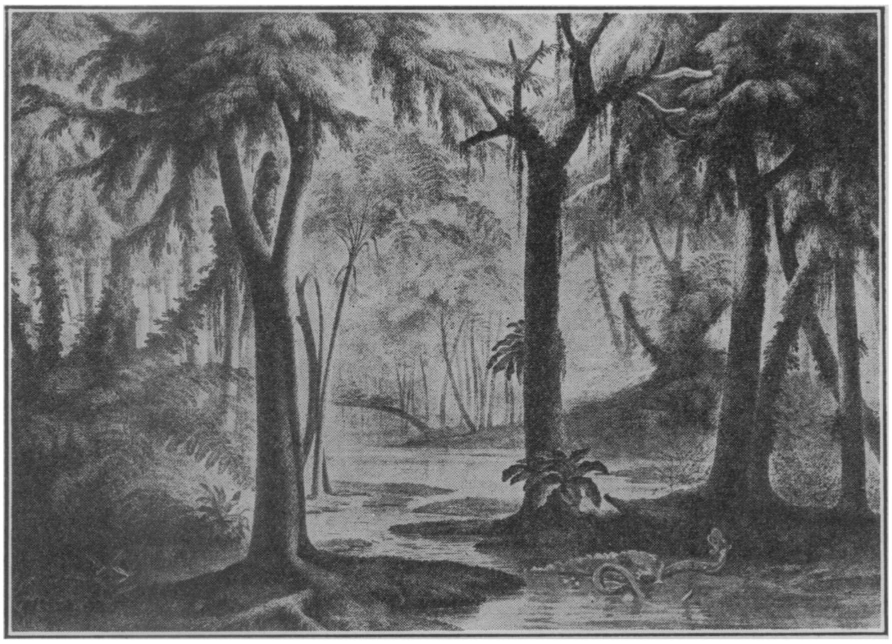
Vacant Lots in the Solar System



A VENUS LANDSCAPE might look something like this; an imaginary picture of the earth during the coal age

By Frank Thone

Is there life on other worlds than ours? More especially, is there intelligent life? Are there human beings, or any beings, whatever they may look like, with minds comparable to human minds? Do they wonder about us, as we wonder about them? Are they trying to get into communication with us, and will it ever do us any good to try to get into communication with them?

The natural inclination of most of us is to believe that there is life in other parts of the universe besides the little spinning globe to which we cling. We are all more or less unconsciously imbued with the dictum of the mediaeval schoolmen that "nature abhors a vacuum," and the notion that all these other worlds are quite empty strikes us as a sheer waste of good real estate. If they are really devoid of human life we'd like to have the job of subdividing them and putting them on the market. Jules Verne, H. G. Wells and a whole host of other romancers have woven hundreds of fantastic tales about invasions of the earth from Mars, or voyages to the moon in a giant rocket.

But the other-world fairylands of renaissance and early modern speculation have been passed in review before the great unwinking eyes of our great telescopes, and one by one they have puffed and burst like rainbow-colored bubbles. Out of the eight planets that circle around the sun, to only one, our own earth, can we with any certainty assign a population of living plants and animals, ruled over by a human race. Two of the remaining seven, Mars and Venus, may conceivably support life, though there is no real evidence that they do. All the other planets, together with earth's satellite, the moon, are with hardly the shadow of a doubt totally devoid of any living thing.

Why are we so certain of this? Well, life of any sort demands certain conditions for its existence. There must be solid land for animals, water for fish, air for birds and insects. There must be oxygen for breath, carbon dioxid and nitrogen for plants to make into food, sunlight to supply the energy for this all-important process. The temperature must not drop below the freezing point of water for too long a time, nor rise above a certain limit, which for most plants and animals is well short of the boiling point. These are not all the necessary conditions, but only a few of the outstanding ones. If a planet can not offer all the necessary conditions, it goes uninhabited. If even one of them is lacking, the planet is just as badly off as if it offered none at all. Life is a very fussy tenant.

If we check over the list of planets with these considerations in mind, the outlook is not at all good for habitability of the houses in this part of the universe. The four outermost planets, Jupiter, Saturn, Uranus and Neptune, the giants of the solar system, are ruled out at once on several counts. For one thing, they are simply too big. The smallest of them, Uranus, has fifteen times the mass of the earth, while the largest, Jupiter, overtops us in weight 318 times. The force of gravity on them of course is proportional to the mass, so that a man or any higher animal of the kinds we know would be crushed flat by his own weight if he landed on one of them. One could get some idea of how it would feel to be on one of these huge planets by putting on a suit of antique armor and trying to take a stroll across the face of one of the powerful electromagnets used in the steel mills for lifting carloads of pig iron.

Moreover, life at the visible surface of one of these planets would be impossible for anything but winged creatures able to remain constantly in the atmosphere; for what we see of these four giants is not the solid globe itself, but the outside of a very dense atmosphere. No one knows what this atmosphere is made of. Certainly, however, it is not transparent like air. It either contains gases much denser or more opaque than air, or is perpetually cloudy. The peculiar belted and striped appearance of Jupiter strongly suggests the latter possibility. How far down through this sea of gas it is to solid earth, or rather to solid Jupiter, again no one knows. Nor is it known what conditions would be like at the solid surface of one of these giant planets, if such a solid surface exists. Some astronomers guess that it might be very hot and others that it is very cold but they candidly state that these are only guesses.

The light received from the sun by these distant planets is much less than that falling on an equal area on earth. Sun-power is only one twenty-fourth as great on the visible surface of Jupiter, the nearest of them, and on Neptune, the most remote, 30 times as far from the sun as the earth is, sunlight is only one nine-hundredth as strong as it is here; on

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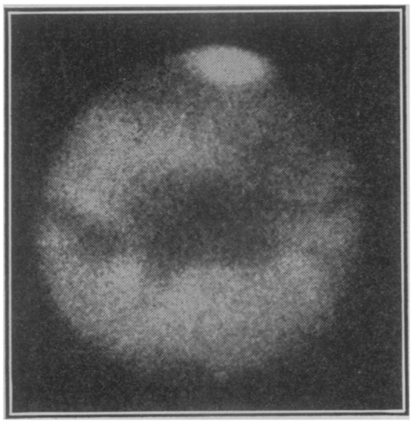

MARS as it appears in a photograph made with a large telescope

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Neptune the sun has the appearance —or would have, if there were any one present to see it—of a star, small but dazzlingly bright. The planet is not in darkness, however, for the illuminating power of the sun even at that distance is equal to that of a good tungsten lamp in an ordinary room. That would be plenty for creatures with ordinary eyes to see by. It might even suffice for the growth of green plants, on which animals of course must depend for food. Plants are being grown successfully by artificial light for scientific purposes all the time now.

But we run into another dilemma. Those same dense, deep atmospheres probably cut off all the light from the cores of these planets, leaving what would correspond to the solid earth in perpetual darkness. And up on the unsubstantial outer shell of the atmosphere, where the light is, it is so cold that nothing could conceivably live. The temperatures up there have been estimated at between 100 and 200 degrees Centigrade below zero—cold enough to liquefy oxygen and freeze nitrogen solid. All round, Neptune, Uranus, Saturn and Jupiter hardly qualify as desirable residential suburbs of the solar system.

How about the close-in districts, then? There is Mercury, right next door to the sun, a nice little planet with a diameter only three-eights that of the earth and a mass only one-twentieth as great. Mercury, so far as the possibility of life is concerned, gets too much of a good thing. Whereas Jupiter receives only one-fifth the illumination for a given area that the earth receives, Mercury basks in a fierce glare six times as strong as the earth's share of solar radiation. Multiply dog-days by six, and you have a nice argument against moving to Mercury.

What is worse, it has been shown that Mercury does not rotate on its axis, but always presents the same side to the sun, merely rocking back and forth a little, as if in misery over the roasting it is getting. One side of the planet therefore must be sheer blistered cinder, while its "back"—the three-eighths of its surface not exposed to the sun by the rocking motion—remains forever a country of dreadful night. What between the terrible bombardment of solar glare and heat, and its own slight gravitational attraction due to its small size, Mercury must long ago have lost all its atmosphere and all its water, if indeed it ever had them. No, there is even less likelihood of life on Mercury than on remote Neptune.

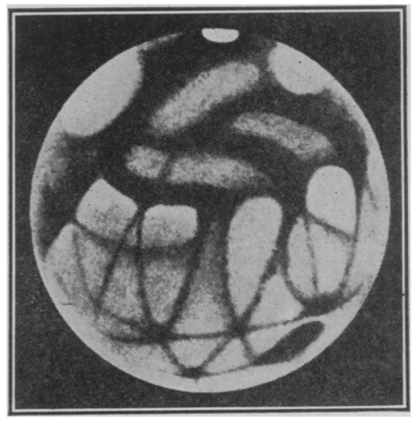
So we come to Mars, the planet which everybody thinks of first when the talk turns on the possibility of extra-terrestrial life. Entirely aside from the mysterious "canals," there is, just on the basis of what we positively know about it, much better chance of favorable conditions for organic existence there than on any of the other planets so far discussed.

To be sure, Mars is much smaller than the earth, having only a little over half the diameter and about one-tenth of the mass. Gravitational pull therefore is much less on Mars than on the earth. The fantastic stunts we think of when we compare man with the insects would be possible on Mars; a man could drag a box car as an ant drags a dead beetle, or jump over a house as a flea jumps over the hand that tries to catch it.

Again, Mars has an atmosphere, which may be made of air such as we have here, though it would of course be much thinner, because of the smaller planet's gravitational inability to keep it pulled down tight. At best, breathing on Mars would be as difficult as it is on a very high earthly mountain top. But there is an atmosphere, anyway.

Mars probably also has water. At least, what seem to be snow fields form and recede about its north and south poles as the seasons come and go. But they are not permanent snow caps; they vanish completely or nearly so, and form anew each season. Also, there is nothing on the plant that can be definitely identified as an ocean, or even as a large lake. There is water, but very little. The climate of Mars is far drier than that of the earth.

The "canals," markings first noted by the Italian astronomer Schiaparelli



DRAWING OF MARS showing the network of so-called "canals"

in 1878, have been made much of, as evidences of vast engineering works produced by an ancient and highly civilized race, to keep themselves alive on a world gone nearly desert. Undoubtedly these markings do freshen and fade with the Martian seasons, but what the meaning of it all is remains a mystery. In any case, the beautiful straight lines, often in parallel pairs, are visible only on drawings made by astronomers of what they saw, or thought they saw, through their telescopes. Actual photographs show them only as blurs and faint streaks. Without doubt there are markings there, but most astronomers regard them as entirely natural formations and relegate the Martian supermen to the realm of romantic novels.

One thing real remains of the whole "canal" extravaganza. Every Martian spring brings a flush of greenish color over parts of the face of the planet, which is usually a pronounced red in color. Are there forests on Mars, or perhaps swamps of bulrushes and cattails, or even—the idea sticks—cultivated fields? There is probably water, at least a little. Mars gets less light than we do, being one and one-half times as far from the sun; but even so, that would probably be enough.

The red color of Mars would seem to lend some support to the idea that the planet is a cold desert, with conditions resembling those of the Gobi but much more intense. Many millions of years ago, between the time when coal was formed and the time when the dinosaurs walked the earth, this planet of ours went through a geological period characterized by drought, accentuated at least part of the time by cold. The lush forests of the coal beds dwindled, the water-loving amphibians vanished, leaving

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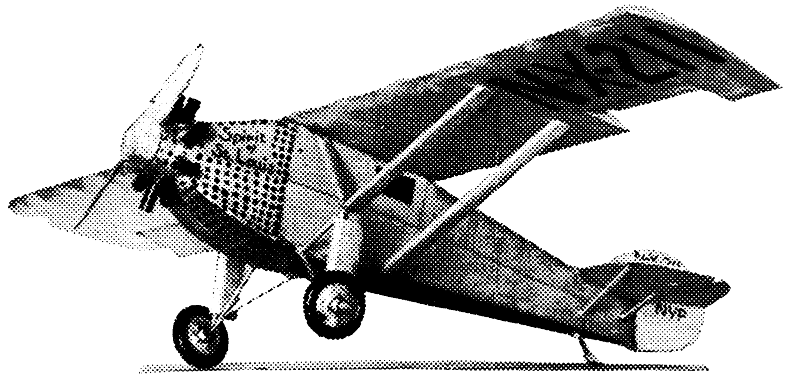
Building and Flying Model Airplanes



Finishing the Lindy Model

This is the eighteenth and last of a series of articles by Paul Edward Garber. Mr. Garber is in charge of aeronautics at the Smithsonian Institution.

The following material will now be required:

4 pine braces 9x¾x⅛ inches.
2 pcs. metal tubing, 4¾ inches long with a ⅛ inch inside diameter.
2 pcs. of the same tubing, 5½ inches long.
1 pc. of the same tubing 3¾ inches long.
1 pc. balsa wood 4¼x⅜x¾ inches.
2 upper pine braces 3"x⅛" diameter.
2 lower pine braces 4"x⅛" diameter

The first step is to fasten the wing to the fuselage. This is done by means of two screws passing through the holes near the center of the wing and into the second upper spar of the fuselage. Be sure that the wing is at right angles to the center line of the fuselage. Next we will prepare the four braces which must reach from the bottom longeron to the wing strengtheners as shown in Figures 1 and 2. At a distance of six inches from one end the front two of these are to be cut over to one side and this remaining part rounded, as shown in Fig. 2-a. The flat section of the braces is to be streamlined, that is, made so it will pass easily through the air, to the shape shown in Fig. 5-a. The rounded part goes in front. Now take the two 4¾ inch lengths of tubing and pinch a portion near one end as shown in Figure 3, and through this part drill a hole large enough to pass a small screw, such as a No. 00-¼" long with a round head. The long portions of the front tubes are to be four inches long, and the bends are to be such that when the tubes are placed at a forty-five degree angle the short parts will engage the streamlined braces.

When these have been correctly shaped they may be screwed to the fuselage and the streamlined braces may be fastened in the short sockets and nailed to the strengthening pieces in the wing. The 2 other braces are shaped and attached in like manner, but must be bent forward from the pinched portion to engage the lower end of the front tubes as shown in Fig. 2-g.

Obtain two wheels about two inches in diameter. These may be purchased from model supply houses, taken from a ten cent store toy, or turned from wood. Now take two nails about No. 16—2 inches long, pass them through the wheel axles and bend them as shown in Fig. 1-b. Solder a small washer on the nail near the wheel, pass the shank of the nail up the front tube, and solder the nails and two tubes together as shown in Fig. 1-c and 2-g. Two upright braces are next made. They are shaped as shown in Fig. 1-d and Fig. 5, from the piece of balsa wood 4¼ inches long. They are Ambroided and wired at the two points of intersection. From the short length of tubing 6 tube sockets are made as shown in Figure 4. Two of these are used to attach the upper end of the upper braces, the lower end being wired to the juncture. The other four are used on each end of the two braces which extend from the point of juncture just named to the joint of the rear brace and longeron. The rear socket is fastened under the other socket, using the same screw for both.

In the original plane flown by Lindbergh every effort was made to reduce head resistance. One instance was in the joint between the wing and fuselage, where the two were blended together. We will do the same thing and attach a piece of covering to the upper surface of the fuselage in front of the wing as shown at Fig. 2-f and carry it over the wing, and adhere it in back of the trailing edge. Dope may be used

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Vacant Lots in Solar System

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newer and hardier forms behind them, and a great development of land-dwelling reptiles, which had hitherto been relatively unimportant. This age was the Permian.

It is admittedly stretching things a bit to jump from a similarity in color between the Mars of today and the earth of the Permian yesterday, to the conclusion that our nearest neighbor planet is now undergoing the hard times of a Permian period of its own. But at least it is worth a question and a conjecture.

There remains still one planet not yet examined. Venus is a more difficult object for astronomical study. But in many ways it resembles the earth far more closely than any other member of the sun's family. It is slightly smaller than the earth, a diameter of 7600 miles as against our 8000, but has about the same mass. Therefore the force of gravity is about the same there as here. If a man should ever reach Venus he would be able to walk normally as soon as he stepped on its soil, neither falling crushed by his own weight, nor leaping over hedges and houses without intending to. That would be a great comfort.

Like Mars, Venus has atmosphere comparable with that of the earth. Only there would seem to be a great deal more atmosphere on Venus than there is on Mars. There may even be more atmosphere on Venus than there is on the earth. But it would not be a monstrous, smothering, murderous atmosphere like that of Jupiter and the other great outlying planets. Telescopic observations have never penetrated to the actual surface of Venus, because of the constant veil this atmosphere throws about the planet, but it is pretty certain that it is not abnormally deep judging by what we know about the relations between the size and mass of the sphere. It has been suggested that the atmosphere of Venus is like that of the earth, with the addition of a great deal of water vapor, making a constant blanket of cloud or fog.

Venus is probably warm, unless this cloud blanket modifies the heat, for the planet's orbit is only three-fourths of our distance from the sun. Of course, not being able to see the actual surface, we are unable to say whether there are any oceans on Venus—but the chances are just as

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Vacant Lots in Solar System

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great that there isn't any land! Assuming, however, that there is, it would seem that the normal climate of Venus would resemble that of the earth's tropical rain-forests: almost constant fog, rain on a minute's notice a dozen times a day, a damp warmth very enervating to human beings but supporting an unimaginably rich jungle vegetation which in turn harbors an unimaginably rich development of animals.

There have been periods in the world's history when far wider stretches of the earth probably had such a climate. The coal age was such a one, when vast forests of ferns, or fern-like seed-plants, of mammoth horsetail rushes, of great harsh trees like nothing that now grows, stood thick and rank in the vast, level bogs that filled what is now most of the eastern half of this country. Again, there was a tremendously rich vegetation during the days of the dinosaurs. Both these times must have had exceedingly warm, moist, cloudy climates, to produce such a welter of vegetable and animal life. It is quite possible also that even earlier periods, such as the Devonian, or age of fishes, when sea life predominated over land life, may have had such a cloud veil wrapped around the earth.

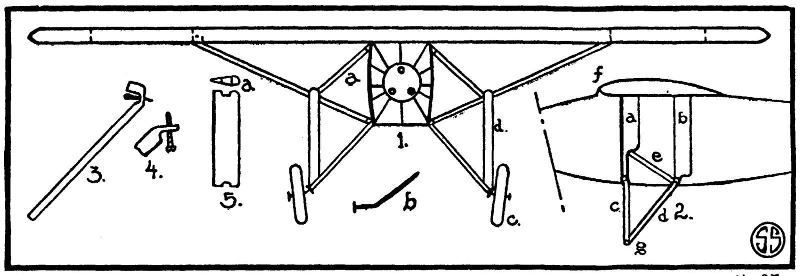
Venus, then, seems to be the darling of the solar systems—if we of the earth modestly except ourselves for the once. Mars, the only other possibility, is wry and withered, but our sister Venus seems to have the vigor and sap of life in her.

But the mystery still remains, and probably will remain for many generations. If we ever succeed in piercing that fog, what shall we see? A planet mostly ocean, swarming with Devonian king-crabs and sharks? A luxuriant Carboniferous bog forest? A landscape over-stridden by monster lizards long since vanished from the earth? Or the towers and cities of a people adapted to a foggy light and inured to a constant tropical warmth?

Science News-Letter, December 17, 1927

California's redwood trees will last about 100 more years, at the present rate of consumption.

By making paper money smaller, it is expected that the government can save $4,000,000 a year.



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Model Airplanes

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for adhesive, and care must be taken to get a smooth joint.

The model should now be a very close reproduction of the original "Spirit of St. Louis", but differs from it in a few details. The most striking departure is the propeller, which we have had to increase in order to make the model capable of flight. The original sized propeller scaled down would be inadequate. The photograph shows a scaled propeller, whereas the one you have made is two inches longer. To accommodate this increased length we have lengthened the landing gear, and braced it a trifle differently to allow for its increased length. In the original plane the upright streamlined braces are enclosures for the shock absorbers, but we have not added this detail. Lindy's plane had the juncture of the slanting streamlined braces and the wing enclosed in a housing. This may be duplicated by forming the housing from Plastic Wood.

A great deal can be done in the way of improving the model by painting it. All surfaces should be painted with aluminum paint. On the right under side and the left upper side of the wing, facing the model, the designating mark N-X-211, Lindy's license number, is to be painted with large letters facing rearward.

You should look through back issues of magazines and newspapers and find a photo of the original plane and from it copy other features. In this way you will see a window on each side through which Lindbergh observed the progress of his plane and a set of six small windows are in the wing above the others. These windows may be indicated by black paint, or by cutting the fabric and inserting a piece of celluloid in the proper place. All of us recall the beautiful metal nose of the original. You may duplicate this by painting black spots on the front of the model, but a far better way is to use a coating of tinfoil. Procure the kind which has a mottled surface, such as comes about typewriter ribbons or candy. Fasten this to the fabric, coating it with shellac and sticking it in place. The lettering, "Spirit of St. Louis," should most assuredly be added. A dummy motor can be made by gluing on nine radial pieces of black painted dowel stick as was done in the above model, or the individual cylinders can be made more like the originals by adding flanges, valves, exhaust pipes, tappet rods, etc. The tank air inlets, the air speed indicator, the earth inductor compass rotor and other features may be added, details of which can be procured from photographs of Lindbergh's plane.

To fly the model set all controls in neutral. Remove the motor stick and attach thereto a rubber motor composed of twelve strands of ⅛-inch flat rubber, looped from a piece 15 feet long. It is attached by means of the "S" hook at one end and the shaft hook at the other end, after passing through the cans, as was done for the other two models previously described. Wind the propeller about a hundred times, either with the finger or by using a winder. Insert the motor in the model, snap the dress clips to retain it and rest the model on the ground, having a good smooth runway underfoot and a clear field for at least 200 feet ahead. Make a final inspection to be sure all is O. K., then release the propeller. The model should rise from the ground and fly. Adjustments can be made by use of the rudder, elevators and ailerons, to insure straight flights, or correct balance. By the manipulation of the controls your model may be made to perform various aerial maneuvers.

With the completion of this model this series ends. I trust that you have gained a liking for the fascinating sport of model flying, and know that you can now proceed with other models, using the knowledge you have obtained from this series. If any of you have any problems to be solved in connection with these or other models I shall be glad to assist you. You may address me in care of the Science News-Letter.

Science News-Letter, December 17, 1927

There is less sap in trees in warm weather than at other times.