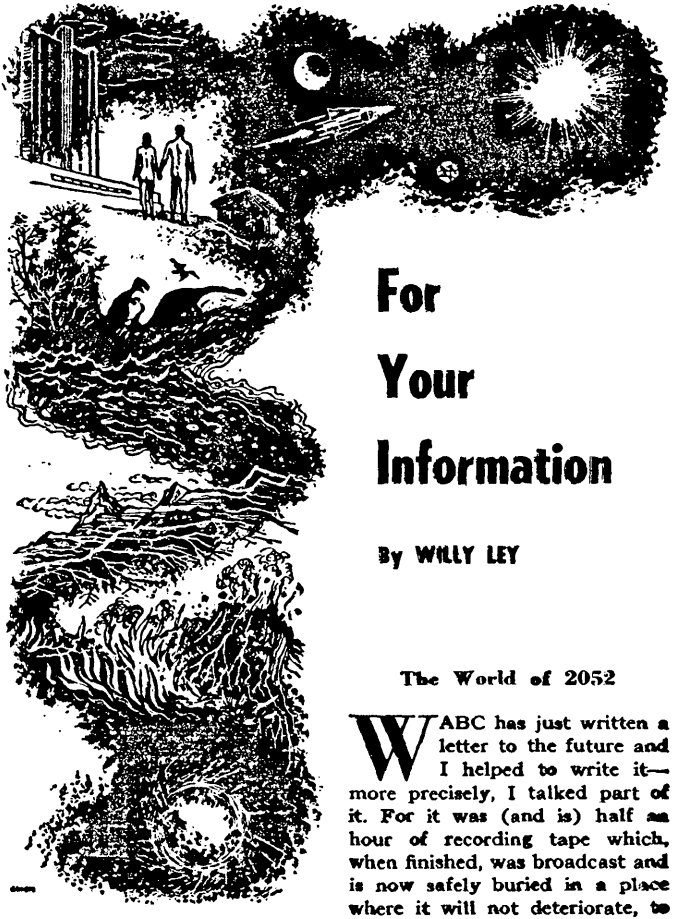
Galaxy
SCIENCE FICTION

OCTOBER 1952
35¢
ANC

THE WORLD OF OCTOBER 2052 By WILLY LEY

1. Fritz Leiber 2. Evelyn Paige 3. Robert A. Heinlein 4. Katherine MacLean 5. Chesley Bonestell
6. Theodore Sturgeon 7. Damon Knight 8. H. L. Gold 9. Robert Guinn 10. Joan De Mario
11. Charles J. Robot 12. Cyril Kornbluth 13. E. A. Emshwiller 14. Willy Ley 15. F. L. Wallace 16. Isaac Asimov
17. Jerry Edelberg 18. Groff Conklin 19. John Anderson 20. Ray Bradbury 21. Bug Eye
22. W. I. Van der Poel 23. Poul Anderson



For Your Information

By WILLY LEY

The World of 2052

WABC has just written a letter to the future and I helped to write it—more precisely, I talked part of it. For it was (and is) half an hour of recording tape which, when finished, was broadcast and is now safely buried in a place where it will not deteriorate, to

be taken out and rebroadcast a century from now.

Naturally, it is reminiscent of the Westinghouse Time Capsule which was buried on the World's Fair Grounds a dozen years ago, to enlighten the inhabitants of this planet 5000 years from now about the doings of the year 1940. During the same year, a Time Vault was started in North Carolina, intended to preserve for posterity the books which we consider most important in our day.

This idea of writing letters to the future is not exactly new. For centuries, European master builders enclosed documents, contemporary coin of the realm and an occasional chronicle in the foundation stones of buildings, and American builders took over the tradition.

Trouble is that in those cases where the contents were recovered and examined, it turned out that the documents told things which we already knew from other sources, and that the coins were well known to numismatists and often not even rare. Still, one wishes that this habit had been established much earlier, say in Greek or at least Roman times.

But the only Roman example of such a Time Vault was not an intentional one. About half a century ago, the learned world was startled and excited by the announcement that a rich Roman's private library had been found in Pompeii. It had been buried when Mt. Vesuvius let go in what is probably the most publicized and romanticized volcanic outbreak of all recorded history. The rolls of parchment were charred, of course. They had dried out in the interim and were so fragile that they could not be handled in any usual way. Still, methods of transporting them, unrolling them and finally reading them were worked out. And then it turned out that the original owner of that library had been a fanatic disciple of a small and completely unimportant philosophical school. After all that labor, it was a sad disappointment.

THE so-called Document Cave not far from the Dead Sea in Palestine, which was found recently, promises better results. At the very least, our knowledge of the history of the books of the Old Testament is going to be improved by that discovery. And that Document Cave might even have been meant as a kind of Time Vault, for the documents seem to have been hidden there from contemporaries for the future, although the men who did it may have had only three or four generations in mind—not sixty or more, as it turned out to be.

IN a somewhat larger sense, every book written is a small time capsule. For while a book is primarily addressed to contemporaries, it is expected or hoped to last into the future. I can get first-hand information about the knowledge and beliefs of Gaius Plinius Secundus (Pliny the Elder) directly from the shelves of my own library. It isn't an original, but it is serviceable. Even originals last a long time, though. If I want to find out what the famous Municipal Physician of Zürich, Dr. Konrad Gesner, thought and knew about fossils in 1560, my library will serve, too. And this book was not preserved through the centuries in some Time Vault; it survived through the interest and care of generations of people.

The most interesting contents of any Time Capsule would be those portions in which its originators tell the future finders their guesses about the civilization, habits, etc., of the finders. But, again, it need not be a specific Time Capsule; it can be simply a book which has been preserved.

As has been pointed out in GALAXY by L. Sprague de Camp, we are just beginning to reap that kind of harvest from early examples of science fiction. If we are somewhat flabbergasted at the lack of vision of daring of those writers, and more than a little astounded by the nonsense which we were supposed to indulge in—not that we don't indulge in different kinds of nonsense of our own designing—it should merely prove to us that we should be more daring in some respects and more careful in others.

Now let's see if I can apply that advice myself.

As I told my audience of a hundred years hence, I think—lots of printed paper to the contrary notwithstanding—that cities will *not* be obsolete. Nor do I think that the wheeled vehicle will be obsolete, having been replaced by the helicopter, or by some other device yet to be invented. Nor do I believe that the day of the printed word has almost reached its end.

Having a little more space here in the magazine than I had time on the air, I would like to elaborate a bit on these statements. With and without reference to atomic bombs, we have been informed that "cities are abnormal." Now, cities had originally the purpose of being trading centers. Later, they also became manufacturing centers. And you can't say that those who settled in the cities did it because of necessity. Then, as now, the majority did it from choice.

It is obviously more convenient to be in the center of things than

in the outskirts. And having lived in the country, I know from personal experience that it is *not* convenient. If you get there during a heat wave, it may look that way, and the little walk of 5500 feet for a newspaper or some smokes or even your mail, down a winding road, may be pleasant. But try it on a cold winter day, when the road is icy and has eight inches of loose snow on top. Try to take care of unexpected guests, unless your basement is a private grocery store. Try to enjoy (or even be attentive) in a movie if you know that the last bus home comes by just five minutes after the show; especially, if you also know that just the last bus is often early because the driver wants to go home, too.

In spite of what moralists and real estate agents tell us, the country home is convenient only if you also have a city home. And since people have the deplorable habit of looking after their own convenience, cities are neither abnormal nor obsolescent.

ANOTHER item I brought up in my broadcast was transportation. Will people ride in from sixty miles away in their own helicopters? Well, some may, of course, but that isn't the proper answer.

The helicopter, once it gets to be easier to fly than the current production models, will have a great deal of advantages over the ground car. But it still needs parking space at the other end and the traffic problems of the modern city are not caused by the cars which move, but by those which are parked.

The solution is obviously a type of transportation which does not park, but keeps moving.

Just imagine how easy it would be to get around in New York if all the transportation available were public transportation—subways, elevateds, busses and taxicabs. The remedy for the future might not be up to the engineer only, but to the lawmakers as well.

This is not the place to go into the design of a city free of traffic problems. I just want to add that, while it has been proved that a large city can be supplied by air lift, it is neither a cheap nor a logical method of doing it.

Finally: I do think that the people a hundred years from now will still buy newspapers and read books. I also believe that these books and papers will be printed—presumably with a more lavish use of color than nowadays—on paper. I don't believe in the "electronic device" which replaces the newspaper, nor in the newspaper printed photographically on a piece of plastic the size of a special delivery stamp. All you

have to do is insert it in the projector and the letters will appear on the ceiling of your bedroom. You can read it while having breakfast in bed. Damned inconvenient is all I have to say.

I'll go along with the tape recorder attached to the telephone which will take messages—"the deadline is really today, but since you were kept busy with two television shows and three conferences, it can be extended until Saturday"—while you are away. I go along with that because there you have an electrical device, your telephone, to begin with, and it can be adapted for playback.

But the printed word is superior to any recording device or projector in several respects, each important. You can read it in any position you happen to prefer at the moment. You need no special reconverting tool. No matter how simple, small, light and fool and tinkerproof that device is postulated to be, you can forget or mislay it. And, like anything else, it can run down or go out of order. Also, you can easily add a note or a reminder to the printed word. Furthermore, you can file a piece of newspaper. Of course you can file pieces of sound tape, too, or plastic microslides, but then you need your reconverting device to find out what's on it.

Nor do I think that books will be printed on anything which we would not call paper, even though it may technically be something else. In quite a number of stories, the spaceship pilot looks up the characteristics of a planet in an almanac "printed on indestructible metal foil" and this practice, for all one can tell, was not restricted to the spaceman's almanac in those stories.

Let's see now. My own *Rockets, Missiles and Space Travel* has very nearly reached the bulk where it becomes a little hard to handle. I just measured and weighed it. The dimensions are 8½ x 6 x 1½ inches and its paper is about as thin as it can be and still be decent. In any event, I don't think that metal foil could be any thinner than that paper and still take inscriptions of some kind on both sides. Hence the dimensions would be the same as those of the paper book.

But while the paper book, with binding, weighs two lbs., the metal book, if aluminum, would weigh nine pounds!

I'm all in favor of a non-yellowing, non-cracking permanent paper for books. But no metal foil, please, unless you can come up with a useful lithium alloy of a specific gravity of 0.5 or less.

Well, there you have a discourse on things that won't hap-

pen. Go back to the stories now and see what might.

RED FEATHERS

IF you'll be patient for about 100 seconds, I'll get around to the theme. Those 100 seconds have to be used to lay the groundwork. The subject of today's lecture about surprise developments is a bird.

The name: *Turacus* (or *Corythaix*) *leucotis*.

Common name: touraco.

Habitat: southern Africa.

Date of discovery: not known (at least not to me), but it must have been early, for the bird is not rare.

Coloration: back, bluish-black; tail, ditto, with some green in it; leading edge of wings, bluish-black (minor individual changes); neck and breast, bright green; whitish markings on neck and head; yellow and red crest; main wing feathers, bright red.

Now the story. In 1818, a French explorer by the name of Jules Verreaux was camping in southern Africa. It was during the rainy season, the sky was gray with clouds, water dripped from every branch and every leaf, and the soil was almost too soggy to walk on. It was decidedly the kind of weather for staying indoors, but Jules Verreaux did not. He made short trips of a few hours' duration at a time, partly because he wanted to see how the wild animals were faring during the rainy season, partly because he was no doubt bored with the unchanging meteorology.

On one of his short trips, he came across a flock of birds which were sitting around in the bushes, dripping with rain water and looking unhappy. When Verreaux approached them, they tried to fly away, but they were too wet to take off.

Verreaux tried to catch one with his bare hands and finally succeeded, but the wet bird struggled free. Verreaux then saw that his hand was dripping with red liquid. His first thought was that he had been pecked by the struggling bird, even though he had not felt any pain and could not find the wound. Upon closer observation, he noticed that the liquid, while red, did not look like blood. It did not seem plausible, but he could only conclude that the color had come off the red feathers of the wet bird. And after his return to France, he reported that there was a bird in South Africa afflicted with a plumage that was not color-fast in the rain.

This, of course, was ridiculous. Color may wash out of cheap manmade fabrics, but not bird feathers, most especially not while said feathers were still attached to a live bird. Just to

prove how ridiculous these claims were, stuffed touracos were taken from the shelves in museums, a red feather or two clipped off and put in a glass of water. The result was as expected: the feathers stayed red and the water stayed clear. So that was that. Verreaux must have made a mistake of some kind. Maybe he had been fooled by the juice of accidentally squeezed red berries.

MORE than four decades had to pass until somebody came forward to defend Verreaux. Gambia was a British colony by then, with a military garrison, and the garrison had a medical staff. One of the members of that staff was a Dr. Hinde, who kept touracos in a large open air enclosure. And Dr. Hinde reported, in 1865, that his touracos, after a bath, stained old newspapers red when they sat down on them to dry. Not only did they stain the papers, Dr. Hinde could actually observe the loss of color and wrote that "the birds nearly washed themselves white in water left for them to drink."

Since this was not a chance observation under difficult circumstances, but something that had been seen at leisure and repeatedly, the fact itself could not longer be doubted. An English chemist by the name of A. H. Church decided to go after the mystery and came up with a detailed research report that was published in the *Proceedings* of the Royal Society in 1869.

Church had first washed the feathers with alcohol to remove any oil or fat that might cling to them. Then he tested the pigment of the feathers for solubility and quickly found that it dissolved in soap water. He tried ammonia and caustic soda—they both worked.

Proceeding with caustic soda, he accumulated a large quantity of reddish solution and then precipitated the pigment by means of hydrochloric acid. The precipitate was then washed once more with alcohol (in which it did not

dissolve) to remove impurities that might be present. The result of all this was a flaky powder of crimson color which Church then analyzed.

It turned out to be a copper compound; its name became touracine. And touracine, as had been demonstrated under strict laboratory conditions, was easily soluble in any alkaline liquid.

Church's report was most satisfactory to a chemist, but the naturalists were not happy with it. All right, you could dissolve touracine with the aid of soap or alkali in the laboratory. But it did not rain soap suds in southern Africa. It had also been demonstrated that neither rain water, nor distilled water, nor tap water dissolved any touracine. Yet Verreaux touracos had dripped red in the rain. And Dr. Hinde's touracos had washed most of the touracine out of their red feathers with their drinking water.

Zoological handbooks listed the observed facts without offering any explanation. Apparently there wasn't any. Long after Church's careful chemical work, in about 1925, a German biologist, Dr. Ingo Krumbiegel, decided that the purpose of a mystery is its solution. He read everything that had been reported about the touraco and the behavior of the copper compound in its red feathers, and he thought that he found a hint in Church's report.

It said that "ordinary soap, or ammonia or caustic soda or any other alkali tested" made the touracine dissolve. Of all the things mentioned, only ammonia was a possibility in the forests and plains of southern Africa. It does occur in Nature in traces. The problem was whether traces were enough.

KRUMBIEGEL went to work systematically, beginning with distilled water. No result. Tap water was next, then boiling water, both distilled and tap. Negative. He weighed some feathers down with wire and immersed them in water for a week. Still negative. Then ammonia, household strength of a few parts in a hundred. Positive, as expected. Then ammonia diluted to two parts in a thousand. Still positive —strongly positive, in fact. Dr. Krumbiegel thinned the solution some more. When he reached a "concentration" of one part of ammonia in two million parts of water, he stopped. The result was still positive and a one-to-two-million ratio certainly was a "trace."

Ammonia, then, was the answer. Verreaux's touracos had been in the underbrush close to the ground, and rain water which drips from branch to branch is

sure to pick up some ammonia. Not much—an expert estimate said "around one part in a million"—but Dr. Krumbiegel had just demonstrated to himself that one part in two million was enough. And Dr. Hinde's touracos probably had had several parts in a thousand in their drinking water, for caged birds don't worry where their droppings land. They don't know, naturally, that their droppings contain ammonia.

Once a touraco has lost the touracine of its red feathers, it stays discolored until the next moulting period, when brightly colored new feathers begin to sprout. As far as the body chemistry of the bird is concerned, the whole is a way of ridding the body of a copper compound which would be poisonous to the organism if it were not changed into the non-toxic touracine. Normally it would be lost along with the feathers during the next moult. But because it happens to be soluble, it can be lost before the next moult.

That purely incidental fact created the zoological riddle that ended up in making the touraco famous as the only bird that isn't color-fast.

"PI"

AFTER my piece about the string around the equator (one yard added) appeared, I have been asked what value for "pi" should be used to calculate the distance precisely. Well, that depends, of course, on the degree of precision you want. The customary value of 3.1416 is perfectly fine for all but astronomical calculations. To fourteen places the value is:

3.14159265358979

and that is good enough to obtain the circumference of a circle the size of the equator to one-millionth of an inch.

THE way to remember pi to fourteen places is to memorize the sentence: "How I want a drink, alcoholic, of course, after the heavy chapters involving quantum mechanics." It not only works, it probably is by a famous author, Sir James Jeans. At least others have credited him with it, though he himself never claimed authorship.

Pi has been calculated to several hundred decimal places. In 1873, the British mathematician William Shanks published the figures for 707 places, but it later turned out that he made a mistake at about the 510th place. Nowadays, electronic calculators could extend it as far as one would want them to, but there is really no practical reason for doing it.

—WILLY LEY

ANY QUESTIONS?

Is it possible that there are dark or black planets in our solar system and, if so, how would astronomers detect such a planet?

Mildred Moore
116 William Street
Hightstown, N. J.

It is quite certain that there is no black planet of a size worth mentioning in our solar system, at least not inside the orbit of Uranus. If a planet really absorbed all the light from the Sun that falls upon it, it would still betray its presence by its gravitational action. The movements of the other known planets near to it would be different. In fact, for a long time both Neptune and Pluto, although not invisible, played the rôle of such "black planets." They were detected by their influence on the orbits of the planets near them.

On January 27, 1950, a Japanese astronomer saw an explosion on Mars. Do you know the cause of it?

Judy Johns
3106 Canfield Niles Rd.
Youngstown 11, Ohio

Naturally, I don't *know* the cause, but I'm willing to make a guess. If that had been a volcanic eruption, it should have lasted for some time. But it did not. A number of astronomers, prompted by the report from Japan, looked for it and failed to see it. It is probable, therefore, that what the Japanese astronomer saw was the impact of a large meteorite. Since Mars is close to the Asteroid Belt, it should be hit by considerable chunks of matter much more frequently than Earth's. In the last case of that kind on Earth (Eastern Siberia in 1947), an enormous column of smoke and dust formed immediately after impact, but it lasted less than twelve hours. The "explosion" on Mars was probably the same thing.

Could you explain to me why exactly does a Möbius Strip have only one side? Secondly, are there such things as a Klein's bottle and a Tesseract? If there are, what are they?

Danny Cohen
4 Magnolia Avenue
Larchmont, N. Y.

(Virtually the same letter was received from Gregory Christy of 720 Mill St., Porterville, Calif., and from John J. Wolschleger, U.S.N., Quonset Point, Rhode Island.)

First: yes, there is such a

thing as a Klein's Bottle. I am not sure whether I should also say that there *is* a Tesseract, for a Klein's Bottle can actually be built, while a Tesseract can only be represented. But let's begin with the Möbius Strip and a mention of the branch of mathematics to which it belongs, namely *analysis situ*, or topology, also called rubbersheet geometry, in descending line of dignity.

Take a sheet of paper and make a few crosses at random, on both sides. Those crosses you can connect by straight or wavy lines without going over an edge are obviously on the same side of the paper. If you paste a strip of paper together so that it forms a cylinder, you find that your crosses are either on the outside of the cylinder or on the inside. But if, in pasting, you give it the Möbius half-twist, you'll find that you can connect them all. Therefore, it has only one side.

For your amusement, draw the centerline and then cut carefully along the centerline. The result will puzzle you no end.

Similarly, Klein's Bottle, though obviously a solid body, has only one side. If you want to make one, use something that can be shaped easily, for example self-setting clay. (No pattern on flat paper is possible.)

While the Strip and the Bottle actually exist, the Tesseract is merely a concept, arrived at by the following reasoning: here we have a one-dimensional line a. Four such lines form a two-dimensional square, a^2, which is bounded by four lines, and has 4 vertices (corners). Four such squares form the three-dimensional cube, a^3, which is bounded by six squares, has 12 edges and 4 vertices.

The four-dimensional cube, called Hypercube or Tesseract, would be mathematically described as a^4 and we can state that it should be bounded by 8 cubes, have 16 vertices, 24 faces and 32 edges. But since it is supposed to be four-dimensional, we obviously can't make one.

"I must take exception to your statement in the June 1952 *issue of GALAXY that the chances of finding intelligent life on other planets are excellent. You have no doubt read du Douy's* Human Destiny; *it contains a calculation that the probability of even a simple protein molecule's formation on an Earthlike planet—that is, this one—is approx. one in* 10^{321}. *Let's say that he has made a slight error on the order of*

10^{300}. *That would still leave the probability of a protein molecule's appearance on Earth about one in* 10^{21}. *For the sake of simplicity in calculation, assume that our galaxy contains* 10 *billion Earthlike planets; the chance of finding life would still be only one in* 10^{11}, *a rather insignificant probability. To assume that life will appear on a planet, or even one per cent of the planets, where conditions are similar to those on Earth, is therefore not quite reasonable.*

W. E. Miller
64 Norris Avenue
Haworth, N. J.

I have read ***Human Destiny*** and I count the time spent with that book as one of the more or less lost weekends of my life —loss of time being the most evident result in the battle between reason and mysticism.

If the probability of the formation of a protein molecule were one in 10^{321} as du Nouy decreed, or merely one in 10^{21} as you find more likely, the conclusion would be inevitable that it didn't happen at all. Not even on Earth. Those botanical parks, zoological gardens, aquaria and mass meetings are just illusions.

Seriously, du Nouy's calculation is completely shattered by the existence of plant life on Mars, something that is generally accepted as a result of observational evidence. Speaking of Earth alone, it could be asserted that the geraniums and the oysters, the canary birds and their keepers are not illusions; in short, that the fantastically low probability of the formation of a protein molecule came true in this particular case which, therefore, had to be unique. But if you find that it came true on two planets in the same solar system, you either have to stretch credulity beyond its admittedly high elastic limit, or else you conclude that the original assertion must be wrong.

It could be wrong in two ways: either because it simply happens not to be true because the probability of the formation of protein molecules under proper conditions is much higher; or else it could be wrong because there is an additional factor which operates to invalidate the low probability.

That additional factor was pointed out more than half a century ago by the great Swedish astrophysicist Svante Arrhenius. Arrhenius pointed out that the size of the spores of most bacteria is such that for them the light pressure of a nearby star is stronger than

the gravitation of the same star. Hence they could drift through space in opposition to gravitational fields.

Arrhenius also pointed out that such spores could stand free space conditions and that, just under these conditions, their life processes would be slowed down to such an extent that they could stay alive for thousands of years.

In that case, life had to originate only once to spread through the whole Galaxy in time—and who could say that it had originated on Earth?

Nor does it seem likely that the probability of protein molecule formation is actually so low. It has been shown in the laboratory that under the influence of ultra-violet light from the Sun, a number of very interesting compounds will form from nothing more exotic than water, carbon dioxide and ammonia. Some of these compounds are sugars. Others might very well be building blocks of proteins, for they came in various stages of complexity.

Actually, these substances are quickly destroyed by micro-organisms. But if there are no micro-organisms yet, these simpler substances may well continue building up—into micro-organisms.

Since I place du Nouy's conclusions with those that "proved" the steamship, airplane and rocket couldn't work, I still maintain that the probability of life on other planets is high.
