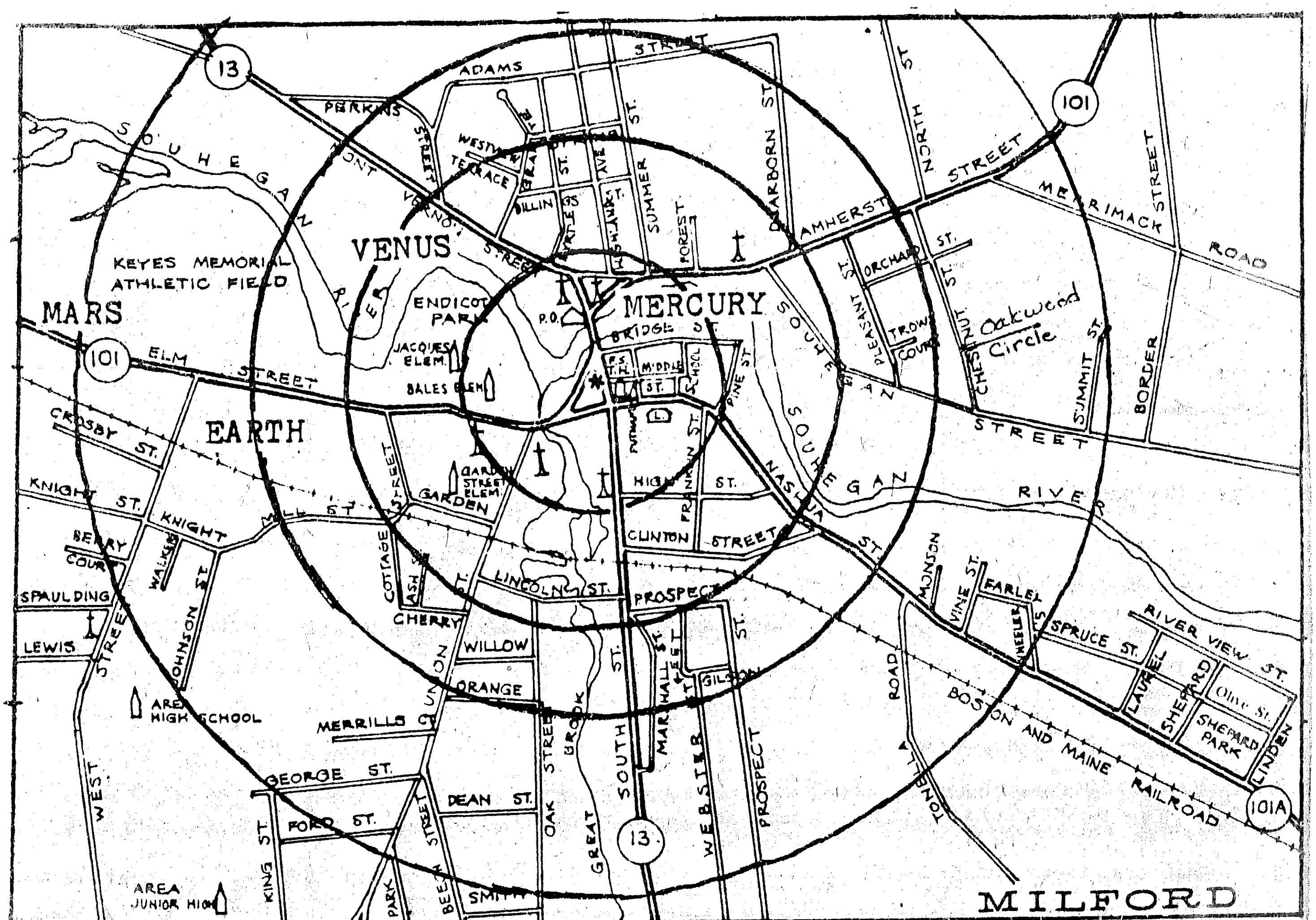

How vast is the solar system? Here is a game that may give you an idea. Pretend the speed of light is three miles per hour and that the bandstand is the sun. Walk west. How long to reach Jupiter?

By Avery R. Johnson

How far away IS the sun? Just how much space IS there between all the planets? Why does it take so long for a space vehicle to get out to Pluto? How BIG? How far?

These questions always ask for something that the answers with numbers in them never seem to satisfy. What they are really reaching for is a way to put the vast dimensions of space and time into something closer to our every day experiences. Suppose this orange here in my hand were the sun......

I recently wanted to acquire a "feel" for the patterns of our solar system in a way that was not only familiar but could be repeated over and over again until the distances and relative sizes of things would become second-nature to me. I wanted the model to be large enough so that it would be more than a diagram on paper or stones in a field. It should make me have to move my body through space over distances that would really seem "far." That way the "going" rather than the seeing would be the more important part of the experience. The results have surprised me and continue to surprise me. Now I would like to share them with others who might be equally fascinated by a walk through our solar system.

The Bandstand

The Bandstand, or Gazebo, on the Oval appeared to be a good "sun" to start from. It is almost round and its diameter is very close to being six meters, which doesn't correspond to anything in particular by itself, but it seemed like a nice modern dimension on which to start the model. As you will see later, some convenient positions and sizes of things were made possible by choosing the Gazebo and six meters diameter as a model sun.

The first convenient surprise that fell out of the numerical conversions that begin to pile up was that the speed of light – 186,000 miles per second -- than which nothing can go faster, scales down to just less than 3 mph. That's a slow walk. Good. Let's take a walk at the speed of light outward from the sun and find the planets in their orbits. We'll start at high noon (on our wrist watch) and log in the time we pass each planet. How big do you think they will be? How far will we have to walk? When will we reach the outer edge of our system? Let's head West on 101.

12:03 We haven't gone very far, beyond the Bales School, and here's little Mercury. It's just about the size of a small spool of thread but we won't touch it. Things get pretty hot this close to the sun.

12:06 Another three minutes and by the entrance to Keyes Field we come upon the orbit of Venus. She's just over two inches in diameter (small doorknob) and shrouded in deep clouds, which to us look like nothing more than a bright coat of paint on the surface.

Eight Minutes

12:08 Eight minutes of light-travel time brings us to our earthly home and we find it just before the K of C sign on Elm Street. It's a bit larger than Venus, but not much, about the size of an ordinary doorknob or a billiard ball. Our moon circles around it at a double armspan away (5½ feet) and appears as an ordinary marble. It looks awfully tiny in this vast, empty space around us.

12:13 Five minutes further on, we are opposite the Meadowbrook sign, well beyond West Street. For the metrically minded we are exactly a kilometer from the Gazebo and here we find Mars, somewhat smaller than a pingpong ball and slightly reddish in color.

As we walk on at our steady pace we are in for our next surprise. So far the "inner" planets have been spaced out fairly evenly and they have been of a size that you could hold in your hand. Now the distances increase by an order of magnitude and we will find some much larger planets. It is no wonder that we never see a picture of the solar system drawn in a single diagram to show all of the orbits. We have some walking to do before we encounter the first "outer" planet and on our way to it we will be aware of a lot of tiny grains of sand and dust. This is the "asteroid belt." We passed Mars a mile and a half ago......

12:43 Here he is, Jupiter, the biggest of them all. His diameter is over 24 inches, larger around than a Volkswagen tire, and if we stopped for long enough we could observe the movement of violent storms sweeping across his surface. Our walking is just about to take us past Hendrix Wire and Cable.

To Wilton

1:19 We have been walking for an hour and 19 minutes. It takes that long for light from the sun to reach Saturn and our walk has taken us just past the Abbott Mill, almost to the Wilton town line. The planet itself is the size of a large pizza pan and the paper-thin disk that characterizes it as Saturn is more than 4 feet in diameter.

2:39 Another hour and twenty minutes of walking at our steady speed-of-light saunter: Uranus is in West Wilton at the top of the hill beyond Gary's Restaurant. We may have had to jog at double-time a little on our New Hampshire map because the road is not a straight lightray, but we'll still talk of it as straight. Uranus is a little larger than a ten-pin bowling ball, which in its turn is the same amount larger than a soccer ball, but I include both of these comparisons just so that more people will "know" the size.

The author . . .

The author of this imaginative "spacewalk" is Avery Johnson, currently working at the depot on South Street in Milford on an imaginative program of providing information and services via computer to be known as Small World Exchange.

4:10 We have just crested the pass on the road over Temple Mountain at the town line between Sharon and Peterborough when we come across the planet Neptune, midway in size between bowling and soccer balls. We are a long way out from the sun, which looks now like a small bright spot back there in Milford, although it certainly is the largest star we can see in an otherwise black sky.

There is still Pluto to look for, but it's hard to say where he'll be. So far the orbits of all the other planets have shared fairly closely what is called the "ecliptic plane". That is, we can model all of their orbits on a flat surface without much error, and the shape of those orbits is in each case nearly circular with the sun at the center. Not so for Pluto. I might add that I have also been making the unwarranted assumption that each planet would be passing our straight course of travel as we passed its orbital diameter. No astronomer would ever expect such a convenient alignment.

Where's Pluto?

Pluto is going to be hard to find. Sometime between 4:06 and 6:48 we will pass his orbit and on our model that can occur from before our encounter with Neptune to near Bonds Corner and Mud Pond in Dublin. The orbit is so tipped with respect to the ecliptic that the planet could be anywhere from six miles above to six miles below our position on Rt. 101 and on top of that, Pluto itself is only about one inch in diameter. That's like looking for a needle in a haystack even if this one is a unique object unobscured in empty space. No wonder Pluto was hard to find from Earth observatories!

I should mention one other object that we missed seeing along the way. Somewhere between the orbits of Saturn and Uranus (Wilton Center), and up to a mile above or below us, was an object about one-sixteenth of an inch in diameter. Discovered in October of 1977 is "Chiron", a planetoid on an eccentric orbit. Very little is yet known about it except that it is there. Another object discovered the same year and designated 1977 HB, looking to us like a tiny grain of sand on an eccentric orbit near the Earth, would probably have escaped our notice but it is being carefully watched and plotted by astronomers. There are also many comets flying about but, again, they would be hard for us to see except for those that swing close to the sun.

If we should keep walking out beyond Pluto, what then? How long before we come upon the next known object out in space? Don't hold your breath for it. Walking constantly without rest at our steady speed-of-light pace, one year would take us once around the earth in distance. Four of those years would take us to the nearest star, IF we were going in the right direction. It would take a thousand lifetimes to reach the edge of our own galaxy -- and that is just one step out into space.

I haven't intended to overwhelm anyone with this account of a simple model of our solar system. I wanted to convey the "feeling" of the real distance relationships in that system and it is my hope that others may enjoy imagining doorknobs and soccer balls and marbles in empty space at these distances from the Oval. As you go, remember: 55 mph is almost 20 times the speed of light and that's not fair!