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DR. PICKERING: The purpose of this News Conference is to present to you the first look at the scientific data which was taken as we went across the planet yesterday, and we have with us the experimenters with the exception of the occultation experiment. The experimenter for that particular experiment is still concerned with the analysis of the data and have nothing to present at this time.

Before going into the conference proper, I am sure that all of you would like to know where we stand on the photography, and I would just like to make a few remarks about that.

Yesterday evening, as you know, there was some concern as to whether or not the tape recorder had operated properly. We, of course, do not have a complete answer on this. We won't know for ten days. We have to wait until all the pictures have been played back, which will take ten days. However, at this time, we believe that the tape recorder did operate properly and that the data for all 20 pictures will be there as expected.

At the present time, data is being received from the first picture and I guess we are about half way through that first picture. It is an eight-hour picture, it is a long drawn out process, and we just have to have patience before any pictures are completed, but I will comment that at this time the data is being received.

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It looks very satisfactory, and we are quite sure that we have pictures of Mars taken from the Mariner.

Now, as far as the other experiments are concerned, I would like to introduce to you first at the right hand closest to me at the table Professor Davis of Cal Tech, who is the principal investigator on the magnetometer experiment. In addition to Professor Davis, on this experiment as co-experimentors, are Dr. Smith Of JPL, Mr. Coleman of U.C.L.A. and Dr. Jones of Brigham Young University.

Next, is Professor Bridge of MIT, and his experiment is the solar plasma probe. Assisting Dr. Bridge is Dr. Lazarus of MIT, and Dr. Snyder of JPL.

Next, Professor Simpson of Chicago, the cosmic ray telescope. Assisting Dr. Simpson is Dr. O' Gallagher of the University of Chicago.

Then, Hugh Anderson of JPL, with the ionization chamber experiment. The principal investigator is Dr. Neher of Cal Tech who, at the present time, is in South America, and Dr. Anderson is assisting him from JPL.

Then, Dr. Van Allen, State University of Iowa, with the Trapped Radiation Detector, assisted by Dr. Frank and Mr. Krimigis of the State University of Iowa.

Finally, Mr. Alexander of the Cosmic Dust Detector. Mr. Alexander, from Goddard Space Flight Center is assisted by Mr. Berg, Mr. McCracken and Mr. Secretan,

all of Goddard, and Dr. Bohn of Temple University.

Now, I would like to ask these gentlemen to each in turn make whatever comments he feels appropriate at this time, bearing in mind that this data has been studied for a relatively few hours, and I am quite sure that further study of the data is going to undoubtedly lead to further results, as I am sure all of them will tell you, but at least we can have a first look at it as to what we think now about the data which has been taken, and I think we will start then with Leverett Davis, since you are at the right hand, then.

All right, Mr. Alexander.

MR. ALEXANDER: Thank you very much, Dr. Pickering.

On the Cosmic Dust Experiment, I will make several summary statements.

To start with, in terms of yesterday's close approach to the planet Mars, there is no evidence of any intense belt or concentration of dust particles.

Now, I emphasize intense concentration because the fly by, the time of the measurement, is quite short for cosmic dust, and if there is a concentration of a factor of 100 close to Mars, within one Mars radii, for instance, this type of thing, we would not have seen it.

So, the major point on the encounter measurement yesterday is that there is not an intense or abnormal concentration near Mars.

I do think that it is in order to make a couple of more remarks concerning the measurement in that this experiment is a little bit unique in the sense that we actually encountered the influence of the heavy body of Mars 40 to 60 days prior to the actual Martian encounter, and I can demonstrate this very quickly for you with the slide that we will show at this time.

DR. PICKERING: Could we have the lights out and then the first slide, please.

(Slide shown)

MR. ALEXANDER: What we are depicting here is a histogram of the number of impacts grouped in periods of 15 days throughout the trip. Now, it is simply the number of impacts, not the size of the particles, this sort of thing.

Now, this data was as we left Earth for the first 90 days and then an increase started, and this increase, as you see, peaks at this point and a decrease started. Now, when one looks at the distance of the spacecraft from the Sun or past the orbit of Earth, we find that we had moved two-tenths of an astronomical unit when this increase started, the astronomical unit being the distance from the Sun to the Earth. At this point, we were two-tenths of an astronomical unit away and then the increase started. The increase continued in this period here.

Now, it turns out that this is approximately

another two-tenths of an astronomical unit, and also, it is the point of Mars' closest approach, our perihelion in it's orbit and if Mars had been at perihelion at this point we would have had a close approach to Mars, but the major thing is that this is the point where the Mars orbit perihelion exists and a decrease started, and this decrease has continued, though it looks like we are levelling out except for this one increment at about 1.5 au.

Now, when I say we encountered Mars -- could we have the slide just a little longer, please --

DR. PICKERING: Looks like a bulb burned out.

MR. ALEXANDER: This distance of 1.4 au at Mars perihelion is the point that we feel very probably that we have started to see major perturbation by a large body of interplanetary dust and this perturbation has continued while we existed in distance from the Sun within the influence of the Mars mass. This low rate for the first 90 days appears to be the indication of the influence of Earth, which is the other large body, and the distance in here, this distribution is mainly out of the reach of these two large bodies.

So, in our experiment, we say maybe we encountered Mars from this point on in terms of influence of the data, and the other interesting thing which I want to show on the slide is that the size distribution of particles also show a change in these three groupings, the

size distribution here and the turn out of the size distribution within the Mars orbit are very nearly the same. The size distribution between Point 2 and Point 4 astronomical units away from the Earth's orbit is markedly different, so that the influence of the two large bodies appears to be quite evident from this measurement, and this is the way we summarize our data at the moment, that the large bodies make a major perturbation on the flux and the size distribution of these very small cosmic dust particles.

Thank you.

DR. PICKERING: Thank you very much, Mr. Alexander.

Now, Dr. Van Allen, please; I would like some comments from you.

DR. VAN ALLEN: I will give the introduction and summary.

First, actually, the principal purpose -- I will give both the introduction and the summary of our results first.

The principal purpose of the University of Iowa experiment was to search for a Martian radiation belt, something generally analogous to that of the Earth, and in addition to that, we have been engaged in a study throughout the fly period of Mariner IV of the electrons and protons which are encountered in interplanetary space due to emission from the Sun, impulsive emission from the Sun.

Now, both of those objectives have been

successful. The apparatus was turned on before launch on the 28th of November and has operated continuously and properly throughout this period, including the encounter period and is still working as of early this morning.

Now, we have obtained completely negative results in the traversal past Mars insofar as detection of any charged particles associated with the planet.

Now, during some seven and a half months of interplanetary flight, we have observed about 12 emissions events from the Sun, special particles emission events, and are in the process of studying each one of those in detail.

Now, this experiment is a similar one to the one we flew in our participation in the Mariner II fly by of Venus in December, 1962, and the interplanetary results are generally rather similar to those obtained during the last months of 1962.

Now, I would like to show a first slide and there may be some confusion about order there, the first slide I have is a color photograph of a piece of apparatus.

(Slide shown)

Thank you.

This slide shows a picture of the Trapped Radiation Detector package. You can see the ruler has a dimension of six inches there and that gives me an idea of the scale. The total package weighs 2.2 pounds and draws about a third of a watt of power from the spacecraft system.

There is a system of four particles detectors here. There are three Geiger tubes having thin windows and peering out through those cylindrical shaped projections from the box. They are able to detect electrons whose energy exceeds about 40 kilovolts, and protons whose energy exceeds about 500 kilovolts. The one detector on the far left is a solid state detector which is sensitive only to protons of energy, again about greater than about 500 kilovolts.

Now, I won't dwell on this detail, but it is clear by that using combinations of the counting rate of these four detectors, one being first of all, that is, one can first of all determine whether the particles being counted are protons or electrons, one can get a crude idea of their spectral distribution, that is, their energy distribution and also by comparison of the forward and backward looking matched pair of detectors one can learn something about the angular distribution of their motions in space.

Now, we had this going during the outgoing phase through the Earth's magnetosphere, and the next slide shows the results obtained on the 28th-- this is inter-mixed, I am afraid, this is going with the wrong one, I don't know --

DR. PICKERING: Back up, Bob.

(Slide shown)

DR. VAN ALLEN: Yes, it is on it's side, but that is probably workable.

DR. PICKERING: Straighten out the film, please.

DR. VAN ALLEN: Plotted here, then, at the top of the scale, it shows the counting rate of three of the detectors of which -- the three electron detectors, and it is not so terribly easy to see in this point of view, but during traversal of the Earth's magnetosphere and the main point I wish to call attention to is that we saw a clear and large effect out to about 23 times the radius of the Earth. That was the point at which the data then dropped down into approximately the interplanetary background.

Next slide, please.

(Slide shown).

DR. VAN ALLEN: Now, this is a rather crude graph drawn up earlier this morning from the results of last night's work on reduction of data, and the upper slide shows in a rather murky way, I am afraid, the results of the counting rate of the most sensitive electron detector we have on board, namely, the one we call Detector B.

Now, this is a plot as a function of time of the counting rate as read right out of the computer during the course of the last day's work, and each one of those little black spots represents the counting rate during a particular interval of time.

Now, I have checked in here sort of some reference point of interest, the graph begins on the left at a very great distance before encounter, about 250,000 kilometers. Then, the first arrow shows a situation at

165,000 and then 133,000 and 85,000, 37,300, and finally toward the far right hand side of both graphs is the period of closest approach to the planet, including the period during which it was occulted and which no signals were received.

Now, I think you can see here that there is no detectable effect whatever. The fluctuation in those points is entirely due to the fact that we are counting a fairly small number of counts during each counting of sample and those are entirely due to statistical fluctuation. The average counting rate during this period is virtually identical to what it has been for many weeks of flight in interplanetary space, so that we are able to say that there was no effect of the planet exceeding one-tenth of a count per second.

Now, in the lower slide is shown another interesting -- just the lower panel of the previously shown slide. In the lower panel is shown the results of the proton detector and I hope you can make out there the low average rate on the left and then at about 1500 ut, yesterday, we observed an increase in counting rate. This increase started at about 165,000 kilometers before approach to the planet.

Now, this increase in protons, these are definitely identified as protons. They are an extremely unlikely component of the outer fringer of radiation belt. The general run of the curve is as follows: It started about 1500. It is continued for well over a day and the detailed

features of the curve seem to have no reference whatever to approach to the planet. Furthermore, this event is rather similar in general character of the spectrum of the particles is similar, the general time history is similar, to some 13 events we have observed during the past seven and a half months in interplanetary space very remote from any body.

So, we believe this result here is entirely and in dense light emission of particles from the Sun and has no reference whatever to the passage by the planet.

Now, I think the general frame of reference here is then that on the detectors, most sensitive to the effect of a radiation belt of a planet as shown by the traversal of the Earth's magnetosphere, and as we know very well from other considerations and a large number of experiments near the Earth, that detector showed absolutely no effect.

Now, it is a good question as to whether, why and what one would expect radiation belts around Mars, I would like to point out the following general frame of discussion about that.

First of all, the Earth is known to have a radiation belt, that is, a body of trapped particles in it's external magnetic field. Jupiter, which is about five times as far from the Sun as is the Earth, has an immense radiation belt as determined by indirect measurements from it's radio noise spectrum.

Now, Mars lies at an intermediate distance from the Sun, namely, between the Earth and Jupiter. It is almost certainly exposed to the same general astrophysical conditions as are Mars and Jupiter, and namely, the passage of the solar wind past the planet. Therefore, it is plausible to think that it shares the same basic astrophysical circumstances as does the Earth and does Jupiter.

Furthermore, Mars has a period of about 24 hours as is well known, similar to that of the Earth. It has, however, only about one-tenth of the mass and this is the principal question of an internal structure character then as to whether Mars has the internal characteristics appropriate to being magnetized body, and therefore, being capable of contributing charged particles in it's environment.

So, the only question we feel to be settled by the direct experiment is simply whether Mars is or is not magnetized, because given a magnetic movement comparable to the Earth, it seems certain that it would have trapped particles in it's vicinity.

(Slide shown)

The next slide shows the framework of more detailed interpretation. This is an analytical graph which we made up a couple of months ago to try to assess the sensitivity of our experiment for this purpose.

Now, the two curved lines to the left lies the Sun in this graph and Mars is that little spot about a

little to the left of center at the top of the slide. Now, on this we plotted two curved lines starting from the upper left and bending downwards across the center of the slide. The inner one of those two represents the boundary of durable trapping region of the Earth on a scale appropriate to the Earth. Then, the outer one, the curved lines, represent both the theoretical and experimental configuration of the shock wave around the Earth which is now very well known both observational and theoretically.

Now, we have plotted then the trajectory of Mariner IV on this sort of a graph in polar coordinates and there are four different curves, you see, one that starts at the lower left and passes nearest the planet and then bends away to the right.

Now, that is the one that represents the trajectory of Mariner IV in true scale and that is the one which corresponds to passage by Mars if it had a magnetic moment equal to that of the Earth.

Now, the next one down is using the physical similitude scaling law which is in reference to discussing the Venus results a couple of years ago and shows what the curve would look like scaled out to correspond to a magnetic moment of one-tenths of that of the Earth. Then, the other two are corresponding to one one-hundredths and one one-thousandths, and finally, this black spot in the lower part of the slide shows the direct Mariner IV boundary of the

Earth's magnetosphere as observed on the 28th of November, last fall.

Now, from this sort of a graph, you can see that you can then judge from the results whatever they might have been which magnetic moment would be the most reasonable to assign in the most rudimentary sense.

Now, the fact that we have completely negative results on the traversal means then to us that we can essentially pick the answer off this set of graphs and it is quite clear that the magnetic moment of Mars, then, granting the validity of this physical scaling must be less than one one thousandth of that of the Earth, so that I would say the principal interpretative results at the present moment is the magnetic moment is less than one-thousandth of the Earth. That is to say, less than one-tenth of one percent.

Now, another way to put the result is that since we observed an increased counting rate of less than one-tenth of a count per second on our detector, we would have observed a counting rate of between a hundred thousand and a million if we had gone by the Earth.

So, the actual intensity of the particles on the same trajectory past the Earth would have given us about a million times as large an effect. However, that is not physically as significant as the first summary I made, namely, that it is less than a tenth of a percent of that of the Earth.

Now, this means that the surface field at Mars

is less than 200 gammas or less than 150th of that on the surface of the Earth, and it has, I believe, a number of quite interesting implications with regard to the internal structure of Mars. It also figures in now in reasonable quantitative discussions of the radiation environment on the surface of Mars by use of the knowledge which we have of the interplanetary radiations from other means measured near the Earth, and finally, I would like to say if there are any Martian men, I am fairly certain they do not use compass needles with any effectiveness, unless they have extremely good bearings.

MR. COLELLA: Thank you, Dr. Van Allen.

Next, Dr. Hugh Anderson, Associate Project Scientist for Mariner IV and also an investigator for the ionization chamber experiment.

Dr. Anderson.

DR. ANDERSON: I will speak very briefly about the Ionization Chamber Experiment.

This device was constructed jointly by Prof. Neher of Cal Tech and myself and was designed to measure the spatial variation of galactic cosmic rays as the spacecraft moved out from the Earth to one au at Mars, and also to measure the flux of relatively energetic radiation present around Mars, if any should prove to be there.

This instrument operated satisfactorily for approximately three months after the spacecraft was launched

and a large amount of data on the near Earth environment and in interplanetary space during that time was obtained, and some of these results were reported in Washington on April 18th, I believe it was, both to the American Geophysical Union and also to a press meeting at that time.

Since March, the instrument has not been sending back data due to a failure in one of the components, and therefore, we have no data from the ion chamber experiment in the vicinity of Mars.

I think that since this is the subject of today's meeting, I will leave it at that and not go into any further details on that instrument.

MR. COLELLA: Thank you, Dr. Anderson.

Next, Dr. Simpson of the University of Chicago, Principal Investigator for the Cosmic Ray Telescope.

Dr. Simpson.

DR. SIMPSON: The University of Chicago experiments are divided into two portions. The instrument in interplanetary space is devoted to the objectives of, one, searching for a gradient or a change of intensity as one moves away from the Sun for the particles coming from the galaxy, the implications of this being that one is able to understand very large scale fields surrounding the solar system. These were discussed at the conference in Washington and the progress of Mariner to the planet has made it possible to study this phenomenon out to one and a half astronomical units.

The other interplanetary objective was that of analyzing the proton and alpha particle contributions from solar outbursts which produced energetic particles and to study their propagation into interplanetary space and to compare these results with the Earth satellite measurements which were going on simultaneously.

But, at the planet, the main purpose of the experiment is to search for trapped radiation, and in order to increase the dynamic range and response of the instrument, the instrument goes into what we call a Mars encounter mode adding a counting rate word to the data. The spacecraft worked so perfectly that indeed this was added to our incoming data and you will see it in one of the slides.

Now, in approaching this question of any trapped radiation at the planet, as Prof. Van Allen has pointed out, the question immediately arises as to what is the magnetic field that can contain these particles, so one is led to constructing models. We have no way of knowing what assumed direction any presumed field of Mars might have. There is no reason why a dipole should be aligned or, shall we say, the little internal magnet of a planet should be aligned along the rotational axis, but the other possible solutions are rather complicated and as it turns out do not change dramatically the results which are obtained, and so, one then looks at the question of what are the orders of magnitude of the magnetic moments that are allowed by the planet relative to the locations for significant and

characteristic radiation effects in the vicinity of the planet.

Now, we might call these signatures. As you undoubtedly know, with the solar wind blowing on the magnetic field of a planet, you first of all encounter a bow shock wave which trails out from the planet on either side of the Sun planet line. Then, there is an intermediate region of what we call might turbulence, a transition region, and then comes the stably trapped or more or less stably trapped radiation that forms the very intense region within, which is called the magnetosphere.

For Mars, then, we see in the first slide calculations similar to those that we presented by the previous speaker.

On the base line we plot time and on the vertical scale or logarithmic, as the logarithmic scale showing decades the ratio of magnetic moment of Mars to the magnetic moment of Earth.

Now, you see up at the top that one point, where it assumes that the magnetic moment or the equivalent little bar magnet within the planet would be lined up with the spin of the axis of the planet that somewhere out a great distance here one would encounter evidence of a bow shock and then in between the transition region and finally the magnetosphere, and so, one proceeds in time as the encounter goes on, as you approach the point of closest approach,

and you notice that you are able to obtain down to one hundredths of the value of the ratio of Earth to Mars, and finally, down close to one thousand, but so far as we can tell, with some corrections taken into account, one obtains really only the shock and transition region evidence down to the order of one-thousandths and something less than that for the Martian magnetopause, taking into account the compression of the region and the distortion of the lines of force.

Well, this, obviously, is the most sensitive region and now the question is what do our data show.

First, I will give you my conclusions. We find no evidence, a, a radiation belt at Mars; b, no signature of a shock transition or particles within any transition region, and further, after the occultation and a period when we are back in the region of Mars, presumably outside of the wake itself, but not outside a region where some spillage from the wake might yield particles moving backwards in space, we find no evidence of particle spillage from the wake.

Well now, let's take a look, then, at some data worked up during the night and see how just to show what the evidence is.

(Slide shown)

In the following slide, we now come back to the first of those slides you showed earlier, the one marked

"Occultation" near the center of the slide.

Well, let me first show this event, then.

This is a solar proton event referred to by Prof. Van Allen. Here is some of the interplanetary counting rates. Here is the increase occurring some time between fifteen and sixteen hundred on this scale. You see that it is an event of variable character. Very clearly, it is an event similar to the order of ten to a dozen events seen throughout the interplanetary mission from our telescope, and it is evident that some of the particles barely reach the energies of the order of 12 mev, 12 million electron volts.

So, it is a spectrum with a flux going up with lower and lower energies, some with very low energies one would see a higher flux. Well, this is nature's way of sort of adding interest to what is going on, just occurred at this time, but it is not associated with the planet.

(Slide shown)

In the next slide, we see raw data taken directly from the transmission. Here are the familiar terms that you encountered yesterday. These relate to the telemetry frame transmissions and here is some dubbed in times to give you a scale. Here is the occultation period, and this fluctuation essentially is due to the small amount of information per data point. It is identical with the interplanetary conditions. There is no evidence here of any change in the

level. One would have seen the fluxes rising rather rapidly if there had been anything appreciable. We also see the turn on of what we call word 30 during the encounter mode and here we see improved spread of the data due to this particular channel.

Well, if we go to the next slide, we compare data obtained last June, for example.

(Slide shown)

This is just an example. Here is interplanetary data. It looks exactly the same. If I were to shuffle the data, you would have a hard time telling me whether we were near the planet or whether we were somewhere between Sun and Earth.

What would we have seen at a planet with a magnitude of the Earth's field?

(Slide shown)

In the following slide, I will show just briefly the results obtained in the pas through the Earth's magnetosphere at launch. This is to reaffirm the response of the detector. Here you see the entry into the outer radiation belt structure in here as seen by all the instruments, ion chamber, trapped radiation detector, and so forth, some main structure.

In this particular case, you notice the drop to the interplanetary level and then burstings of radiation, and a large peak, some missing the data up around 26, 26½ radii, and some small peaks and then interplanetary level at

this point. None of this was observed.

Now, I would like to just draw two sets of implications. First of all, the implications for the planet as you have already heard; essentially, these types of experiments set up your limits for a dipole moment. Well now, one, in addition to data and assumptions regarding the analysis, one most followed in the probable range of errors in getting the form of any type of magnetic moment, is it's direction with respect to the axis of rotation. When we do this, we feel that we can conservatively state that the upper limit is a half of one percent or five-thousandths of the Earth's dipole moment. We believe that it is likely that upon further detailed statistical analysis, this number will drop to less than one part in a thousand.

Now, these results, obviously, have implications for the planet itself. We know that the planet rotates. We don't know whether it has a liquid core. If it had both, it would likely have a magnetic field. However, I think it is most important to realize that the real upper limits for any dipole moment or equivalent dipole moment of the Earth is really going to be set by the magnetometer. This, undoubtedly, will be the most sensitive instrument.

The other set of implications are concerned with manned exploration. I think it is obvious now that man will experience no radiation hazard in the near Mars environment. The atmosphere of Mars is, however, bombarded

at all times by the full flux of cosmic rays and by the full fluxes of the solar flare particles, and hence is expected to be interesting in the sense that the radioactive products of the disintegrations that are present are going to be different from the Earth and probably somewhat more intense relative to the density of the atmosphere.

Third, the surface bombardment of the planet is going to be different from that of the Earth, since a much larger fraction of the cosmic ray energy will reach the surface, no matter what model is assumed for the planetary atmosphere, and in addition, a larger number of solar flare events will have a very significant input to the surface.

I believe that is all we have at this time.

DR. PICKERING: Thank you very much, Dr. Simpson.

Now, I would like to call on Dr. Bridge, MIT, of the Solar Plasma Probe.

DR. BRIDGE: Well, the experiment I would like to discuss is, as Dr. Pickering stated, the experiment with the solar plasma, so-called solar wind.

I would like to discuss two aspects of the experiment in terms of its two primary objects, measurements, properties of the solar wind in the interplanetary region during the cruise mode of the spacecraft, and then the properties of the plasma near the planet during the encounter phase.

Now, I think I will be very brief on the

interplanetary section of the data.

The previous results mainly on Mariner II and on the IMP-I satellite have given us a pretty good idea of what the properties of the solar wind are in the interplanetary region. We know that the velocities generally are several hundreds of kilometers per second, that the density of the positive ions is in the order of five to ten per cc.

Now, it is not sure that these conditions, was not sure that these conditions persisted to the orbit of Mars, so one of the primary objectives is to see whether or not the properties of the solar wind itself do indeed vary the way we expect. That is mainly a variation in the density of the solar wind. One expects it to drop off, roughly, as the square of the distance and indeed this roughly seems to be the case. I might say that the primary objective in solar wind experiments is to see a good Class III solar flare. So far we have been very unfortunate, as have the other experimentors on Mariner IV, that no such events have occurred.

So, our ideas as to what the solar wind is like in this region of space are based on the results of previous experiments and I would say that we have had no surprises in that region.

I want to make a similar statement about the vicinity of Mars. Here our ideas as to what the region around Mars is going to look like are based mainly on the results of satellite experiments in the vicinity of the Earth. The

Earth or any other solid object acts as an obstacle to the plasma flow. In the case of the Earth, it is the magnetic field of the Earth which acts as the obstacle, and as the previous speakers have pointed out, one finds two characteristic features in the nature of the Earth. One finds a shock transition of some sort at which point the properties of the solar wind change drastically and then there is an inter-boundary to the so-called magnetosphere and the magnetopause at which the plasma disappears.

Now, I emphasize that what happens in the vicinity of an arbitrary obstacle is not completely clear. It depends on the properties of the obstacle and on the properties of the solar wind. The properties of the obstacle in the case of Mars that we are interested in are the magnetic field.

If one looked to interpret, then, assuming that there is a magnetic field, the dipole field, similar to that of the Earth, one has to know also something about the properties of plasma, and in effect, if one knows the plasma properties, then one can conclude something about the magnetic field, chiefly by observing the position^{at} which one sees the field and by seeing how its value changes across this boundary.

Now, what we would expect to see in the case of the plasma, if we were to cross the shock transition, would be that the energy spectrum of the plasma would broaden, that is,

it would, instead of observing essentially a unique velocity in the wind, we would find that the velocity spectrum or that the energy spectrum had a very appreciable width and if we to start not as go through the magnetopause and into the magnetosphere of Mars, if such exists, we would expect the plasma to disappear.

Now, I think that the main result, then, during the encounter is that there was no change in the property of the plasma. It's number of density was about what we would expect, not very different from what it is at the Earth, and it's velocity was of the order of 300 kilometers per second, which is a quite reasonable velocity.

These values, then, permit one to set limits to the magnetic moment of Mars, assuming that the field is again similar to the Earth's field. I think that what we would say is that the limit, the magnetic moment of Mars, is roughly a thousandth of the

Thank you.

DR. PICKERING: Thank you, Dr. Bridge.

Finally, then, Dr. Leverett Davis will talk about the Magnetometer experiment.

DR. DAVIS: As on all of the other experiments, there was more than one purpose to this.

We had things to study in the interplanetary region, and as with the other experimentors, I will be very brief about this.

The structure of the interplanetary magnetic field and its fluctuations seem to behave about as expected as one went out to Mars. We still have a lot of work ahead of us looking for correlations between particular features of this field and the small solar flares that were seen, the behavior of the Sun, the behavior of the magnetic field of the Earth, but this isn't part of this story and in any case we haven't got it done.

As to what we saw near Mars, which was the second main thing that we were trying to do with this experiment, the short answer is that we see nothing that we can positively ascribe to the presence of Mars with our magnetometer. We would have been prepared to see the transition across the bow shock that you have heard mentioned. If we had gone across that we would have expected to have seen a substantial increase in the fluctuations of the magnetic field and a significant change in the strength of the field. If we had succeeded in going further in and go through the magnetopause, go into the region where the lines of force are attached to the planet at both ends, we would have expected to see a systematic and orderly change and increase in the strength of the field from whose pattern we could have told whether there was a dipole and what direction it was oriented.

Actually, what we did see was that up until 22 minutes after closest approach, the field ran along quite smoothly, much more smoothly than ordinarily in interplanetary

space, but not unusually so, as this was a quiet time, not a disturbing time. At about 22 minutes after closest approach, there was a moderate disturbance in the magnetometer data, the kind of a disturbance that we must have seen 40 or 50 more times in interplanetary space. So, there is no indication that it was any indication that we were near Mars. On the other hand, with only a few hours to look at the data, we can't absolutely exclude -- I shouldn't be quite that strong -- we can't exclude the possibility that we did see an indication of a Martian magnetic field.

This leads one to interpret the data in two ways: First, take the thing that we can be absolutely sure about, namely, that we saw no presence, no indication of the presence in Mars up to 22 minutes after closest approach. This is essentially what everyone else has to -- calculations from here on go rather similarly with the others. Each person has his own minor deviations in the way he does it.

We use the model of the Earth's magnetic field which has been developed through a good deal of work in the past few years. We used Dr. Bridge's plasma data to estimate what the effect of the actual solar wind that we had yesterday at Mars would be in this discussion, and that since the wind was slightly lower in density than it is near the Earth and the velocity was, while not unusually low, is such that we would lead us to expect that the Martian field is somewhat lower than we would have if we had not had this data.

On the other hand, it is preliminary, and one should not attach an enormous amount of significance to it at the present time.

The upshot of our best analysis of the model is that we think that the Martian magnetic field cannot be bigger than one-three-thousandth of the -- I am sorry -- the Martian magnetic moment, the size of the Mars, cannot be more than one-three thousandth that of the Earth's magnet, with a range of uncertainty due to the factors that have already been mentioned of about a factor of three, because if we have to put a conservative upper limit then we could say it is almost surely less than three-thousandths. It wouldn't surprise us if the data would go the other way when analyzed carefully and one would say it is less than one ten-thousandth of the Earth's magnetic field.

If you take the other point of view and say not only that there was no disturbance up until 20 minutes after closest approach, but that the disturbance we saw there was an interplanetary event, could very well be, and that there was no magnetic disturbance clear on until occultation, then you would push this magnetic moment of Mars down a little bit more.

At this point, the validity of the models gets less certain and it is hard to be very precise, I suppose a factor of 2, further, which is obviously smaller than our factor of 3.

If I could show one slide, this is very similar to the ones that you have seen several times before, but it is slightly different and perhaps it may be less clear to some and more clear to others.

(Slide shown)

Here is the trajectory going by Mars. Always, the trajectory, of course, is in three dimensions, and this has been rotated around so that it is always in the plane of the slide and put in a position which is most convenient for understanding the strength of the Mars dipole moment, not giving you a good idea of what the trajectory looks like.

If Mars had a magnetic moment equal to that of the Earth, the magnetopause would have been here and the shock would have been this jiggly thing out here. If Mars had had a magnetic moment of a strength that of the Earth, it would have had the median two curves heavy, for the magnetopause and the outer one for the shock. If it would have been one hundred times of the Earth, it would have been the two curves further in. We didn't try to crowd out of this slide the curves for one-one thousandth but that would have been more appropriate to what we actually saw. We didn't see any trace of the shock as everyone has said, anywhere in the orbit.

Now, just a couple of more remarks on the implications. Again, this isn't particularly peculiar to the magnetometer, except that if we put our upper limit to the field of one-three-thousandth of the Earth's magnetic moment,

then our surface field would be correspondingly lower. It will be somewhere in the range of 100 gamma at the surface. The implications of this information other scientists have mostly suggested already. The absence of magnet field suggests that -- excuse me -- I think I should start over -- I think the most reasonable starting place if one wants to apply this observation, these observations to other studies, is to say that Mars probably has essentially no magnetic field at all. We can't prove that, but we can get pretty close. If you start with that, then you expect that the atmosphere of Mars is exposed to the solar wind, the solar wind reaches the atmosphere and doesn't produce any drastic changes, but it is certainly different from Earth. You expect that the interplanetary cosmic radiation which is the top of the Mars atmosphere as mentioned earlier creates radioactivity through the whole atmosphere.

Again, probably not a very drastic -- it probably does not have very drastic effects, but it is certainly different from the Earth's.

If you wonder where the magnetic fields of planets come from, the usual theories are that they come from not solid iron bar magnets inside but fluid dynamos and this suggests that Mars is different from the Earth in it's interior construction. This shouldn't be a surprise, I think, to anyone. If you look at the data on Mars, you look at it's density, you look at it's size, you find that it is

nearer to the Moon in density and size than it is to the Earth, and it doesn't seem surprising, that it is at least to some of us, that it is more like the Moon magnetically than it is like the Earth, and this may imply similar statements for other geological features, but a person working in cosmic rays and magnetic fields shouldn't venture into that.

A remark in a somewhat different vein, to close. When you do an experiment of this kind, and you don't find that your data shows any interesting variations as you get near Mars, you start in by feeling disappointed. You think it would be much nicer to have something spectacular happen. I think after you reflect on results a little while, it is just normal psychology. You come to the realization that showing that nothing has happened to your data, showing that Mars is very different from the Earth magnetically, is probably just as useful a result as to get a big effect and show only that Mars is the same as the Earth.

DR. PICKERING: Thank you, Leverett.

Well, as you say, data received during the encounter appears to indicate that the effect of Mars on these experiments was very minor indeed and as Leverett says, even though at first sight one would perhaps wished for some violent phenomena to have taken place, the actual fact that you received no indications of the planet is equally fascinating and equally important.

So, I would like to summarize the observations

which have been made by commenting first that the experimental data received was, I believe, of uniformly good quality for all the experimentors, that the long journey through space did not degrade the data transmission.

Secondly, that these results apparently these results apparently indicating very small or perhaps no effects of the planet are results which are going to take considerable more study and interpretation before the full implications of these will be appreciated.

Well now, at this time, I would like to invite some questions from the audience.

Q I have two questions; one for Dr. Bridge. I wondered if the vehicle got near enough to a point to see a wake if there was a wake like the one reported by him from the Moon. I will give you the other question afterwards.

DR. BRIDGE: No, it did not.

Q So, you can't tell whether there was a wake or not?

DR. BRIDGE: Well, except you mean in the case of Mars?

Q Right.

DR. BRIDGE: No, we saw none, no wake.

Q On the other question, perhaps I can get to Dr. Van Allen. He has heard it so many times already, apropos of his own radiation belt. Could he estimate what the surface flux of cosmic rays would be without a magnetic field and

would it have a direct bearing on the possibility of life on the planet?

DR. VAN ALLEN: I can try to answer the first part of the question, but perhaps not the second.

The flux would be about the same as we find it at the top of the atmosphere in the polar regions around the Earth, namely, about two particles per square centimeter per second and this would presumably be essentially uniform all over the top of the Martian atmosphere.

Now, from there on, the main difference from Mars and the Earth is that it has already been known to be very much thinner atmosphere, so the atmosphere of Mars is like one-tenth to perhaps as great as one-fiftieth as much atmosphere per unit column around Mars and it is presumed that those results will be refined and improved as soon as the occultation/^{experimenters} have finished their analysis, but that is already fairly well known in round numbers, so the absence of an atmospheric shield means that the intensity at the surface of Mars would be of the order of fifty times that of the Earth.

Now, this is still not at all a frightening value in any sort of a radiation sense. I should say it is still rather small, but perhaps we get intensity in rather refined genetic mutation considerations.

Now, in addition to that, of course, the solar cosmic rays, the great bursts of much lower energy particles

from the Sun would have much freer access to the surface of Mars, but even there, the atmosphere of Mars is particularly thinned out to certainly shield out those rather well.

Q Could you summarize for us or perhaps one of these gentlemen, what does all this information you have learned mean in terms of the possibility of life on Mars, the possibility of landing men on Mars?

DR. PICKERING: Well, I don't want to make a very long statement about that, but I will say the following thing. As has been already commented, the absence of a magnetic field means that the top of the atmosphere of Mars is bombarded by all of the solar radiations and cosmic radiations. There is no shielding due to magnetic field. Just precisely what the effect that this will have as regards life, depends on a variety of factors.

First, the actual depth of the atmosphere, how much atmosphere is actually present. Secondly, the nature of the species in that atmosphere. Well, those two items particularly, that will in effect govern what sort of radiations are present at the surface, and then, the question as to whether or what effect that has on life. Then, again, it depends on what assumptions one makes about genetic effects of radiation, particularly of the types of particles which one would assume would be present in this environment. We need more information.

Q Are you discouraged, Dr. Pickering, as to the

possibility of life on Mars?

DR. PICKERING: Discouraged? No. I have always felt that we will find some forms of life on Mars. I still look forward with great anticipation to experiments which will involve landing capsules on the surface and searching for life.

Q For Mr. Alexander.

If I understand you correctly at the start, you said that you found no evidence of any intense belt or concentration of dust particles around Mars at a distance of about one Martian radius.

Now, in view of the fact that you were only within three Martian radii, how do you come to this conclusion at all?

MR. ALEXANDER: I didn't state it quite correctly; that in looking at the concentration around Earth, we set one within Earth radii.

Q Yes.

MR. ALEXANDER: We would have had to have been within one Martian radii to have seen the same kind of concentration. Since we weren't there, we could only have seen an intense concentration at three. In other words, something greater than Earth. We didn't see that. We couldn't have seen it. That is what I meant.

Q Now, to follow up this, I wonder if you could express yourself in a little detail than you did about the

particles size and distribution. You merely alluded to it without giving us any number.

MR. ALEXANDER: The real important thing on particle size is what we call the slope of the curve. In other words, you have more smaller particles than larger particles, and if one draws a graph that shows how many particles of little ones and then the way the curve slopes as the particles get larger, so the slope of that curve isn't important to us.

Now, in this what are called the Earth influence region, which was two-tenths of an au, and that is a surprise for us, this slope was in the neighborhood of the square root of the mass, or rather flat slope for us. Between .2 and .4 au, this slope changed almost to just the mass itself.

In other words, you get ten particles in one slope and you go down to ten times the size, you will have one particle. It approached that. Then, when we approached Mars again, it curved out flatter, like the Earth, in the mass distribution, so the two things that showed this rather wide sweeping effect, which is not prior to this spectra.

Q And, the third, and I promise you, final question. Is this related to the gravitational field of the two planets?

MR. ALEXANDER: This has to be related to it, but we are pretty sure now that we have a very complicated thing here, in that the forces on these very small particles are

not only the gravitational force, the Sun and the Earth and Mars, whatever view there that it gets near to, we are involved with radiation pressure and things like that on the small particles that are having a very dynamic effect on them, and the degree of it we had not realized, and so now, we have been using the phrase, today, we have a lot more home work to do.

Q Bill, I wonder if you or perhaps Dr. Van Allen, could paint us a portrait, if you will, of what it is like to be on the surface of Mars, if there is anything there in terms of magnetic field radiation belt and temperature as compared to the surface of Earth.

DR. VAN ALLEN: I think I caught some of the main ideas. First, the temperature. I really don't pretend to be competent to discuss that on my own initiative, so to speak, or my own knowledge, but I think the temperature is generally supposed to be 180 degrees, sort of an average temperature, which is quite cold. It is like 100 degrees below zero or something of that order. That is the first point.

The second point is as far as radiation belts are concerned, on the grounds of our findings yesterday, there is no such.

Now, as far as radiation on the planet, it is the atmosphere which is the main difference from the Earth. The atmospheric people haven't reported in yet so I should

say that it is plainly a question for them to determine the composition and total extent of the atmosphere, because that is the principal thing which determines the nature of the temperature distribution, the atmosphere, and the kind of ultra violet and so forth that is distributed on the surface, so I don't feel competent to discuss that.

I think you had another point, but I don't recall.

Q The third one was magnetic field radiation belt temperature.

Dr. Van Allen: The magnetic field is apparently quite weak as we pointed out. It is almost certainly less than one hundredth of that on the surface and it would be a very weak magnetic field. However, the magnetic field itself probably has no direct bearing on the general nature of life on the planet.

Q This is for Dr. Van Allen.

I hear there is no radiation belt, no shock, no bow shock, no magnetosphere. What effect will this have on the future Voyager, particularly in radio transmission. I assume we get less word coming through. Is it possible that two stations on Mars can communicate by bouncing or they got to be direct line. How about a little fast resume of what all the finds so far would give us in regard to the Voyager experiments.

DR. VAN ALLEN: The first point is that I think that

the radiation belt of the Earth has virtually no significance on radio communications from the Earth. The part of the Earth's environment which really counts is the ionosphere at about 100 kilometers and more above the Earth, and that again is atmospheric question rather than in any way is illuminated by what has been reported this morning, so I think in kind of a broad sense, nothing that we reported here this morning has any significant bearing on communications from Mars or from one point on Mars to another point on it.

The magnetic field does have some influence on radio propagation of the Earth's atmosphere, but it is not of dominant importance.

Q I would like to ask Dr. Simpson if he might elaborate a bit. He indicated that, if I understood him correctly, there was no significant radiation hazard to men landing on the planet. Also, I am not clear, quite clear, as to relation between that and the lack of a trapped radiation belt.

DR. SIMPSON: I believe it is fair to say that until these measurements were made and results were obtained, one can make guesses, but wouldn't know what the radiation belt might be like around Mars, and since almost all types of operations that would bring men in a capsule into the planet would presumably involve their spending a considerable amount of time in the vicinity of the planet, in a satellite orbit, so to speak, around the planet, it would be presumed that a

strong belt would be discouraging to such individuals.

So, therefore, it seems clear that there is no problem here.

On the question of there being on the planet, although the radiation levels are obviously higher, they don't seem to be so high that one would be concerned for a temporary visit.

Q Dr. Pickering, do you have any estimate as to when the first pictures might be processed for reviewing or when somebody might first see it?

DR. PICKERING: I am just as interested as you are to see that first picture. The complete data reception should be complete in another hour. There is, of course, processing, cutting and so forth, but the picture of some sort will be obviously finished up in a few hours from now.

Just as a matter of interest, by the way, in view of the interest in the photograph, I thought perhaps you might like to see the way this digital data comes in, and if I can have the closed circuit TV switched to that data, if you look on the closed circuit TV you see now this data. It is a little out of focus because the tape isn't holding quite steady, but you see the chain of numbers which are coming in continually. These numbers then contain, as I say, of the particular point, namely, the identification of the particular point, and then a number representing the intensity of the grey scale corresponding to that particular point,

and I can't see them from here, but if you can see them, the gray scale numbers which lie between one and 63 change as the intensity of that particular spot changes.

And so, this is the process which is taking place. Each one of those lines have numbers corresponding to one particular point on the picture, one dot on the picture, and the intensity of that dot, and this material then is coming in at this rate, relatively slow rate, and is being converted then through the computer into a final picture.

Q Dr. Pickering, a little more on the subject of life on Mars, based on this knowledge, is science now prepared to rule out the possibility of any form of higher life existing on the planet of Mars?

DR. PICKERING: I am sure that one can find all sorts of speculations about this subject. I think that as regards higher forms of life on Mars, the most interesting question which we have to answer is what is the nature of the atmosphere of Mars, because at least with the higher forms of life with which we are familiar, we need to have a reasonable atmosphere for reasonable supply of oxygen to maintain metabolism.

Now, if there is practically no air on Mars, this would certainly limit the forms of life which could exist if it is similar to Earth forms. However, the variety and complexity of life forms which have evolved here on the Earth is so fantastic that I don't think we should rule out

what we will find on Mars until we actually get there.

Q What about subterranean life? It seems to be hollow --

DR. PICKERING: I don't think Mars is hollow. We merely said it's density is not as great as that of the Earth. You can speculate on subterranean life, if you like.

Q What you are saying, in essence, Dr. Pickering, is that we are as much in the dark this afternoon as we were yesterday afternoon?

DR. PICKERING: Wait a minute.

Let me point out that this particular Mariner flight was never supposed to answer the question as to whether there is life on Mars or there is not life on Mars.

In order to answer that question, it is obviously necessary to land on the planet and Project Voyager, the next interplanetary project, is aimed at this particular objective, and we will expect to land capsules on the surface of the planet with Voyager.

In the case of this Mariner mission, we have conducted the first close-up exploration of the planet. We have gained a great deal of scientific information, but I hope we will get a great deal more interesting and useful information from the photographs, but we will not be able to say that there is or is not life on Mars. At least, we don't expect to. However, the additional information which we have

obtained has given us more information about the kind of environment which we can expect, and therefore perhaps some clues as to constraints on life forms on Mars.

Q What is the latest you can tell us about picture release?

DR. PICKERING: I am sorry. I beg your pardon?

Q What is the latest you can tell us about picture release?

DR. PICKERING: I can't tell you anything. I haven't seen the pictures yet myself and we are, of course, as I said yesterday, we are actually experimenting with a variety of ways of getting this picture, all the way down to brute force, put it in dots one at a time by reading that tape which you just saw, and in various ways we are trying to get a picture as quickly as we can, and before the afternoon is out, I hope that we can indeed have a picture.

Whether or not the picture will be released at this time, I will make no commitments now.

Q This is for whoever would like to respond.

I found some of the dissertations a bit over my head. I wondered if someone would care to discuss the relationship of the radiation belt to the existence or non-existence of the magnetic field. One has to exist in order for the other to be present, and does this data that you have received today indicate that there is no possibility of the magnetic field or radiation belt or just that it

would be very tenuous if it existed at all.

DR. PICKERING: I would like to comment on that.

As you heard from the various experimentors, there is a great deal of interrelation between the results of the various experiments as far as the magnetic fields are concerned, and, in fact, it is necessary to have a magnetic field if we are going to have a radiation belt, and the measurements, the particle measurements which were made, the direct magnetic measurements, supplement each other and confirm that any magnetic field which exists must be very small.

Q And therefore, the radiation belt --

DR. PICKERING: And, likewise the radiation belt is small. In other words, the smaller radiation belt the smaller field; the smaller field, the smaller radiation belt.

Q I would like to clear up one point.

Would any of the experimentors care to speculate as to whether the surface radioactivity on Mars due to the lack of atmosphere and magnetic field would be dangerous for man landing or even for a spacecraft?

DR. PICKERING: You want to answer that?

DR. SIMPSON: Well, I think that some of our remarks here, I think, indicate that the level is different from Earth. It is higher than Earth, but there is no evidence that it would be dangerous.

Q Well, I guess you would be the one to answer this one, Doctor.

We have just seen a tape here of the data coming through. What is to prevent someone else from pointing an antenna at the spacecraft getting their own data and their own set of pictures and would there be any advantage in this?

DR. PICKERING: I think that the antenna system which we are using at Goldstone is unique in the world and I don't think that anybody else with the necessary skills could build a communication system which can match it.

Q Did the spacecraft show any awareness of the effort along the way, any data to indicate the presence --

DR. PICKERING: The question is whether our spacecraft showed any evidence of the Russian Zond II on it's journey, and the answer is no. Zond II was reportedly several days behind us and that is a long way on a space journey like this.

Q Would you and Dr. Van Allen try to take an educated guess that we have increased our knowledge of the surface of Mars, as a result of all of these experiments?

DR. PICKERING: Well, so far, we have not changed our knowledge of the surface of Mars. We have changed our knowledge of the surface environment in a small amount. We have increased it. We will increase our knowledge of the surface of Mars when we look at some photographs and, well,

I think that is really all I can say at this stage.

Q Dr. Pickering, what do you think is the most important element that you gathered on this program?

DR. PICKERING: The most important element?

Q Out of all the experiments.

DR. PICKERING: I am sure that each one of these experimentors believes his experiment is the most important, and I won't enter into the argument.

Q Dr. Pickering, what would the absence of a magnetic moment mean in the design of some instrumentation on the Voyager. Would it alter it?

DR. PICKERING: The question as to whether or not the magnetic moment effects the design of instrumentation for the Voyager.

I don't think so. I don't believe there will really be any serious interaction between the Voyager design and the absence of a magnetic field, except that I suppose if one wanted to use a compass on the Voyager, you would land at a point north, naturally, you can't use a compass.

Q Do you have any additional data yet on the density or the composition of the atmosphere?

DR. PICKERING: No. We hope to have a report on that tomorrow. The experimentors who are concerned with this occultation experiment report to us that they have some interesting looking data. The interpretation of this is

difficult and we hope that by tomorrow we will have something to say.

Q Dr. Pickering, did the lapsed time from the start of the tape to the end of the tape indicate that the sequence was proper; that is, 24 seconds of recording and 24 seconds of pause?

DR. PICKERING: This question of interpretation of the tape recording, as to whether or not it worked properly, whether or not the extra signal we got really indicated any difficulty or not, this has been analyzed by the spacecraft crew and they are of the opinion that this tape did work properly and that extraneous signals was just sort of extraneous electric signal and does not indicate any difficulty with the tape.

However, I must point out that the real proof of this is not going to come for another 15 days when we either have 20 pictures in hand or we don't. We expect now, we fully expect 10 days from now we will have 20 different pictures taken from the tape.

Q Dr. Bridge stated that the solar wind data seems to fit in with previously existing theories. I was wondering how the magnetic field and radiation belt data, did it confirm or confound the previously existing theories and what does it say about the interior of the planet.

DR. PICKERING: Is this for Dr. Bridge?

DR. BRIDGE: I think the question was more about

magnetic fields than interior of the planet and I am certainly not competent to answer that.

You want to comment, Leverett?

DR. DAVIS: Well, I don't think any of us here would claim to be geophysicists or experts on dynamic theories, so that any answer you get here will be somewhat uninformed speculation.

The question as to whether this result is unexpected or not, is really the question: do you expect Mars to have a magnetic field like the Earth.

I think that you will find in the literature ranges of estimates, estimates would be better, of the Martian magnetic field, but it is a very crude -- well, not crude, but incomplete ideas and how it should range, from one-tenth that of the Earth down to zero, and if you ask people who are predicting one-tenth, they will say we were greatly surprised and if you ask approximately numerous people if it was zero, they will say just as we thought.

Q Dr. Pickering, has President Johnson contacted you?

DR. PICKERING: The answer is yes. I have had a call from the President congratulating us on the success of this mission.

I would like at this time to remind the people present here that this press conference is being carried live to NASA in Washington and I think I should give the audience

in Washington an opportunity to ask some questions, so, Washington, do you have any questions?

Q Yes, we do. We have Henry Simmons here, I believe.

DR. PICKERING: Go ahead, please; the first question.

Q Just a question on the scaling of your pictorial data. You say the range is from zero to 63 in the number for the elements, for each element. Which end of the scale is black and which is white?

DR. PICKERING: 63 is black and the other end is white.

Any further questions from Washington?

WASHINGTON: No more questions from Washington.

DR. PICKERING: Thank you.

Q We have some more from Pasadena.

Would one of the experimenters explain what the difference is between a magnetic moment and a magnetic field?

DR. DAVIS: I suppose I am responsible for this.

A magnetic field is the thing which makes a compass needle move, is the manifestations of a magnetic moment, a magnetic moment is essentially the source for the field. The reason one talks about magnetic moment rather than about magnetic field so much is that Mars, having a different size, when you are on the surface, you are a different distance from the center of Mars than you are to

the Earth, and this means that a given Earth will produce a different effect. When we talk about the magnetic moment, we are trying to emphasize the strength of the size. When we talk about the magnetic field, we are trying to emphasize the size of the effect.

Q Until yesterday, we had thought that up to 21 pictures were coming back from Mariner. Today you have referred consistently to 20. Is that significant?

DR. PICKERING: Yes.

The precise number of pictures is going to be determined by the precise path across the planet which will end up on the night side of the planet, and there was a question as to whether or not the first picture would be taken off in space before we got to the planet, whether the last one or two will be taken on the night side of the planet.

The estimates are now that on the particular strip which we photographed, two or three of the final pictures will be beyond the twilight zone.

Q Does that mean that you have read some indication in the first frame so far?

DR. PICKERING: Oh, no.

Q That you are looking at the planet instead of at the limb?

DR. PICKERING: Oh, yes, we are. In other words, when the remark was made earlier this morning that video data

was being received and when I pointed to the tape and said the numbers were changing, this means in fact that we are getting variations in brightness on the video data and therefore we are seeing variations in the surface of the planet.

Q Bill, I don't mean to knock this present success for one second, but I wonder if it is possible to answer one thing on the wires.

Senator Proxmire is charging that you could have gotten twice as much data and much better quality pictures if NASA had spent more money on ground antennas and larger Earth stations. Is that so?

DR. PICKERING: No.

Q Dr. Pickering, this question regarding expectation of some day a man will try and get on Mars, the lack of any magnetic moments, any significance into the possibility of --

DR. PICKERING: Speculate on that, Leverett -- I think that the point which Dr. Davis made was that we believe that a magnetic moment requires a central core of magnetic material. Now, that doesn't rule out, lets say, the absence of a central core. I don't think it would rule out the presence of certain magnetic materials disbursed throughout the body of the planet, and indeed, there are many people who believe that the red on Mars is due to one of the oxides of iron.

Q Dr. Pickering, you mentioned earlier that you felt the structure of Mars is very different from the Earth and the geological features are more like the Moon. You mean by this that you regard it as a dead planet?

DR. PICKERING: I don't think I said that. I think that Leverett Davis said that, but maybe you want to explain a little bit.

DR. DAVIS: I was thinking primarily of the interior and not the surface. The surface of Mars has an atmosphere and the Moon doesn't. I was referring for speculations on interior geology and I don't feel I should go any further.

Q You referred earlier to the density of Mars being low. I wondered if you had a new figure on the density from the fly by.

DR. PICKERING: We hope to, indeed, yes. In other words, the analysis of the trajectory close to Mars will give us new information about the mass of Mars, and that analysis should be reported on tomorrow. I think we have one more question and that is it.

Well, just to wind up the conference, then, I would like first to make a small correction to Dr. Van Allen's statement about temperature. I think you are a bit cold, Jim. I think an estimate is that it is more like about minus 40 for an average over the illuminated disc of Mars. It is cold. Mars is not going to have a pleasant climate, we know that, but I don't think it is quite as cold as Jim is

speculating on.

Finally, a question concerning the photographs which we are all anxiously awaiting.

As you know, the first photograph will be completely received in about another three-quarter of an hour, and precisely when we will have a photograph and when a photograph will be released, we just don't know at this time, although we hope to be able to say something later towards the end of the afternoon.

Thank you very much.

(Press Conference concluded at 1 P.M.
this date)