APOLLO NEWS CENTER
Houston, Texas

ASTP Science Briefing
July 19, 1975
3:00 p.m. CDT

Participants:

Dr. Thomas Giuli, ASTP Scientist
Dr. Farouk El Baz, Earth Observations & Mapping
Dr. Friedrick Vonbun, Geodynamics
Dr. Robert Snyder, Multipurpose Furnace & Electrophoresis
Dr. Thomas Donshue, Ultreviolet Absorption
Dr. Robert Hudson, Ultraviolet Absorption
David Garrett, Public Affairs Officer

ASTP (USA) PC42A/1
Time: 15:00 CDT
7/19/75

PAO Good afternoon. We're ready to begin our science scraping. To my immediate right is Dr. Tom Guili, the ASTP scientist and he will in turn introduce the other principal investigators who will participate in the briefing. Dr. Giuli.

GIULI Thank you Dave. Today is a milestone in the ASTP mission in that we have now concluded the joint operation phase of the mission and are entering into what we call the solo phase. During the entire part of the mission we have been and will be conducting experiments. And so we thought we would take this opportunity to summarize for you what we have accomplished so far during the joint phase in the experiment program and then we will be coming back at a later date to summarize for you the accomplishments of our solo phase experiments program. Before we go into the status reports since many of you are not aware of the scope of our science program, I thought I would give you a brief review of the total experiments package then go into the status report and then introduce to you some of our scientific investigators who have individual experiments onboard the ASTP mission. On board the mission we have 28 experiments. They are broken down into three catagories: the space sciences, the life sciences and the applications. Further breaking down into the space science area, we have astronomy experiments. Three of those look outward into the galaxy to investigate phenomena there. One of them looks inward in our solar system to the Sun to investigate solar phenomena. And one of them is an instrument development effort which will have future application for gamma ray astronomy. In the Earth environment part of space sciences, we have two experiments which are investigating the Earth's atmosphere. One experiment which looks downward and does observations of the surface of the Earth from the position of the spacecraft and we have two experiments which are investigating the interior structure near the surface of the Earth. This structure being the mass structure, the mass anomalies in the Earth. In the life sciences area, we have three experiments, which together are investigating the affects of cosmic ray particle interection with live cells, that is emphasizing the heavier and the more energetic cosmic ray particles and their affects upon living cells. One of those experiments investigates the interaction with the human cells, namely the retina cells in the eye, and that will incorporate observations by the astronauts. One of the experiments investigates the interaction of particles with dormant live cells, which will then be grown in the laboratory and studied for mutation affects. And the third experiment is one which investigates the particle interactions with cells which are alive and growing in the spacecraft in petri dishes. We have three experiments which are investigating the human immune system. That is immunity to infection by microbes of various kinds and together they really comprise a single, coordinated effort which - the significance of which is that samples are taken from inside the two spacecraft and from various locations on all five crew members of the mission and returned to the on base laboratories for analysis. Also blood samples are analyzed, so that they investigate both the microbes and the immune system directly, and ability to resist infection by

ASTP (USA) PC42A/2
Time: 15:00 CDT
7/19/75

the microbes. In the applications area, again we have two sections. We have two experiments which emphasize the medical applications to electrophoresis experiments which you will hear more about shortly. And the other applications category is material processing. There we have nine experimens, eight of them are associated with high temperature processing of materials in a special electric furnace, which is on board the spacecraft. And the remaining experiment investigates materials processing in the low temperature or ambient temperature method by allowing the reactant materials to defuse toward each other through pure water. Now the status of the experimentation so far on the mission is that we have completed the solar eclipse experiment MA-148. We have completed almost all of the ultraviolet absorption experiment MA-059. We have completed almost all of the zone forming fungi experiment MA-147. We have completed the microbial exchange experiment AR-002. And we have completed all of the - one of the electrophoresis experiments MA-014. By the way the titles and numbers of these experiments can be found referenced to and described in a document which is available to you through our Public Affairs Office. It's called "ASTP Experiments Summary", and you will also find these experiments described in the American press kit. The experiments which have been in operation during the joint phase and will continue operation in the solar phase are the earth observations experiment MA-136, the geodynamics experiment MA-128, the killi fish experiment MA-161 and the electric furnace experiments MA-010 and several of the experiments associated with that furnace. Now we have here today, as I said, five of the scientific investigators who have experiments onboard the spacecraft. And so I will introduce to you first of all Dr. Tom Donahue of the University of Michigan, who will explain to you the relation of his experiment, which is the ultraviolet absorption experiment MA-059, which has been mostly completed and is being finished up at this very moment. Dr. Donahue.

DR. DONAHUE Thank you Tom. Now although - and I think properly - the impression is fairly widespread that the purpose of the Apollo lunar shots and the purpose of this shot is other than - is not only science and in fact, is primarily perhaps something else, there is a - it is certainly not a correct impression to characterize the Apollo program for the Moon or this one as a nonscientific mission. There's lots of good science on this - on this mission as there was on the Apollo lunar, in the Apollo lunar program. And of course it is, as Tom just pointed out, our purpose is to let you know what is going on in the way of good science on this mission. Let me first of all point out I have colleagues in this experiment. My co-principal investigator is from the Johnson Space Center, Dr. Robert Hudson. I have colleagues from the University of Michigan, Dr. Anderson; from the University of Pittsburg, Dr. Kaulfman, and the red-headed fellow you might have seen on the firing line during the last week from Harvard, Mike McElory. And in fact we've recruited two people from the Soviet Union, Dr. Kurt and Dr. Istomin. My friends at NASA tell me that our experiment was the most difficult one they ever attempted to carry out in the history of

ASTP (USA) PC42A/3
Time: 15:00 CDT
7/19/75

the Manned Space program. And our experience a few hours ago sort of indicates that they might be right, but fortunately we ended up with a successful data run. The purpose of the experiment is to determine how much oxygen, atomic oxygen and how much atomic nitrogen there is at the altitude where the spacecraft are flying. This is done by a very simple, classical way. It's been done in the laboratory for a long time. You send light from the Apollo that has a special color or a special wave length in the ultraviolet, part of the spectrum that is absorbed only by oxygen in the case of one wave length, only by nitrogen in the case of the other. Let it go over to the Apollo and to the Soyuz, bounce off of a special mirror on the Soyuz and come back to the Apollo and the intensity be measured there. You can tell how much oxygen or how much nitrogen there was between the two spacecraft by the amount the light was absorbed or diminished in its trip. And we carried out that experiment at three different separations, 150 meters, 500 meters and 1000 meters. And we just finished the 1000 meter data take while the two spacecraft were parting from each other a few minutes ago. The purpose of the experiment was in the case of oxygen, which is the most abundant constituent at that part of the atmosphere was to verify by hitherto unused method in space the measurements that had been made by mass spectrometers aboard satellites and sounding rockets for years and years and years and years, but still remains somewhat in doubt. That is this absorption technique has not been used before because we haven't had the opportunity of utilizing two spacecraft in orbit like this, side by side in the past. In the second case, atomic nitrogen, the idea was to detect a species that's never been detected before - it's there in such small quantities. And we have to look at the data more carefully but I think we've - we might have done both of these, it's not - certainly not clear yet. It's interesting that all of the United States participants in this experiment are deeply into the problem of the affect of such substances such as chlorine or freons and nitrogen oxides on the ozone in the Earth's stratsphere. And in fact, that's not an accident because this experiment was conceived about 3 years ago during a summer study at Woodhole to determine how to use the space shuttle when it came available. And we - among the possibilities that still exist and probably will be used is a larger version of this experiment in which you fly a free flying collection of reflectors thousands of kilometers away from the space lab or the space, the space lab carried by the space shuttle and shine light from this space shuttle down through the lower part of the Earth's atmosphere, through the stratosphere to these reflectors mounted on a great big spear and then back, back to the satellite again. We've been thinking about that kind of experiment in connection with a program to monitor substances in the stratosphere that affect zones. Several years ago when the opportunity of proposing for this experiment and this mission came along and we - it occurred to us that we might try the thing out on a small scale in a region where we had reason to believe we knew something about the properties of the atmosphere and that, that in fact is how the experiment was generated in the first place. It's

ASTP (USA) PC42A/4
Time: 15 00 CDT
7/19/75

a little bit too early to say just what the data we obtained a few hours ago mean in terms of the accuracy of the present measurements of atomic oxygen and the amount of atomic nitrogen in the upper atmosphere. But we know that the experiment worked and some one of these days we expect to publish the results in the journal. I guess that's a summary of what we did.

PAO Thank you very much. Thank you very much Dr. Donahue. The next speaker is Dr. Farouk El Baz from the Smithsonian Institution who was the principal of Scientific Investigator for the Earth Observation Experiment. This experiment is one of the ones which has been performed during the joint phase and will continue through out the solar phase also. Dr. El Baz.

EL BAZ Thank you Tom. Ladies and gentlemen, the Earth Observations and Photography experiment does not use a black box, but the three astronauts onboard obtained the data for us. And here we are really using the capability of man as trained observer to make visual observations and obtain photographs of the Earth. The Earth as a whole with all its phenonema, and with all its features. So these observations will be done over land, over the ocean and also the atmosphere. The - that isn't the atmosphere, I really mean the weather or meteology. In the Earth's Observation and photography experiments we have some 40 investigators and investigator groups involved in this and they come from many government institutions and universities all across the country and we also have participation by some nine countries in the experiment. The most important aspect of the experiment is the fact that we have put together the largest ground support team of any mission yet flown in space. We have some 24 different groups, whether they are in ocean vessels, in New Zealand, or off Australia, or off Florida, or New England, to several aircraft flights over India, over the U.S. and also over - near the British Isle. On land we have geologists in the areas in the United States, in Africa, and Egypt, and also in the Arabian peninsula. So we have put together a very good ground support team and I personally believe that all of this came from the interest of the scientific community in manned space missions and what can - trained - or I should say well trained men as observers do from space, visually and also photographically. The fields in which we will be doing much of the work are geology and here we will be looking at the tecktonic set-up.

END OF TAPE

ASTP (USA) PC 42B/1
Time: 15:00 CDT
7/19/75

EL BAZ - - as observers do from space, visually and also photographically. The fields in which we will be doing much of the work are geology and here we'll be looking at the tectonic setup or the fracture system of the Earth. Particularly the very large fractures like the San Andreas fault system in the southwestern United States and also the rip apart structure of the Red Sea and in oceanography he will be looking mainly at ocean currents and eddies and the red tide problem. We will trying to map red tidal currents west of the coast of Florida, and also off the coast of New England. And deserts we'll be particularly giving attention to the drought zone of Africa and other places in the world. And the deserts, which occupy something like one sixth of the land masses of Earth, we will be trying to photograph and document the changes to the desert zones that may be indicative of the growth of deserts in one direction or another. We will be doing this with the aid a new type of color film that is very sensitive - sensitive to color variations and faint color zoning that we were not able to get before. Also in the color subject, we have put together a color wheel that the astronauts did carry in the command module and you may have been seeing them using that color wheel. It's a two-sided wheel with some 54 colors on each side. The side that I'm showing you now is the one that shows the desert colors. And you can see that there is quite a bit of variation of color in the desert and this color difference, also is indicative of the age of the desert. You can see that there are many, many red deserts in the - in the world and we have attempted to get as close as possible to the color of the deserts as described to us by the crew in the training which they did. They flew in T38's over many, many deserts in the U.S. and Mexico, and they used prototypes of the color wheel, and they came back to us - we should change the here - and such and such. And we also have the blue side, which is the ocean colors that reflect the deep ocean color as well as the shelf water colors, which are a little lighter, and also some colors were for the red tide. What we are trying to do is to calibrate the color film with what the astronauts tell us. The exact colors of what they are seeing in realtime. We - in hydrology, we are doing studies of the snow melt patterns in the northwestern United States and the southern parts of Canada, and we are also doing this over the Alps, but the most importantly over the Himalayas, and this based on an international agreement between the NASA and Indian Space Research Organization where the Indian government wanted to obtain photographs of the snow melt pattern over the Himalayas so that we could all work together to decipher the drainage pattern of the snow melts, and therefore they can use this information for both irrigation use or water use and for flood control. In meteorology we're concentrating on the photography of storm centers. That is, to help meteorologists develop computer models of their hurricanes and of tropical storms. We're also doing several studies of environmental value, for instance,

ASTP (USA) PC42B/2
Time: 15:00 CDT
7/19/75

in cooperation with the International Maritime Commission, we'll be watching for oil slicks in the northern Atlantic, and this is in oil ship routes. We're also photographing many of the river deltas of the Earth to study the growth of the river deltas and also to study the problem of pollution. In closing, I also would like to say that we are doing some observation of cultural features and this is basically to determine what the limits of the resolution of the eyes of the astronauts from space. For instance, we're asking them to, without the aid of binoculars or the telescope that they are carrying, which is a zoom sighting scope, without the aid of that, to look out the window and see what they can see. One; the Bonneville Racetrack and the Bonneville Lake in Utah. Two; which is a very thin but long line. Two; a very large structure but basically very different in color from the surroundings, and this is the Great Pyramid in Egypt, and three; very intricate designs in the Peruvian Deserts, these are the Nazca Plain markings. Thank you.

PAO Thank you very much, Dr. El Baz. Next our speaker will be Dr. Friedrihk Vonbun form the Goddard Spaceflight Center. He is the principal science investigator for one of our two Earth gravity experiments. He's going to tell us a little bit about his experiment, and about the companion experiment, which will be conducted near the end of the mission. Dr. Vonbun.

VONBUN Thank you, Tom. The purpose of the geodynamics experiment is, in essence a two-fold one. First, we'd like to determine the gravity anomaly in the Earth's gravitational field. Gravity anomalies anomalies where the strength of the gravity varies to a large extent. And second, to obtain experience in precision orbit determination for future tracking of spacecraft. This mission here gives us really a golden opportunity to do these experiments. Particularly as Tom already mentioned, there are in essence, two experiments onboard. One experiment measures the variation in the velocity between the ATS spacecraft, which is in synchronous orbit, on 36 000 kilometers is orbit and the Apollo spacecraft which is in a very low orbit. So this measures the variation of the speed between these two spacecraft. From that speed variation, we can determine, hopefully, the gravity anomalies of the Earth's gravity field. This is done by the Goddard Spaceflight Center. The second experiment, and Dr. Weiffenbach isn't here from the Smithsonian Institute, does a similar approach, but he measures the variation and the velocity of two Spacecraft which are almost is the same orbit. In this case, he will use the Apollo on one side, and the docking module on the other side. After the mission, the docking module will be kicked off, and will be in a distance of about 300 kilometers traveling in synchronization around the Earth. And the small variations of these velocities will be measured and again the variations in the gravity field determined. We have at the present time two other experiments going on between ATS and Nimbus, which is an unmanned satellite flying in Apollo orbit around 1000 kilometers, and a second experiment, the ATS GEOS. Both of these spacecraft are being tracked

by the ATS when they go around the Earth. The Apollo spacecraft is a third of the experiment. But the importance lays in two things. First, it's very low, which is important because the sensitivity of the harmonics of the gravity field is much higher for a low-flying spacecraft than it is for a high-flying spacecraft. In addition to this, we can do the other experiment between the two spacecraft I just mentioned. That's an opportunity we never had before, and wouldn't have been, if that mission hadn't have flown. Now, what does this do, the two experiments?

END OF TAPE

ASTP (USA) PC42C/1
Time: 15:00 CDT
7/19/75

VONBUN - -that's an opportunity we never had before and it wouldn't have been if that mission wouldn't have flown. Now what does this do - these two experiments? It will advance our knowledge of the Earth's gravitational field and second, we will be able to study (garble) boundaries and maybe even determine gravity anomalies connected with these (garble) boundaries as was already mentioned. And second, we will hopefully improve our knowledge of the Earth's gravity field, which is necessary for improved orbit determination for future precision spacecraft such as GUC which is in orbit right now and GSAT which will be launched in 1968. GUC carries an altimeter onboard and thus is able to measure the topography of the ocean. I have a topography map here in three dimension and I'll show it to you later on if you are interested. But this spacecraft will be able to detect small variation in the topography of the ocean. This in turn can interpreted as wind pileups, ocean currents and other phenomena, which are important for future spacecraft application. Third, the utilization of satellite-to-satallite tracking, that means tracking from an orbiting tracking station. It will give us a possible capability in the future to reduce NASA's numbers of tracking stations around the world. In other words, we'd take a station which we have now around the world and just put it in orbit. We have planned such a tracking station called the TDRSS, a tracking and data readout satellite, which maybe launched on one of the Shuttle flights in 1980 to 82. In summary, these two experiments do two things - advance the science and help us applying space technology for all of us. Thank you.

FAO Thank you very much Doctor Vonbun. Our next speaker is from the Marshall Space Flight Center, Doctor Robert Snyder, and he is associated with several of the experiments on board. He's going to tell us about the electrophorisis experiment, which has been concluded and a little bit about a companion experiment onboard, another electrophoresis, which is yet to be performed. And he's going to tell us about the furnace experiment which has been performed during the joint phase and will continue into the solo phase. Doctor Snyder.

SNYDER Thank you, Tom. There are essentially three space processing experiments on ASTP as Tom has just mentioned. The first experiment, which is an electrophoresis experiment proposed and developed by the German government, Professor Henning is the principal investigator with the Max Planck Institute for Biochemistry, has been completed. This was a type of electrophoresis using a system that he has used on the ground quite successfully to get separations of heavy human and animal cells. This experiment is using essentially the same type of apparatus with the same fluid components but utilizing the advantage of space for electrophoresis, which is the weightlessness, to accomplish a better separation. This - the weightlessness is the unique feature of space for the processing of materials. The heavier of materials of electrophoresis, the living cells, the heavier components of alloy and metal systems that normally on Earth will separate and segregate, do not - this pheromena

does not occur in the space environment. The second electrophoresis experiment, which will be begun on Monday, is an electrophoresis technology experiment developed at the Marshall Space Flight Center, which will incorporate several separations. One is the separation of red blood cells to measure and assess the separation capability of the facility. There will be again a separation of lynphocytes to - into subpopulations of these lynphocytes. There will also be a - an experiment with kidney cells proposed by the Abbott Laboratories. And this - in this case the kidney cell species that are desired by Abbott Laboratories are those kidney cells that are producers of urokinase, which is a blood clot dissolving enzyme. The fourth experiment which is part of this electrophoresis facility is called an isotagophoresis, which is a fairly new modification of electrophoresis, again the principal application is for the living cells which can not be separated on the ground because these cells are larger more dense than the separating medium. Each of these electrophoresis is using a different system to accomplish this kind of separation. With Professor Hanning's system that has been completed, the fluid system is in motion, but on Earth thermal convection induces a broadening of the bands that he gets. Also with the ban - with the living cells, they sediment in his facility. The US electrophoresis, which is called Electrophoresis Technology MA011 is using a static column electrophoresis system where the fluid is not in motion. This is more of an analytical system. The multi-purpose furnace experiments consist of, as Tom has mentioned 7 separate melting of metals experiments. The MA010 is a furnace system, which is an electrically heated furnace, single zone, in which three experiments at a time can be inserted and the samples melted and and solidified. They can be grouped essentially in 3 different catagories. There's the crystral growth group, where the objective is to produce more homogenious, more perfect single crystals of materials that have semiconductor electronic applications. Metals and alloy systems, where you're dealing with metals of several compoments, the components normally having a range of densities that in the molten stage will tend to separate and segregate. There is also a third catagory of experiments where the principle objective is to elucidate and clarify phenomena such as surface tension induced convection that occur on the ground, that can really only be clarified in the weightless environment of space. We began several these experiments as demonstrations on the Apollo missions. The multi-purpose furnace that is being flown on ASTP is basically a modification of a furnace that was flown on Skylab. And indeed several of the investigators are using the ASTP mission to clarify and expand on the results that they did obtain on Skylab. The electrophoresis is essentially a new experiment. It has not been done is space before as a - an experiment with the living cell. Model experiments have been done in the past however. Thank you, Tom.

PAO Thank you very much Dr. Snyder. Our final speaker Dr. Stu Bowyer from the University of California, is the principal

scientific investigator for 2 experiments on the ASTP mission. Neither of these has yet flown. They both have very interesting application and implication and will be conducted during the second part of the mission and so he is going to give you sort of a preview of things to come. Dr. Bowyer.

BOWYER Given the time that's available, I think I'll talk, Tom, just about the extreme ultraviolet telescope experiment. The collaborators in this are Dr. Michel Anton, Dr. Paresce, and Dr. Margon(?) and than there two graduate students involved, Bob Stern and Jay Freeman. If it works they'll get a - their PHD out of this sort - this work. The - if it doesn't work, why, we'll have a major disaster of various kinds. The - we have a large number of ground base astronomers in the United States and several foreign countries including observers in Russia, that are getting collaborative data and we also have a very sophisticated amateus group called the Association of Variable Star Observers, who are helping get correlated ground base data. I'd ought to take a moment which will be far too simple for most of the science writers here, to make a comment on the nature of extreme ultaviolet radiation, so you can all go to sleep and the rest of you can bear with me and then we'll wake up the science writers again when I get through this little chunk. Most of astronomy information is obtained from the study- -

END OF TAPE

extreme ultraviolet telescope experiment is to see if we can observe objects in the extreme ultraviolet and see if in fact the interstellar medium is clumpy enough so that we can peak between the clouds and make these measurements. Now we'll look at a variety of objects that - there are hints that they may be emitting extreme ultraviolet radiation. And I would have liked to have shown you some of the optical counterparts of these radi - of these things because they're very spectacular but is isn't practical in this sort of a format. But they really - the optical part of this radiation is - is very interesting. We won't be looking at the optical part, we'll be looking at the part that hasn't been looked at before the extreme ultraviolet part. That's in fact if it can be done. Now, - now if we do observe it we can maybe - we hope to be able to say things about such topics as the death throes of a star - the death throes that are on some will go through eventually. And these - this sort of data is what we will eventually hope that we will publish in the scientific literature. But if we in fact can detect objects in extreme ultraviolet, I think we will have done something considerably larger than that, we will have demonstrated that a field that was thought to be impossible to do is in fact possible.

SPKR Okay, Tom.

PAO Thank you very much Dr. Bowyer. I think it would be appropriate now to open the - the briefing for questions.

QUERY Dr. Bowyer, I'm just interested in why the human eye can't see the higher frequency parts of the electromagnetic spectrum, and the lower frequency parts - I'm one of the more simple-minded science writers.

BOWYER Okay, that's fine, adelightful question. In fact those - these wavelength bands get absorbed by the Earth's atmosphere, so if there were - in the process of evolution if some species got evolved that got its information about the world, like there's a bigger animal trying to eat me, or there is a smaller animal that I can eat, he would have a severe deficit, because - that radiation is absorbed by the Earth's atmosphere. And he would not catch the other guy, or the other guy wouldn't catch him. And therefore his protoge [sic] would not survive. So the very fact that those wavelength bands are transmitted by - that's the case in optical that's why your eye sees there. - why it doesn't utilize radio as a little more complicated but that's so it - -

QUERY Is it accurate to say that we can't see it because high energy stuff is moving too fast to be focused and the low energy stuff isn't intense enough to for the eye to pick up?

BOWYER Okay, I - the - you're in a - a much more technical area and I had - I think maybe we should defer that conversation to afterwards - you know the general statement is that your eye can see there because that's where it's usful to see, and that's why you're here and the other guy isn't. The guy that could see at ultraviolent waves isn't around.

ASTP (USA) PC42D/3
Time: 15:00 CDT
7/19/75

GARRETT Would one or more of you gentlemen care to comment on some of the Senator Proxmire's charges that ASTP is a program with no scientific value?

BOWYER Yes, I would. I was considerably angered by that comment, and - my group and I have been working for over 2 years. Most recently for instance we had shifts working through Easter vacation and only one shift on Easter Sunday, itself. And I hope I was able to convey to you why our scie - why our experiment - in fact new science and why it is very useful science, or potentially - it's an exploratory new thing that hasn't been done before and to have Senator Proxmire say there's no science was - I took that as a personal insult. I called his office - and a got his administrative assistant in charge of keeping track of space research and he - flatly contradicted what the Senator said. - Oh, he said "No, no, that was not meant to say that there wasn't any good science onboard and - yes, no we weren't talking about your experiment and all that." But fact I - I went - some of our colleagues went to the trouble of getting his speech. And he certainly did say that. And there's been considerable debate among some of us as to how we should respond, and if we should respond, and NASA's general comment is that we should not - that's a political thing, - and Senator Proxmire can be against the ASTP program or anything else like that but he certainly is just dead wrong when he says that there's no science.

QUERY What - -

SPEAKER You listened to - you listened to a discussion of some of the - some of the science that is being done on the mission and if you listen to the names of some of the people involved you might have recognized names of people who are working very hard in in pure science - and in some of the more important social questions that are associated with the applications of science today, such as the problem of the - of the destruction of ozone Ozone layer for example. And I think that you could - one - we could leave the verdict to - to the audience to decide whether or not there is any good science on the mission or not. There are a lot of good scientists put a great deal of effort into and a lot several years of their lives in - the preparing - experiments for this mission.

EL-BAZ I'd like also to - add something on that the - I really would like to say that NASA did make a very concerted effort to put as much science on the mission as possibly could be done. And it is I should also say that the - the Senator would be unfair in saying that there is no science knowing that he has - he may have not really read the document that said what there is on ASTP and here are the experiments and what they might do.

QUERY Dr. Donahue, were - there was some suggestion over the intercom earlier that the - the readings weren't good on your - absorption experiment. Can you detail what happened on that?

Time: 15:00 CDT
7/19/75

DONAHUE Along with the - the first - data take this so called 150 meter data take - the one in which the - the Apollo went out of plane 150 meters, and executed an arc while it - while Deke Slayton was attempting to point - the light source on the - aboard the Apollo at the Soyuz we couldn't detect any reflected signal from the corner reflectors on the Soyuz and - came to the conclusion after the whole experiment was over - that is in fact after we decided to shift to a different corner reflector mounted on the rear of the Syouz, from which we got good data, that - very likely and unfortunately he had looked on to a window of the Soyuz, that is not a good reflector in the ultra-violet. So we didn't get data on that part of the - on that - at 150 meters. But we did get data at the - at the other separations, so we have data to analyze.

QUERY Dr. Snyder, on the furnace experiments the results that Skylab furnace experiments - the results the Skylab furnace experiments was there something there that was mysterious that you had to recomfirm on these?

SNYDER There are several - there are several surprises with the Skylab, and one in particular where we are repeating essentially parts of the experiment. This is a vapor growth, this was professor Widmar at Rensselaer Polytechnical Institute. He got one crystal that was a factor of 10 larger than he had ever seen on the ground nor reported by other people working the same Germanium taluride,(.) Germanium celanide system. This crystal was not only larger, but a larger quantity of the crystaline material was transported in the Skylab. Now he is doing a similar experiment on ASTP - ASTP to check this out, and verify that indeed this - this crystaline perfection is improved. Professor Gaytose(?) from Massachusetts Institute of Technology did a crystal growth with indium antiminide(?) at which - during which he observed a crystaline perfection that was far in excess of what he had achieved on the ground he's doing more detailed studies of a similar system on ASTP.

QUERY Are these crystals potentially useful - electronic components?

SNYDER Oh, yes, well germanium is one of your major semi-conductor materials. And these germanium teluride,(?) germanium celanede, these are mixed crystals. These are very complicated crystals that in the vapor phase on Earth the vapor is constantly in turbulence during the crystal growth. On the ground - on - in space where you don't have these very turbulent vapor phases, because you don't have thermal convection. Your able to get this crystaline perfection that he has never seen before. And this - this crystaline perfection - -

END OF TAPE

ASTP PC42E/1
Time: 15:00 CDT
7/19/75

SNYDER - - we get this - this crystal perfection that he has never seen before. And this crystal perfection then leads to improved semiconductor and electronic properties. Because the crystal perfection is better.

QUERY To bring the status report up to date, can you tell us of anything that's hopelessly lost? And then I have a - a subdivision that I'd like to get to later on that.

SNYDER Yes, we have lost some data. On - but no experiment - that is no entire experiment. Many or most of our experiments extend over a period of time and during the first part of the mission where we were getting behind in the timeline we had to sacrifice or lose the opportunity to take scientific data there. So pieces of experiments have been lost. They were however experiments which continue throughout the mission so they will - are expected to form a small part of the loss of the total experiment result.

QUERY I wanted to ask especially about the German electrophoresis experiment when that sample got loose in the cabin. It wasn't clear to me whether it was contained or whether it was a loose glob of fluid that was floating and recaptured -

SNYDER Okay, the samples was in its own special container in the cryogenic freezer. Now the cryogenic freezer has a cap on it and apparently when the cap pulled off a pressure differential existed in the freezer for some reason - a very small pressure differential - and this sample which was contained in - its own container did seem to come out and again in space - once in motion it stayed in motion until captured. It did - it was - the sample which was rat lymphocytes was totally contained though.

QUERY I have a question about eyes again for Dr. El-Baz. I read - I remember reading somewhere that the human eye is one of the best instruments around for doing comparative color studies. Is this the reason why you're using this color wheel, and what do you feel that's going to tell you about the pictures you get back?

El-Baz Okay. We get the - human eye supposedly under theoretical conditions can distinquish some 10 million color surfaces. The idea of using the human eye as a detector of actual colors, indivisible naturally, is a very sensitive instrument particularly when one considers the - the interaction between the eye and the interpretive powers of the brain. What if the person that is looking is trained and he knows what he is supposed to be looking for, particularly in things like the zoning in a desert for instance. And as you said correctly the color wheel that we're carrying is to calibrate this so that we personally would know from the crew what were the exact colors, because if the eye can see very well the brain can not remember very well. So we could not really wait until after the mission and then give them the colored chips, and for them to tell us what colors were they, so that they had to be looking at a color wheel to be able to read us a color in real time at the exact moment they are looking at it to make that comparison. And from this we hope to learn ourselves what the real colors were and also perhaps calibrate the color films that

we carry onboard later for that.

QUERY Does this mean that you would be - put more trust in that real time accessment by the human eye than the actual colors you'd see on the photographs?

El-Baz Yes, indeed, because we have had in all of the missions, whether they are lunar missions, whether they are Skylab missions, we've known from all crews that the color in the color photographs that we - they bring back is not as good as they were able to see and it is somewhat different.

QUERY Dr. Donahue were you suggesting that from your early data you do have indications of atomic nitrogen at that altitude?

DONAHUE I'm not prepared to say yet. We have to look at the data carefully - we - we've received the nitrogen resonance signal return from the retroreflector, and now we have to look at the data and see if it was absorbed. And I didn't have time to do that before I came over here. I ran over here right after the last data take.

QUERY I have an update to the German Electrophoresis experiment. They had four samples and the first one was apparently partly damaged. Could you tell us what kind of (garble) they had different samples, and I think the first one they had blood cells is that correct?

SNYDER The first sample were bone marrow cells from the rat. The second - the second sample were a mix of rabbit and human red blood cells. The third sample was lymphocytes from the rat and the fourth sample which was in the cryogenic freezer and frozen before they did the electrophoresis. This was their back-up sample, was a repeat of the rat lymphocytes.

QUERY Conducting pure research on this flight - I think we've established - you wish to do more can you fly another flight without the political show of this one for pure research? Is that possible?

SNYDER Are you referring to like an Apollo spacecraft mission? The type that we have been flying for several years? If so, the answer is yes, we don't need to develop new spacecraft to fly pure scientific missions. Even though the Apollo spacecraft was designed almost entirely with requirements specifically for transporting and returning men to the moon, it turns out that the spacecraft has high capability for performing scientific missions. So, by all means continued Apollo flights could be scientifically very useful in the Earth Orbital Mode.

DONAHUE But, NASA has problems - has programs other than - than the - than manned spaceflight. There is an office of space science that flies unmanned spacecraft to various places in the world. I'm head of a science team for the investigation of Venus for example. And there's coming along in the future the Spaceshuttle with the - with Spacelab, as the big program and the manned space program and they are many many plans to utilize the Shuttle, to carry very exciting payloads into orbit and to revisit them, refurbish them such as as defraction limited 2.4 meter telescope, a whole host of high energy deflecter, called a high energy observatory, and a - laboratory to make the kind of investigations of

the nature of the Earth's atmosphere, and the lower atmosphere or the Ozone is called AMPS. So their manned space - manned space - program has great plans for the future in this area.

QUERY Dr. Donahue, could you tell us more specifically how the results of your experiment could effect the modeling of the ozone layer? Is it now going on?

DONAHUE Well the results of this experiment itself are - virtually are - are - are only remotely related to the ozone layer in the sense that the data were obtained at 225 kilometers, and the ozone layer we're worried about from about 50 kilometers down to the - down to 15 or so. It's - and so the that applica - I mean that relationship is somewhat remote. But not - not all together because a - a precise knowledge of what is happening to atomic oxygen at high altitude is important to understanding the entire system. It's from atomic oxygen that ozone is made - but when I discuss - when I mention that there was a relationship I - I was talking about a technique a technique that we're planning to use aboard the AMPS payload on the Spacelab will have a tunable dilaser in the ultraviolet capable of sending intense radiation over long distances and - the - much larger version of this reflector in orbit itself many many thousands of kilometers away, and we send the radiation through the lower part of the atmosphere to the corner reflector and then back again. And so - infact some of the constituents of the Earth's atmosphere that are important in determining how much ozone there is there.

QUERY More questions if I may Dave, first Dr. El Baz, given the fact that you have neither the time nor the sophisticated photographic equipment that you had on Skylab, what kind of gains do you expect to make in the Earth Observation Photography?

EL-BAZ The experience that we have had from Skylab helps a great deal into making our questions of things to observe very specific. That's why we do not really need the time. And we really would be looking at something even though we come very quickly on it and maybe we'll see it only once but the crew would be aware of the problem. And they are trained for it and they know exactly what we're looking out for. And this is the problem of time. And in - although there are sites where we have 4 and 5 passes over still with the 9 day mission. The other part of the question that relates to the photographic equipment - I think we have improved the Hasselblads quite a bit. First of all we are having two cameras. One of them has the reso(?) plate which can keep the film back into the - the - film - backing - or the camera backing, flat so it can actually make photogramatic measurements so we can actually make controlled photomosaics from this film in addition to the fact that we are carrying a special color film which would enhance the color sensations or the color sensitivity of what we get back. And the other thing we did is that we're flying the one of the Hasselblads has a single lens reflex mechanism which allows the astronauts to see exactly what he is photographing in real time.

QUERY And another question which may appear somewhat simple-

minded and is being here only because NASA does not put out press kits, in audio form that can go on the radio. Why what's the value of isolating pure human cells?

SNYDER This - the blood cell is one of - the lymphocytes in particular - is the major disease fighting cell of the body. And lymphocytes are slightly more dense than the normal body fluid. They're very susceptible to contamination from other materials that may come in contact with them. And when separations other than the very gentle separation are done their delicate membranes are destroyed and the cells themselves are destroyed. Electrophoresis which simply applies an electric field to accomplish this separation is a fairly delicate separation technique. But, it is disturbed on Earth because the cells are large and dense, and techniques on Earth have given very poor separations. The best separations of your lymphocytes have been accomplished by Professor Hanning in Germany with a flowing electrophoresis apparatus. But this apparatus is hindered by thermal convection which distorts the bands and sedimentations which causes the cells to sink and mix. In space without the thermal convection, and without the sedimentation we should be able to get a an improved separation. And then once we have this improved separation we should be able to determine what these different lymphocyte populations do do.

QUERY Dr. El Baz, where are the volcanoes that are assigned for viewing Thursday and why was the fire triangle and the city of London included?

EL-BAZ Okay, viewing every mission from the time of Skylab, there have been some volcanoes active on Earth, and the observation of the active volcanos only is an indication of where the wind direction is. How much disturbance to the - to the atmosphere as the venting, (garble), so on, so you get some - some information that would be useful from observation of volcanic activity. But, during this mission we have a possibility of the action from Mauna Loa in Hawaii, and the Adina(?) volcano in Costa Rica and the Mount Baker in the north wes - in - Washington. And the crew are aware of this and they will make whatever observations as necessary in real time and that will give us a feeling of the direction. Now in the case of the Afra(?) Triangle this particular part of the world has exposed one of the major very old scarps that resulted from the ripping apart of two large continental plates. And this scarp is exposed on the ground and we would like to have detailed photographs as we see it from orbit. We do not have detailed photography of - of that particular scarp of the scarp of the Ethiopian plateau. And that's on the western part of the Red Sea, and the last part of the question relates to the - -

END OF TAPE

ASTP (USA) PC42F/1
Time: 15:00 CDT
7/20/75

EL-BAZ - - and that's on the western part of the Red Sea and the last part of the question, it leads to the city of London, where we're really more interested in the Thames River and the London harbor and the pollution that comes from the Thames, but this is also related to an oceanographic study of the English Channel in which the - our oceanographic team is cooperating with the RAF and making over flights and studying the water in the English Channel in general.

QUERY I have two questions. First is to Dr. Voyer. I wonder whether time has been allotted to the astronauts to observe the comet that was first discovered about 10 days ago.

DR. VOYER All right, that's an intriguing question. At the press briefing before the launch, it was the first time I was aware there was a comet there. I was driving across the country to the launch site, and a reporter such as yourself, brought this up and I was excited about it in principle, but in fact the astronauts time is very closly apportioned because of NASA's desire to make sure that the maximum possible return is achieved in this flight and so as - I didn't want to put NASA on the spot as to saying yea we would like to observe that and then not be able to fit in the time line. Now, in fact, I was encouraged by NASA to investigate to see if we could get a useful measurement. And I called up a colleague who has made the only observation at these wavelenghts of the comet. And the first indications were that well our detector is a factor of a 100 to 1000 times more sensitive than his detector was. Now the problem is that he made, the measurement that he made was made at a comet - it was at Kahoutek and it was very close to the Sun and by the time you put in the factors that are different because of that, it turns out that you lose more than you gain. And so we wouldn't - it looks now as if we won't get that much more new information, although we're still looking at it to make sure that maybe at the end of the mission it will of moved in close enough that we can do something, but we are - our spirits went up, down, up, and now they're sort of down.

QUERY Let's see. What is the comets name please? Has it been given one, even an unofficial designation - -

SPEAKER Yea, it's given one and you know it'll take you back, it's on my desk up there. I can tell you more about it's evaporative rate of hydrogen than I can it's name.

QUERY Okay. My second question is to Dr. Vonbun. Whether the Earth gravity experiments that you described will help in deciding whether the gravitational constant is decreasing as some scientist have speculated?

DR. VONBUN Are you referring to Professor Dekov(?) from Princeton. The answer to this question is no. The sensitivity of our experiments is not in that order of magnitude. The gravitational constant varies a part attentivly in 10 to 11 percent if I recall right. And those kind of sensitivities cannot be obtained from observations we're doing. Our observations are purely directed toward the gravity anomalies and the gravity field itself, but not such a sensitive variation which you talking

about.

QUERY This question is for Dr. El-Baz. First of all, you said that you were going to map the occurrences of the red tide. I was just wondering what the value of this mapping will be, considering it's all of it will be done, you know, in a 10 day time frame and this is sort of a dynamic kind of event.

DR. EL-BAZ We find that the red tide is really not such a dynamic phenonemen. The red tide of both, Florida and New England, stays around for the summer. And we know from the ocean and the shiping or fishing fleets that it comes pretty close to shore wherever fisherman would go on fishing. You know this red tide is a microorganism that is poisonous to fish, that it disturbs their, and it also disturbs the respiratory organisms of man. And every summer, for instance in New England, between July and August, every eye and lung in the northeast coast between Washington and Portland, Maine is occupied because of that red tide. And what we are attempting to do is to obtain visual observations and photographs, successive photographs taken of places where we suspect, there will be larger, rather large red tide blooms of the ocean area off the coast. Then when we are able to map this we have vessels in the ocean making measurements and taking samples of this who will be able to make this information available to the fisheries and the local commissions of public health, as for instance we're doing in Maine and Massachusetts and New Hampshire.

QUERY Also, you said that you were going to look for changes in desert zones. I was wondering what you feel you can do along this line that isn't possible through LANDSAT imagery?

DR. EL BAZ Okay. The LANDSAT imagery can provide and has been providing us with a lot of data from - of the desert regions. And what we can see in the LANDSAT data particularly is the vegetation and interaction between vegetation and the deserts. But, we do not see in that imagery real color so we do not know which part of the desert is younger and which part is older and which way the desert is growing. All right because we can't get indications, most of the desert sands contain a little bit of iron and the iron if you keep it long enough exposed to the atmosphere it will get oxidized and the oxides are redder so you get a redder desert just by leaving it for a longer time and we have the visual comments by the crew with the aid of the color wheel and also the color sensitive film to be able to delineate these zones. And also the changes in the dune patterns and interactions between dunes and topography and that will also give us a feeling of which way is the prevailing winds and which way is the desert growing and this data we cannot get from LANDSAT.

QUERY Dr. Bowyer can you tell us what the role is of the astronauts in your experiment? In other words, can such an experiment ever be performed by unmind - unmanned astronomical satellites?

BOWYER Right. I can answer that in a two part question. In this mission the astronauts role is to point the telescope. The telescope is about 2 feet across in size, a fair - it could fit on

ASTP (USA) PC42F/3
Time: 15:00
7/20/75

this desk quite easily. And - -

END OF TAPE

ASTP (USA) PC42G/1
Time: 15:00 CDT
7/19/75

BOWYER - - point the telescope, the telescope is about 2 feet across in size - a fair - it's - it could fit on this desk quite easily and it's hardmounted in the spacecraft. And if you recall seeing the spacecraft, it's this giant huge thing, and so we sort of have - and the way they point this is they point the whole spacecraft, using the inertial guidance system onboard to provide the angle,. So that the line of sight of the telescope is directed at the objects we want to investigate. So what we sort of have is just a moderate sized telescope with the world's largest mounting. Now, it could be done on a device - a search like could be done with an unmanned satellite. The cost for such a thing was looked into and it would in terms of a grant to us on the order of six million dollars and it would probably cost NASA another four million dollars and you're talking about some maybe 10 million dollars. Now, the cost for this mission - given that the mission already was to occur - the cost for doing it was about a million and a half dollars. So that, given the mission already occurring, it's a considerably cheaper way of doing it. And given the fact that the skeptics may be right, maybe there won't be information there. Maybe we'll - eventually we'll study this wavelength band. There's no doubt in my mind. But it's - the question is, is our technology level at this time up to the task? And it seemed to me like a perfect opportunity to answer the question, is pir technology able to do it. If we can do it - if now, with current technology, we're able to make these measurements, we'll be knocking at NASA's door, and so will a number of other groups saying let's push this area. On the other hand, if it turns out we don't see anything, then NASA will almost assuredly say, wait until your technology has evolved before you do anymore.

QUERY Your Proxmire statement about the scientific experiments not being on the ship may have something to do with the same thing that we get a lot of complaints with. Why are we doing this sort of thing? What does it mean to the woman in Peoria, Illinois? This is the ideal situation where you have all the news people here covering it. Other than scientific research, how are you going to get this information back to us so that we can tell our people what kind of data you have gotten, and why it is important to the woman in Peoria, Illinois?

FRANK I could say a few comments. As you may have notices from the description of the overall experiment program, it isn't just scientific research that we are doing. But, also research in connection with applications or direct application. And here again, we've been discussing with you the electrophoresis experiments, and the materials processing experiments. Dr. El Baz mentioned to you in the Earth Observations some very important applications for the water control for the population of India, which information would not otherwise be available to them. To dissiminate information like this, the way it has been done in the past, and probably will continue to be done, is that we make the inputs directly to the field. The characteristic about the space program, as I look back over the years of our

ASTP (USA) PC42G/2
Time: 15:00 CDT
7/19/75

experience is that we deal in topics which are so sophisticated that it does not embody a large number of things that are easily understandable to the woman in Peoria. What happens is that the advantages and the benefits, the results of the Space Program go directly into the electronics industry, the materials applications, or the medical applications, in a very sophisticated and complex way so that they are there, but not highly publicized. Because the simple things can be done without a Space Program, it seems to me that our efforts toward the benefit of mankind, other than the pure cultural aspect of scientific investigation will continue to be on this very high level, very complex or technical level, and will probably then not be so widely discussed with the woman in Peoria, but with her doctor, with the person who manufactures her radio or other appliances in the house. So she receives the benefit, but she isn't concious that it came from the Space Program.

QUERY But then, the problem comes back to, how do we justify the money that you're trying to get. The people in small communities are the ones that fight your program. And we're trying, I think that the press that are here are trying to fight that and say, no, there are worth, but it's very difficult for us because you do keep everything so quiet and so to yourself. Okay, it does take a little bit longer to explain some of these things, but there are simplified ways of doing it.

SPKR Be glad to talk to you anytime.

QUERY Just how are we going to get the information other than through scientific journals? Do any of you have plans on doing it other than through scientific ways?

EL BAZ In Earth observations of photography, there are ways and we have the ways of doing this other than scientific communication and scientific journals or waiting for the preliminary science report. In the Earth Observation photography team, much of the data is being taken for a specific scientific group, and that specific scentific group is in touch with all the local people who would benefit from this. For instance, in Tampa, Florida, where you come from, Rita, the NOAA scientists are in touch with the local fisheries. And the local fishing fleets also know that NOAA has a vessel to support this operation, and the data that we will acquire, and we are also in constant tough with that NOAA vessel in the Gulf of Tampa and all the data that will be acquired will be given to the local - -

END OF TAPE

ASTP (USA) PC42H/1
Time: 15:00 CDT
7/19/75

EL BAZ - - and we are also in constant touch with that NOAH Vessel in the Gulf of Tampa, and all the data that will be acquired will be given to the local people in - Tampa, Florida. And this is the case with all the rest of the of the sites that we have. And even in foreign countries we have this too. The photography of the deserts in Egypt the people that are there collecting samples and so on, and the material will go to them, and they will help analysyze it, and they will know about it there. This is for - in all the sites we have, groups like this doing the work and will receive the information, and well disseminate it locally for whoever will benefit from it.

PAO Let me add a few comments to this. You've touched a sensitive nerve. We are constantly at NASA subjected to this question and I'd like to return it. Do you have any suggestion what we should do in order to help. And I think we will be able to and we'll be willing to, but it a two way street. I think we're honestly trying to help the - provide information. But if we don't do the job, maybe it's because we don't know how and if you'll let us know I'm sure we will do so.

QUERY Well, could we clairfy one point in that respect then. Very often, even we in the technical press are told scientists don't publish in the press. They wait to publish it in some technical journal, yet this is - all these programs are being supported with public money and we're spending money to send people down here. Are we gonna be told when we go to NASA that no, you can not have the information. We can't tell you, we're gonna publish it in our technical journal first.

PAO I don't think this is really the case, well it shouldn't be anyway. But to make an example for instance on the - on the LANDSAT data, which is a guided satellite, there are thousands and literally millions of pictures distributed around the globe and I think everybody saw them. And everybody can just send a thing in - a request in, cost 5 dollars, and you get a picture. Now in these programs here and particularly is all the applications program, where I'm particularly associated with, I think there is no reason, to my knowledge, that we are withholding information. If we do so, which may be the case, we really do it unintentionally. And I'd really like to suggest to you to let us know what we can do. Hold more press conferences, or whatever you suggest, I think - say we'll try to do so.

SPEAKER Yeah, but just wait a minute. As far as basic scientific research is concerned, there is an old and I think very - and very useful method of handling publication, and that is to try to make sure that the information that you're publishing is as reliable and sound as it can be by subjecting it to review, to refereeing, we call it, by our peers before it's published. Now once it reaches that stage at which it's been looked over and our peers judged that we haven't goofed up in some stupid way, then there's no reason whatever that we

shouldn't - I feel that we shouldn't talk to you. But in my area in particular, there's probably been a little bit too much talking lately, too quickly, in specifically I'm referring to the question of the affect of anthrobiogenic pollutants on the - on the stratasphere. Lots of things have been said rather, more quickly, perhaps, than they should have been said. So there is - there's a stage in when one ought to be sure before he gets into the headline.

PAO I'm going to take one more question from Louie Alexander and then we'll have to break off. We do have a change of shift coming up shortly.

QUERY This is a very simple question relatively. What you're calling experiments, would it be equally correct to call that research or research studies?

PAO In general, the entire package of experiments is research. The reason why we at NASA call them experiments is to indicate the funtional aspect of it. That is we perform some operation onboard which is something different that just spacecraft maneuvering or other things so we say we are doing experiments when in fact of course we are doing research with all of these experiments, whether they are for direct applications or whether they are for cultural research. Before we conclude the briefing, I'd like to thank those of you who came today for expressing such interest in the space program and in the experiments program. I have two anouncements. First of all, several of you had expressed interest in seeing or interviewing Dr. Herbert Freedman of the Naval Research Laboratory in connection with his soft x-ray astronomy experiment on the ASTP mission. He will be arriving in Houston this evening, sometime after 7 p.m. and will be available thenceforth throughout the mission. The other announcement is that later on this afternoon one of the activities that will be performed by the crew is something called Science Demonstrations. Those of you who are wondering what these are all about and if you are interested receive clarification on this point from Dr. Snyder. They are placed onboard the mission by the Marshall Space Flight Center and he is a good point of contact for description of that effort also. Thank you.

SPKR I might make one point in regard with telling the people what is going on with the space program and what are the implications for this. This is a repeat of demonstrations - science demonstrations that were done on Skylab. These were prepared in the form of film that were distributed widely and quite a few people have gone to the trouble of taking these films, putting their own educational material together and giving these films to junior high schools and high schools throughout the country. There was a water droplet demonstration there were different colored Tea and Tang and this sort of thing that the science that you can get from these demonstrations. This is the type of thing that will be done this afternoon.

END OF TAPE