

SPEAKER: This illusion is perceived --

DR. BERRY: Could we ask the panelists to please come up and take a seat at the table?

Well, colleagues, ladies and gentlemen, we've reached that point that we've all been waiting for, to try and decide the total meaning of all the material which has been presented. That's an awesome task. I think Dr. Dietlein did a fantastic job of pulling his material together. I certainly think his summary was excellent and he did a very good job of telling us where we are.

There are a few remarks that I would like to make at the outset, and then I would like to note how we're going to work the remainder of this session. For this period, we have asked the panelists covering various areas, to be a part of this discussion and give their views of the data. They're not limited to their special area of discussion, but they should present their views concerning what they have heard of these results. These statements will be relatively brief so that we don't end up with a whole series of papers all over again. The objective is to have some interchange among those of us on the panel and with you in the audience. We particularly want those who have been investigators, those of you who have been carrying out some of these studies, to address questions you may have to the panelists. It would be interesting to determine if they view the data the same way you did.

Now I think it's very important that we all realize one of the things that Dr. Dietlein said and is well stated in the title of his paper. This point is still a beginning. It's a culmination, though, of many things, as you saw from the slides that he presented; and that there are many people in this room who have had a tremendous amount to do with reaching this point. There are some people whom I think have not been singled out--and

*Skylab
Simpson*

that this is always dangerous, once you start doing that. I want to say at the outset that there is no way possible that I could single out all the people in this room who have something to do with making today possible and this day is possible only after roughly the last 15 years of activity in this field--a tremendous effort to get us to the point where we had data to review as has been done today.

I would like to congratulate the entire biomedical team for the development of this symposium. As you know, this team is composed of members from both inside NASA and from the scientific community. Within NASA we have people from the Johnson Space Center, from other Centers and Headquarters. My congratulations are directed to this entire group, and in particular, to the Johnson team who worked so earnestly in organizing the program in which we are participating this afternoon. Now some of the individuals who are in this audience are people who have formerly worked with this team in one form or another. They've had activities tied with the team--trying to get data for one area or another or working with the operations teams. Many of you are here because of those particular interests and we're thankful to all of you. There are some people here, though, who have played a particular role in some of our activities over the years because they've taught many of us and led many of us down these productive paths. Dr. Strughold I see sitting over here. He's been with us for many, many years and really led us into space medicine. I think we owe a particular debt to him. We also have a couple of people in the audience who were quite active in leading the team of us who were involved at the very beginning of the program back in the Mercury days. They have since moved to other areas, one of them only recently, but they are still very tied to our area of interest. I'm referring to Stan White and Bill Douglas, who are here in the audience. We have Dr. Hitchcock down here in the very front of the room, and it's people such as he who have helped to teach us along the way and have made great imprints upon the capability to

develop data such as you've seen here. Dr. Bjurstedt and Dr. Gauer from across the oceans are here with us in the room. You've heard Dr. Gauer's name mentioned so many times during the symposium. Drs. Luft and Sam White from Lovelace started very early in the program working with us, and they have continued with that activity. We could go on and on and on with people like these. There is another thing I would like to emphasize---there are a number of panelists here who went through some very trying times with us.

I saw Herb Hultgren out in the audience during the last 3 days, and I'd like to say something about the role he and some other fine people played with us. You've heard many very fine comments about what great teamwork we had; what a great job everyone has done and how happily it's all ended. Today, everyone is bouncing and full of joy. I'd like to tell you that this last year has not always been bouncing and full of joy for the people who have been working on this program. At times, I tell you very personally, I considered it hell. And I'm not sure that some other people on the team didn't consider it that way also. So while it has all turned out great, I don't want anyone to go away from here with the idea that it's easy and that it all just sort of happens because it doesn't just happen. There were daily problems, and these were alluded to in some of the opening morning speeches when some of our key people in the Program office mentioned that there had been some of these early problems. Some of the people who were talking about the program operations mentioned these, and there was daily some sort of difficulty in trying to work out the problems which were occurring on a minute-to-minute and hour-to-hour basis. These problems and their resolutions were important to the outcome of these data which you've heard discussed here. While some of them may have sounded not important at the time, they had great importance;

and those decisions required were not always easy to reach, and they always weren't made to everyone's satisfaction, of course. There was severe management concern, and Dr. Dietlein, I think, led up to that very well in some of the things that he was telling you about past history.

I'd like to call to your attention the fact that the cardiovascular system, while it was the first system that was ever noted to show measurable changes and with which we had problems, certainly remained one of concern. This concern was augmented by our problems with Apollo 15--the arrhythmias which were mentioned--and then a great deal of data which we obtained from our Russian Cohorts. I would just make one parenthetical statement here; that we have come a long way in our dealing with our Russian colleagues over these years. A great deal has changed in the last 15 years. We've exchanged a significant amount of data directly. They're looking at many of the same problems and questions as we are. They're not always looking at them in the same way that we are, but they're searching for an understanding of the physiological mechanisms.

These concerns of top management surfaced to the point that we were required to get decisions weekly, for medical purposes, as to whether we would continue to extend the mission or not. I can tell you that those weekly meetings were deadly serious; that the Administrator was very, very serious about what he was going to do, or not do, and he required that he be reassured by evidence. It was fine to try and give that reassurance on a personal basis, backed by our NASA team such as we had conducting these missions, but we needed other assistance. We formed two particular consultant groups. One group was a cardiovascular group. And John Shepherd, who's here on the panel, spent a great deal of time with that. Scott Swisher, who is also a member of this panel, was on that group. This group met many times during the course of the program. They met with others and gave of their time unstintingly to help us

convince management; I needed that support and I'm deeply grateful for it. We also had a group that was organized to try and look at the vestibular area, and one of those people is here on the panel, Melvill Jones. Its hard to find many vestibular experts once you get past Ash Graybiel. We went to great lengths to try and find vestibular people to come. They did meet and we appreciate the guidance they provided.

I've reviewed the remarks that I had a chance to present in trying to sum up this program on two previous occasions; namely, the Fifth-Man-in-Space Symposium last December, and then again in May at the Aerospace Medical Association meeting. In December, we were still flying the last mission and in May, we were at the point where the missions were completed and we were sort of able to sum up, at least with data as they were revealed at that point in time. I don't think that I would change anything that I said in any of those remarks, and so I'm not going to repeat them here today. I think that Dr. Dietlein has summarized very well the status that we all believe exists and that man has shown adaptive changes to a unique environment. In some cases, these changes are definitely going to require some countermeasures. I think in the calcium balance area we're going to have to use countermeasures. I suspect even in the cardiovascular area we're going to continue to look for these procedures.

There is one observation that I would like to leave you with, and that is the fact that we are defining many new norms as we look at these findings. There's no question about that. We're looking at man, normal man, placed into this very unique environment. As we make our observations, we know we can't look at the absoluteness of weightlessness because man is going about his mission activities. Still I believe that we are conducting an

unparalleled experiment in man's adaptation. As we derive these new norms, we are able to look at the hypothesis that we've developed. There are some gaps in this hypothesis and they lead to the future research that needs to be done. I hope that our panelists are going to identify a good deal of that needed research in their discussions.

I'm left with the feeling that while we have probably come up with more questions than answers, still we have gained a lot of answers. And certainly, if you look back at the time of the beginning of Mercury, we've come a long way in deciding what's really happening to man in this very unique environment. Now I'd like to begin our panel discussion. The cardiovascular system was mentioned first. To save time, I'll not introduce everybody on the panel until we come to them. First, although listed on your program, Neal Bricker is not with us. Nor is Ted Cooper. I'm going to call on Dr. Epstein in a moment, as he is replacing Dr. Cooper. I'd first like to call on John Shepherd, because of his interest in the cardiovascular system which we've mentioned so frequently and most recently in our elaborations of the last day and a half. And so, John, I'd like for you to take a few minutes and give us your views about how you sum this all up, as far as the cardiovascular system is concerned.