

Draft 6/24/76

In view of the scientific and political environment in which Skylab was flown it is remarkable but not as surprising as one might expect, that the most significant achievement is the accumulation of a large volume of negative data. These data allowed us to reach the conclusion that man is capable of adapting ~~himself~~ physiologically and psychologically to <sup>the</sup> 0g or weightless environment and that he can change that adaptation, after a period as long as 84 days, and re-adapt himself to a normal 1g, earth environment. The significance of this finding to the future of man in space is truly monumental. <sup>THE SIGNIFICANCE OF THIS FINDING TO MAN ON EARTH IS YET TO BE DISCOVERED.</sup> Not only did the crewmen show themselves capable of readapting to 1g but they readapted in increasingly shorter periods with increasing flight durations. <sup>+</sup> The opposite of what one might expect. They were able to egress the spacecraft ~~and~~ under their own power, as most of you probably saw on TV, and this was in marked contrast to some of the findings of our Russian colleagues. Happily we continued to be impressed with the marked individual variations shown by human beings in their physiologic and psychologic responses. This is one of the greatest qualities and attributes of humans - as all physicians know. It does lead to difficulty <sup>in</sup> ~~to~~ interpretation of data at times but we feel that the data base obtained in Skylab allows <sup>THE DRAWING OF</sup> the above conclusions without question. <sup>R</sup> All of the crewmen on recovery had a mixture of signs and symptoms relating principally to the cardiovascular, the central nervous system, the vestibular system and the hematologic systems. ~~They showed a remarkable ability to overcome these signs and symptoms in responding to normal activity within the 1g environment.~~ There was some loss of muscle mass, even with increasing exercise loads, and there was a continuing and progressive <sup>cy</sup> ~~A~~ small loss of calcium from the skeleton with increasing







3 6/24/76

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## ACCLIMATIZATION

We have had an unusual opportunity to observe adaptation or acclimatization of the human to a very particular stress<sup>or</sup>, weightlessness, available to us only in space. The study in adaptational~~is~~ physiology and biochemistry has great import in many fields of medicine on the ground. The ability to physiologically dissect the vestibular system in the unique way provided by weightlessness has allowed us to examine our thoughts about the function and dysfunction of this system. The responses of the cardiovascular system involving pressure and volume changes has offered us a unique model to study the possible relationships to hypertension and other cardiac disease. The 15% loss of <sup>RED</sup> blood cell mass noted after the 28-day flight<sup>and</sup> not progressive with increased flight duration<sup>leads</sup> us to some intense studies concerning the governing of <sup>MECHANISM</sup> red blood cell mass, ~~and~~ this can have great implications to hematology and the control of red blood cell production and loss here on earth. The calcium loss, which appears to parallel that seen in bedrest studies in spite of adequate intakes and which must be solved, will lead us toward solutions of the osteoporosis problem suffered by millions here on earth. We must not merely find therapeutic means, but in dealing with osteoporosis, we must find adequate preventive mechanisms, and institute them at an early age.

In looking ahead at the next 200 years of medicine, I think one of the greatest changes which will be noted, is an emphasis on the healthy rather than on the ill. Health is already rapidly being considered a right of every individual and indeed has been so declared. This will become a reality within the next <sup>two</sup> ~~ten~~ hundred years and it calls for great attention to the development of preventive medicine. Careful scrutiny of preventive techniques must be made and then must be applied. It has become increasingly



obvious that the application of effective preventive medicine techniques for the conditions of greatest import to man's health today will require more action on the part of the individual <sup>perhaps more so than on the part of</sup> ~~perhaps more so than on the part of~~ <sup>by any member</sup> the health team, <sup>contrary to our past experience with infectious disease,</sup> This means that health education will come into its own in the next century and that great emphasis will be placed on health education of individuals and groups, and the problems faced by the health professionals will be clearly understanding that this is not a simple educational process but indeed a complex one and must be carefully done if it is not to be wasteful and ineffective. <sup>P</sup> The tremendous advances in technology for the use of medicine, many of which were brought about by the needs of the space program, will continue at an ever increasing pace and with more input from the entire health team and basic scientists so that technology can better and more accurately serve the medical needs. It will provide us with better scientific information to assist in diagnosis and in therapy. Data will be more accurate and more detailed. There will be capability to look for substances ~~which have not~~ previously considered unimportant in both urine and blood, or even unknown. We will also continue to develop the capability to determine changes in the body's biochemistry and homeostasis by the use of smaller and smaller, even <sup>and</sup> lamdas of blood ~~in~~ the use of breath, saliva, hair and nails for diagnostic purposes. Thus better diagnosis will be aided by continuing development of noninvasive techniques for looking at, not only parts of the body, but the entire body by various imaging techniques. Ultrasound will continue to develop for ~~the~~ use with moving, functioning organs such as the heart and become ever more commonplace. Computers, while they have grown in the last few years, in use, will expand dramatically over the next 200 years and to remarkable sophistication, <sup>They will be</sup> used as aids or memory banks for screening



5 6/24/76

and diagnosis and increasingly used in the analysis of research data.

These developments will not be without problems not the least of which is balancing what the health care system, ~~the~~ individuals <sup>or</sup> and even institutions can afford with what technology can offer. I feel that the technological advances will become cheaper in cost but we must always try and determine the cost effectiveness of the use of such technology. We must also learn to analyze and cope with the accuracy<sup>produced</sup> and not be caught on the thorn of data which may be meaningless in determining the condition of the patient. I think we are capable of doing this and we must develop and enhance this capability as the technology becomes available. Transfer of technology to the medical field has not been as rapid as I would have envisioned 10 years ago but I feel that this transfer will proceed at ever increasing rates over the next 200 years for it can save time for busy health professionals and immeasurably add to the capabilities of the health care team whose task will grow with our population.

Population growth in the world and the remoteness of some individuals, even in our own country, as well as in some of the less developed parts of the world, will require the development of techniques for remote medicine for we will never see the time when every hamlet is capable of having a medical team immediately available on site. I am convinced that the use of remote medicine through either fixed or traveling facilities with the help of various members of the health team, the use of TV, analysis of breath sounds, and transmission of same, the transmission of electrocardiograms and x-ray and the capability to converse at a distance through communications and TV with the patient, will produce control centers in large medical centers that can reach huge areas of a state or a country. Thus, specialty consultation can be provided to even the most remote area and good

6 6/24/76

medicine leading to good health can be made available. This is within the realm of our technology today, ~~and~~ <sup>W</sup> we pioneered it in the space program and it is now being pioneered in pilot programs here on earth.

It is evident that if we are to make medicine or health available to the large numbers of people in the world we must work at redefining the roles of people who will be members of the growing health team. As physicians we will learn to work with and utilize these teams and <sup>be instrumental</sup> ~~help~~ in the redefinition of roles to reduce strife and friction. There has already been evidence of a need for someone, <sup>most-</sup> ~~and likely~~ <sup>usually</sup> the physician,

? to assume a key role in being concerned about the individual patient, <sup>in totality</sup> ~~and~~ helping them to determine the care they need and then to follow them through the maze and help to interpret the information they receive from the various information providers in the health care system. It <sup>should</sup> ~~may indeed~~ <sup>rendering primary care to</sup> ~~not~~ be the physician who is <sup>we may have to assign</sup> ~~treating~~ the individual but someone who works with <sup>various</sup> ~~those~~ physicians as a medical "broker" and follows the patient to a secure end result directly related to that individual. In this definition of roles we must also be aware that there is much that occurs to patients which we can do nothing about or <sup>occasionally even</sup> ~~or~~ little to alter. As we admit this, we must do all in our power to obtain any type of <sup>real</sup> ~~help~~ for this patient through the use of other members on the health team.

While basic research is being daily attacked, as is science and technology today, I expect to see the pendulum swing for I feel that research is essential to medical progress. It is obviously vital to provide immediate care for the patient but that can best be done only if we know the cause of a particular illness or defect and can hopefully develop preventive measures which can be

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7 6/24/76

invoked at an early period in life. Basic research offers us the capability for such control and prevention and will continue to be out front at the cutting edge of the development of science and technology in our society, <sup>It must</sup> and provide the tools for the health team to more competently accomplish their task. <sup>P</sup>Being now in a Health Science Center or Health University setting, I find myself interfacing with an exciting group of members of the health care team, health educators and researchers. Medicine is under severe challenge today and this challenge, I predict, will become no less but indeed more severe within the next hundred years. I sincerely hope and predict that medicine and all those engaged in health care will develop a team organization to meet the severe challenges to the current views and practices of care. We must not merely maintain the old because it is there but be willing to answer the challenges and to review our practices. <sup>This must be done however by</sup> ~~but to do it with~~ knowledgeable people who are engaged in the professions in the health field, rather than by political decision ~~makers~~.

With all the science and technology available, information <sup>FROM RESEARCH</sup> on causation <sup>^</sup> ~~from research~~, new diagnostic and treatment methods, certainly much of benefit to the patient can accrue ~~in this next~~ before our tri or quadcentennial. It is most important however to realize that perhaps more important than all of these predicted developments is a re-emph asis on humanism. A continuing realization that the patient is a person with particular individual needs, who wants love and consideration as a human being <sup>is vital.</sup> ~~and~~ the treatment, however scientifically based, and accurately administered will fail, if we fail to recognize and respond to these humanistic needs. This requires great awareness and concern on the part of all members of the health team and I am

8 6/24/76

convinced that we are capable <sup>of</sup> ~~and will show ourselves so of~~ utilizing the  
time given by the use of technology to administer to the human needs and  
thus never have patients trying to converse with machines or laboratories  
but <sup>ONLY</sup> <sub>A</sub> with physicians and others on the health care team. The advances  
before our next tricentennial will be awesome <sup>AND MARVELOUS</sup> indeed <sub>A</sub> but will be to  
little avail if we do not heed the humanistic needs of those we serve.