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June 15, 2005

Mr. Chris Shank
NASA Headquarters, Suite 9F44
300 E Street SW
Washington, DC 20546

Dear Mr. Shank:

Thank you very much for meeting with Dr. Joan Vernikos, Dr. Russell Rayman, Mr. Tom Crabb and me on June 3. We are fortunate that Dr. Griffin has instructed the NASA family not be afraid to speak out when it sees a problem. We appreciate this openness to such dialogue. At our meeting, we expressed some of our concerns and listened carefully to your response and advice. We followed up on your suggestions and communicated with both Dr. Ross and Dr. Trinh regarding the Zero Based Review. Here we wish to provide a follow up to those discussions on the priority and value warranted to life science in relation to the Exploration Vision.

Briefly, life science capabilities and investigations are critical to human exploration. Only by understanding and pinpointing the human health issues for Exploration, by creating scientifically validated countermeasures, and by creating the knowledge to assure sustainable human and environmental safety can the Exploration Vision be realized safely and effectively. Indeed, life sciences are essential for the success of human space exploration.

These views are shared by thousands of supporters of Exploration who have engaged in science and dedicated their careers to reducing the risk and increasing the efficiency of human space flight and exploration. The Exploration Life and Medical Sciences (ELMS) coalition supports exploration, innovation and delivery of return on the American taxpayers' investment of over $30B in the International Space Station. Our 10,000-member based coalition provides a uniquely skilled research community. We also plan for the (not too distant) future by training young scientists and engineers. As Senator Richard Shelby stated "The missions of tomorrow will not be possible if there are no scientists and engineers being developed today."

We are aware NASA's current path to not cancel space biology programs, but merely to postpone them. Unfortunately, postponement equals cancellation. Postponement of existing investments, developments, and implementation of science facilities will destroy the ability for later recovery. Postponement of science investigations will curtail the involvement of lifetime experts and their successors, and cause redirection of their interests to other fields, creating unrecoverable "gaps" in the critical knowledge at a moment vital for Exploration. It will require decades of costly re-investment to restore our existing base of talent and expertise.

This will leave the United States and NASA at great disadvantage in the near future when the problems and risks of Exploration will become apparent.

We offer three concrete recommendations:

Stop the dissolution and reductions of the national space biology capabilities. This would be congruent with your pledge that NASA would not cut science to fund manned space flight.

Maintain the definition of "station complete" to include delivery and assembly of the Centrifuge Accommodation Module and related Centrifuge facilities. The ability to achieve fractional gravity levels is critical as we prepare for lunar and Martian missions.

Re-establish life sciences as a discipline within NASA worthy of its critical importance to the sustainability and assurance of space exploration safety. The transfer of life sciences into an engineering organization within NASA has failed and will not provide the proper checks and mission assurance validation required for the long duration human endeavors.

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Life Sciences are not only critical to the Exploration initiative *per se*, but add considerable value to other aspects of NASA's endeavors and provides solutions for greater societal needs. Some examples are highlighted below:

Human and environmental safety for exploration of the Moon, Mars and beyond. Many current space life science efforts directly applicable to Exploration are negatively impacted in future budgets. These include:

- *Animal investigations* of human health risks for exploration (including bone maintenance, wound healing, immune competence, and pharmacokinetics) can be completed more efficiently and safely with animals than with research on Astronauts.

- *Plant investigations* can provide new approaches and advances in closing the re-supply loop needed for sustaining long-term human life support systems.

- *Cellular and Molecular investigations* can engage both public domain and commercial research, providing insight into human space biology, and insight into terrestrial aging and disease processes, as never before possible.

- *Technology demonstrations* on ISS facilities can validate component and subsystem reliabilities, fluid and heat transfer effects, and chemical reaction effects in the harsh and unusual environment of space.

Continuity of national space biology capability. Had we not proposed the Centrifuge Accommodation Module years ago, we would be proposing it now. The National Academy of Sciences has long recommended a sound research strategy for space biology and medicine, one that would span and integrate knowledge and applications from the genome, through the cells and systems organisms, to the whole organism itself. The baseline space hardware has been funded, and new low mass, high volume science is ready to be flown during the construction phase of ISS.

Fulfillment of value and return on the 30-year investment for Space Station. How can Americans and their representatives be expected to stay with us over the long haul of expanded exploration if we build a station that has no productivity? The American public wants to support a robust and exciting space program, but if they measure NASA's ability to get the job done by what has been accomplished on the ISS so far, they will hard to win over a second time. We must ensure that the ISS is a resounding success.

Trustworthiness as a global leader. Assurance that existing international agreements will be honored will serve to maintain our nation's leadership role in the world community. This comes at a time when we are asking our international partners for their participation in extended, sustained and expensive missions to explore space. Our partners are justly concerned about the direction we are taking with the ISS. They may tire of working with us and strike out to compete with us in space life sciences. The question is – Do we want to be at the forefront or do we want to play a supporting role?

Value and Capabilities that will transition beyond NASA and Exploration. Fundamental advances made today will be put to use in 10, 15, 20 years from now. If we postpone our basic research, the knowledge and expertise trajectory will be broken and unavailable for future needs. Moreover, the benefits of life science research resonate back on Earth as well. NASA's R&D expenditures yield from a 3:1 to a 9:1 return on investment.

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History has placed upon the current Administrator's shoulders and those of all the individuals who make up NASA a challenge that may well equal the placement of the first men on the moon. On that challenge ride the dreams of the American People and their Presidents, and

indeed all of our space faring allies. We stand ready to help. We welcome the opportunity to meet with you and your staff to discuss the points in this letter at the earliest possible time.

Sincerely and on behalf of Joan, Russell and Tom,

Christopher S. Brown

Christopher S. Brown
Research Professor of Botany, North Carolina State University
President, American Society for Gravitational and Space Biology
Founding Member, Exploration Life and Medical Sciences Coalition

cc: Dr. Michael Griffin
Dr. Howard Ross
Dr. Eugene Trinh