MARS SAMPLE HANDLING PROTOCOL WORKSHOP SERIES

WORKSHOP #2 TENTATIVE AGENDA
(10/16/00 DRAFT)

Day 1 (Wednesday, October 25th)
noon LUNCH (Working Lunch for Sub-group Chairs - meet with Rummel et al.)
1:00 p.m. Plenary – Intros and tutorials
   • Mars program status
   • Workshop #2 process (Organization and Objectives)
   • Workshop #1 recap
   • NRC life detection recap
   • COMPLEX Mars sample return report (if available)
   • Introduction to Strawman Protocol
3:30 Establish three Sub-groups to deal with key questions from framework:
   • Life detection translation
   • Biohazard testing group 1
   • Biohazard testing group 2
6:30 WELCOME RECEPTION

Day 2 (Thursday, October 26th)
7:30 a.m. BREAKFAST
8:00 Day 1 Sub-groups caucus individually (until noon)
noon LUNCH
1:00 p.m. Plenary – Day 1 Sub-group reports (1/2 hour each)
2:30 Discussion of Day 1 Sub-group reports
5:30 Establish three new Sub-groups
   • Physical and chemical test sequencing
   • Molecular tests
   • Organism-based tests (cellular & microbial; plant; animal)
6:00 ADJOURN

Day 3 (Friday, October 27th)
7:30 a.m. BREAKFAST
8:00 Day 2 Sub-groups caucus individually (until noon)
noon LUNCH
1:00 p.m. Plenary – Day 2 Sub-group reports (1/2 hour each)
2:30 Synthesis and discussion (assignment of final writing assignments)
5:00 ADJOURN
<table>
<thead>
<tr>
<th>PARTICIPANT</th>
<th>AFFILIATION</th>
<th>AREA(S) OF EXPERTISE</th>
<th>SUB-GROUP ASSIGNMENTS (Day 1; Day 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acosta, Sara E.</td>
<td>SETI Institute</td>
<td>Planning Committee Member</td>
<td>&quot;Floater&quot;</td>
</tr>
<tr>
<td>Allen, Carl</td>
<td>NASA Johnson Space Center</td>
<td>Sample handling and curation; physical/earth and planetary sciences</td>
<td>Biohazard Protocol (1); Physical and Chemical Tests (Co-chair)</td>
</tr>
<tr>
<td>Alton, Judith H.</td>
<td>NASA Johnson Space Center</td>
<td>Sample handling and curation; physical/earth and planetary sciences</td>
<td>Life Detection Protocol; Physical and Chemical Tests</td>
</tr>
<tr>
<td>Badia, Jeffrey</td>
<td>Scripps Institute of Oceanography, University of</td>
<td>Structure, stability, and evolution of proteins</td>
<td>Life Detection Protocol; Molecular Tests</td>
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<td></td>
<td>California, San Diego</td>
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<tr>
<td>BieIizki, Joseph</td>
<td>NASA Ames Research Center</td>
<td>Chief NASA Veterinary Officer</td>
<td>Biohazard Protocol (2); Organismal/Cellular Tests</td>
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<tr>
<td>Bradley, John</td>
<td>MVA Associates, Norcross GA; Georgia Institute of</td>
<td>Electron Microscopy; Physical/Earth and Planetary Sciences</td>
<td>Life Detection Protocol; Physical and Chemical Tests</td>
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<td></td>
<td>Technology, Atlanta, GA</td>
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<tr>
<td>Candresse, Thierry</td>
<td>French National Institute of</td>
<td>Deputy Head of the Plant Health and Environment Department; Molecular-based detection and identification techniques for plant viruses and viroids</td>
<td>Biohazard Protocol (2) (Co-chair); Organismal/Cellular Tests</td>
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<tr>
<td></td>
<td>Agronomical Research (INRA)</td>
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<tr>
<td>Cresam, Henry A.</td>
<td>Los Alamos National Lab</td>
<td>Flow cytometry and cytotoxicity detection methods; life detection</td>
<td>Life Detection Protocol; Organismal/Cellular Tests</td>
</tr>
<tr>
<td>Daily, Michael J.</td>
<td>Dept. of Pathology, Uniformed Services</td>
<td>Radiation resistant bacteria</td>
<td>Biohazard Protocol (1); Molecular Tests</td>
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<td></td>
<td>University</td>
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<tr>
<td>DeVincenzi, Donald</td>
<td>NASA Ames Research Center</td>
<td>(Planning Committee Member)</td>
<td>Life Detection Protocol; Physical and Chemical Tests</td>
</tr>
<tr>
<td>Eisen, Johnathan</td>
<td>Institute for Genomic Research</td>
<td>Radiation resistance and DNA repair, microbial genomics and evolution, characterization of uncultured microbes</td>
<td>Biohazard Protocol (2); Molecular Tests</td>
</tr>
<tr>
<td>Fishbelin, William N.</td>
<td>Dept. of Environment and ToxicoLogic Pathology,</td>
<td>Molecular toxicology, biochemical and molecular pathology; biohazard testing, cellular and molecular genetic mechanisms in pathogenesis</td>
<td>Biohazard Protocol (1); Organismal/Cellular Tests</td>
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<td></td>
<td>Armed Forces Institute of Pathology</td>
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<td>Gabriel, Dean W.</td>
<td>Professor, Molecular Plant Pathology, University of</td>
<td>Molecular plant pathology; biohazard testing; cellular and molecular genetic mechanisms in pathogenesis</td>
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<td></td>
<td>Florida</td>
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<tr>
<td>Giroir, Brett P.</td>
<td>Univ. of Texas Southwestern Medical Ctr</td>
<td>Endotoxins in pharmacological studies</td>
<td>Biohazard Protocol (1); Organismal/Cellular Tests</td>
</tr>
<tr>
<td>Granga, Jacques</td>
<td>Laboratoire de Haute Securite P4 Jean Merieux</td>
<td>Research Professor; Doctor Ingerm In Chemistry; Responsible of the MERIEUX Biosafety level 4 Facility; Thesis in virology; abilities in biochemistry and in cancerology</td>
<td>Biohazard Protocol (1); Organismal/Cellular Tests</td>
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<tr>
<td>Gray, Greg</td>
<td>Naval Health Research Center</td>
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<td>Hawley, Robert</td>
<td>USAMRIID, Ft. Detrick MD</td>
<td>Biosafety, emergent biohazard detection, and containment methods; biohazard testing; cellular and molecular genetic mechanisms in pathogenesis</td>
<td>Biohazard Protocol (1); Organismal/Cellular Tests</td>
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<tr>
<td>Holland, Heinrich D.</td>
<td>Harvard University, Department of Earth and Planetary Sciences</td>
<td>Earth Sciences</td>
<td>Life Detection Protocol; Organismal/Cellular Tests</td>
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<tr>
<td>Humble, Michael</td>
<td>National Institute of Environmental Health Sciences</td>
<td></td>
<td>Biohazard Protocol (2); Organismal/Cellular Tests</td>
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<td>USAMRIID, Ft. Detrick MD</td>
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<tr>
<td>Joyce, Gerald</td>
<td>Department of Molecular Biology, The Scripps</td>
<td>Origins of life; RNA and Pre-RNA Worlds</td>
<td>Biohazard Protocol (2); Molecular Tests</td>
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<td></td>
<td>Research Institute</td>
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<tr>
<td>Khan, Ali S.</td>
<td>National Center for Infectious Diseases, Centers for Disease Control and Prevention</td>
<td>Biodiversity; biohazard testing, cellular and molecular genetic mechanisms in pathogenesis</td>
<td>Biohazard Protocol (1) (Co-chair); Molecular Tests</td>
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<tr>
<td>Kovace, Gregory T.A.</td>
<td>Associate Professor, Electrical Engineering, Stanford University</td>
<td>Biodiversity; biohazard testing, cellular and molecular genetic mechanisms in pathogenesis</td>
<td>Biohazard Protocol (2) (Co-chair); Molecular Tests</td>
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<tr>
<td>Leonard, Debra G.B.</td>
<td>Dept. of Pathology and Laboratory Medicine, University of Pennsylvania</td>
<td>Molecular pathology of infectious diseases; biohazard testing; cellular and molecular genetic mechanisms in pathogenesis</td>
<td>Biohazard Protocol (1); Molecular Tests</td>
</tr>
<tr>
<td>MacPherson, Glenn</td>
<td>National Museum of Natural History, Smithsonian Institution</td>
<td>(Planning Committee Member)</td>
<td>Biohazard Protocol (3); Physical and Chemical Tests</td>
</tr>
<tr>
<td>Mauré, Marie-Christine</td>
<td>Institut Jacques Monod</td>
<td>Microbiology; life origins</td>
<td>Life Detection Protocol; Molecular Tests</td>
</tr>
<tr>
<td>Moutou, François</td>
<td>Head of the laboratory of General Epidemiology at the Central laboratory for veterinary research</td>
<td>Epidemiology of major animal diseases and zoonoses; modeling of airborne dissemination of the FMD virus; Epidemiology of Transmissible Spongiform Encephalopathies; Risk analysis methodology and disease control; Epidemiological surveillance of wild and domestic animal diseases.</td>
<td>Biohazard Protocol (2); Organismal/Cellular Tests (Co-chair)</td>
</tr>
<tr>
<td>Muslin, Christian</td>
<td>Centre de Pédiatrie Biologique</td>
<td></td>
<td>Life Detection Protocol; Physical and Chemical Tests (Co-chair)</td>
</tr>
<tr>
<td>Pardee, Arthur B.</td>
<td>Dana Farber Cancer Institute Biological Chemistry and Molecular Pharmacology</td>
<td>Molecular evolution; cell cycle control; cancer etiology</td>
<td>Biohazard Protocol (1); Organismal/Cellular Tests</td>
</tr>
<tr>
<td>Prieur, Daniel</td>
<td>Université de Bretagne Occidentale</td>
<td></td>
<td>Life Detection Protocol; Molecular Tests (Co-chair)</td>
</tr>
<tr>
<td>Prumert-Bebout, Lee</td>
<td>NASA Ames Research Center</td>
<td>(Planning Committee Member)</td>
<td>Life Detection Protocol; Organismal/Cellular Tests</td>
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<tr>
<td>Race, Margaret</td>
<td>SETI Institute</td>
<td>(Planning Committee Member)</td>
<td>Biohazard Protocol (1); Molecular Tests</td>
</tr>
<tr>
<td>Raullin, François</td>
<td>Université Paris 12 &amp; 7</td>
<td></td>
<td>Life Detection Protocol (Co-chair); Physical and Chemical Tests</td>
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<tr>
<td>Richmond, Jonathan</td>
<td>Director, Office of Health and Safety, Centers for Disease Control and Prevention</td>
<td>Biostability, emergent biohazard detection, and containment methods; biohazard testing; cellular and molecular genetic mechanisms in pathogenesis</td>
<td>Biohazard Protocol (2); Organismal/Cellular Tests (Co-chair)</td>
</tr>
<tr>
<td>Rummel, John</td>
<td>Planetary Protection Officer, NASA Headquarters</td>
<td>(Planning Committee Chair)</td>
<td>Floaters*</td>
</tr>
<tr>
<td>Scannon Patrick J.</td>
<td>Chief Scientific and Medical Officer XOMA Corp.</td>
<td>Microbial pharmacology</td>
<td>Biohazard Protocol (2); Molecular Tests</td>
</tr>
<tr>
<td>Schad, Jack</td>
<td>NASA Headquarters</td>
<td>(Planning Committee Member)</td>
<td>Biohazard Protocol (1); Organismal/Cellular Tests</td>
</tr>
<tr>
<td>Sourdive, David J.D.</td>
<td>Centre d'Etudes du Bouchet</td>
<td>Viral Immunology, arnaviruses; Biotechnology project leader at CEB (Min. of Defense); High sensitivity detection and identification of potentially hazardous microorganisms</td>
<td>Biohazard Protocol (1) (Co-chair); Molecular Tests</td>
</tr>
<tr>
<td>Stirakis, Pericles D.</td>
<td>Lockheed-Martin, Washington DC</td>
<td>(Planning Committee Member)</td>
<td>Biohazard Protocol (2) Physical and Chemical Tests</td>
</tr>
<tr>
<td>Vasil, Indra K.</td>
<td>Professor, Plant Cell and Molecular Biology, University of Florida</td>
<td>Plant tissue culture methods and biotechnology; biohazard testing; cellular and molecular genetic mechanisms in pathogenesis</td>
<td>Biohazard Protocol (1); Organismal/Cellular Tests</td>
</tr>
<tr>
<td>Visco, Michel</td>
<td>CNES, France</td>
<td>Secretary of the French PP group; Program scientist for animal Physiology and Biology. Radionuclides in biology, Applied Medical Statistics, Animal and Comparative Immunology</td>
<td>Floaters*</td>
</tr>
<tr>
<td>Wainwright, Norman R.</td>
<td>Senior Scientist, Molecular Biology, Marine Biological Laboratory</td>
<td>Comparative molecular biology and evolution; life detection</td>
<td>Life Detection Protocol (Co-chair); Molecular Tests</td>
</tr>
</tbody>
</table>

Observers:

- Baste, David  NASA, Jet Propulsion Laboratory  Floaters*
- Boyce, Joseph  NASA Headquarters  Floaters*
- Hone, Diana  NASA Headquarters  Floaters*
- David, Leonard  Science Writer  Floaters*
- Lindstrom, David  NASA, Jet Propulsion Laboratory  Floaters*
- Meyer, Michael  NASA Headquarters  Floaters*
Life Detection Protocol Sub-Group
The goals are to: a) detect the presence of live organisms, or materials derived from live organisms ('biomarkers'), and b) distinguish between martian life forms or biomarkers and terrestrial contamination. The specific objectives to be accomplished are: a) identify and prioritize current candidate methods to detect live organisms and biomarkers, b) identify and prioritize current candidate methods to detect terrestrial contamination, c) specify sample size, sample type, and analysis time requirements, and d) select specific current methods, and place them in a specific sequence, such that the life detection protocol can be accomplished in a reasonable amount of time (≤ about 90 days ?) and using the minimum amount feasible of a presumed 500 g sample.

Wainwright, Norman R. (Chair)
Raulin, François (Co-chair)
Alton, Judith H.
Bada, Jeffrey
Bradley, John
Crissman, Harry A.
DeVincenzi, Donald
Holland, Heinrich
Maurel, Marie-Christine
Mustin, Christian
Prieur, Daniel
Prufert-Bebout, Lee
(12)

Biohazard Protocol Sub-Groups (2 sub-groups on this same topic)
The goal is to determine if the samples pose any threat to terrestrial organisms or ecosystems, and whether or not the samples contain life forms or biomarkers. The specific objectives to be accomplished are: a) to identify and prioritize current candidate methods to determine any threat to terrestrial organisms or ecosystems, b) to specify sample size, sample type, and analysis time requirements, and c) to select current specific methods, and place them in a specific sequence, such that the biohazard protocol can be accomplished in a reasonable amount of time (≤ about 90 days ?) and using the minimum amount feasible of a presumed 500 g sample.

Khan, Ali S. (Chair)
Sourdive, David J.D. (Co-chair)
Allen, Carl
Daly, Michael J.
Fishbein, William N.
Giroir, Brett P.
Grange, Jacques
Gray, Greg
Hawley, Robert
Leonard, Debra G.B.
Pardee, Arthur B.
Race, Margaret
Schad, Jack
Vasil, Indra K.
(14)

Kovacs, Gregory T.A. (Chair)
Candresse, Thierry (Co-chair)
Bielitzki, Joseph
Eisen, Johnathan
Gabriel, Dean W.
Humble, Michael
Jahrling, Peter
Joyce, Gerald
MacPherson, Glenn
Moutou, François
Richmond, Jonathan
Scannon, Patrick J.
Stabekis, Pericles D.
(13)
Physical and Chemical Tests Sub-Group
The goal is to determine the physical and chemical properties of the samples that must be ascertained prior to the life-detection or biohazard tests so that: a) samples can be intelligently selected for the life detection and biohazard protocols, and b) life detection and biohazard protocol results can be properly interpreted. The specific objectives to be accomplished are: a) identify and prioritize current candidate methods for these physical and chemical tests, b) specify minimum sample size, sample type, and analysis time requirements, and c) select specific current methods, and place them in a specific sequence, such that the physical and chemical analysis protocol can be accomplished in the minimum time feasible, and with the minimum amount of a presumed 500 g sample. Specify which of these methodologies might be done on irradiation-sterilized or heat-sterilized samples.

Allen, Carl (Chair)
Mustin, Christian (Co-chair)
Allton, Judith H.
Bradley, John
DeVincenzi, Donald
Holland, Heinrich
MacPherson, Glenn
Raulin, François
Stabekis, Pericles D.
(9)

Molecular Tests Sub-Group
The goal is to indicate and/or illustrate specific molecular tests and procedures that will be employed to accomplish either the consensus biohazard protocol from Day 1, or to accomplish a protocol that is consistent with one or the other biohazard protocols reported to the plenary session. This Sub-group should specify current candidate methods for these tests, the instrumentation needed to accomplish these tests in situ, and the minimum sample size, sample type, specific sequence, and analysis time requirements for each test that is described.

Joyce, Gerald (Chair)
Prieler, Daniel (Co-chair)
Bada, Jeffrey
Daly, Michael J.
Eisen, Johnathan
Khan, Ali S.
Kovacs, Gregory T.A.
Leonard, Debra G.B.
Maurel, Marie-Christine
Race, Margaret
Scannon, Patrick J.
Sourdive, David J.D.
Wainwright, Norman R.
(13)
Organismal/Cellular Tests Sub-Group
The goal is to indicate and/or illustrate specific in vivo and in vitro tests and procedures that will be employed to accomplish either the consensus biohazard protocol from Day 1, or to accomplish a protocol that is consistent with one or the other biohazard protocols reported to the plenary session. This Sub-group should specify current candidate methods for these tests, the facilities and instrumentation needed to support such tests in situ, and the minimum sample size, sample type, specific sequence, and analysis time requirements for each test that is described.

Richmond, Jonathan (Chair)
Moutou, François (Co-chair)
Biellitzki, Joseph
Candresse, Thierry
Crissman, Harry A.
Fishbein, William N.
Gabriel, Dean W.
Giroir, Brett P.
Grange, Jacques
Gray, Greg
Hawley, Robert
Humble, Michael
Jahrling, Peter
Pardee, Arthur B.
Prufert-Bebout, Lee
Schad, Jack
Vasil, Indra K.
(17)

“Floaters” (both days)
Sara E. Acevedo, David Beaty, Joseph Boyce, Leonard David, Diana Hoyt, David Lindstrom, Michael Meyer, John Rummel, and Michel Viso (9)

Notes:
A working lunch is scheduled on Wednesday, October 25th for all sub-group Chairs and Co-chairs to discuss the sub-group charters in detail (Meet at noon at the Marriott Hotel). An outline of the requested sub-group reports and writing instructions will be provided to the Chairs and Co-chairs at that meeting.

In recommending methods, test systems, and instruments, each sub-group should address the issues of sampling error and ‘test insufficiency’ that may pertain to 'missing' something that is in the sample, but may not be detected.

Using the report of Workshop 1 as a point of departure, each sub-group should attend to the writing in whatever depth can be accomplished during the workshop. The guidelines for preparing the final sub-group summaries is attached.
In preparing the summary reports for each sub-group, the writers are urged to consider the following format suggestions to ensure consistency in the final Workshop 2 report.

1) Title of Sub-group and exact Sub-group charter

2) Members of Sub-group (Chair and Co-chair identified)

3) Introduction; Background Information; and Starting Assumptions (if any)

4) Overview of Preliminary Deliberations:
   ◆ Candidate methods - identify and prioritize viable alternatives; include comments or caveats for each as appropriate
   ◆ Candidate model systems to be used for testing (as appropriate)
   ◆ Candidate instrumentation or equipment needed
   ◆ Estimated amount of material for various tests
   ◆ Estimated time required for test results

5) Specific Recommendations: (Ideally this section should be a bulleted, annotated list with brief details. Extensive details should be included in an appendix if needed):
   ◆ Based on discussion of various alternatives (above) indicate the selected list of specific methods, test systems and instrumentation recommended and the sequence of tests needed to accomplish the charge (life detection or biohazard etc)
   ◆ Indicate estimated amount of sample needed
   ◆ Indicate estimated amount of time needed
   ◆ Identify whether test will be done inside or outside containment

6) Include flow charts/diagrams of process; how various tests relate to each other

7) Additional Information - May include topics such as the following:
   ◆ Caveats?
   ◆ R&D needs?
   ◆ Anticipated problems and interpretation of the test for various scenarios (possible live organisms, biomarkers, false positives, or fossils)
   ◆ How does the list of recommended tests relate to the Criteria for Release (Critical? Essential? Complementary? Supportive? etc.)
   ◆ Other issues to be resolved or discussed at next workshop?

8) Send a hard copy and an electronic version of your Sub-group summary no later than Friday Nov. 10, 2000 to:

Ms. S.E. Acevedo
Mail Stop 245-1
NASA Ames Research Center
Moffett Field CA 94035-1000
USA

sacevedo@mail.arc.nasa.gov
1) **Venue & Directions:**
   • Marriott Hotel, 5151 Pooks Hill Road, Bethesda, Maryland.
   • The Marriott is at the intersection of I-495 (the "Washington Beltway") and Route 355 (Wisconsin Avenue). *(A map of the greater Washington D.C. area is attached).*
   • The telephone number for the front desk at the hotel is 301-897-9400.
   • The web site for the Marriott Bethesda is http://marriotthotels.com/WASBT/
   • The name and location of the meeting room(s) will be posted in the hotel lobby.

2) **Airports/Shuttles/Autos:**
   • Commercial Airport Shuttle service: *Super Shuttle* (1-800-258-3826).
   • Complimentary Marriott hotel shuttle service to/from the Metro (301-897-9400).

3) **Accommodations:**
   • If you are a U.S. Civil Servant, and unable to accept NASA research funds to pay for your room, simply present your own credit card when you arrive at the hotel to register (your room may have been reserved by Sara using her card). *It is the responsibility of each U.S. Civil Servant to operate according to the protocol of their agency regarding accepting travel reimbursements for this NASA-sponsored Workshop. If you have any questions or concerns about your room reservation, see Sara at the Workshop or call or e-mail (see cover letter for contact info).*

4) **Speakers and Sub-group Chairpersons:**
   • One 35mm slide projector, one overhead viewgraph projector, and a cordless microphone will be available in the plenary meeting room for your use.
   • Speakers: *please bring to the Workshop* one hard copy of your presentation materials and e-mail the electronic file to Sara.
   • Sub-group Chairpersons: please see the attached sub-group summary writing guidelines.

5) **Breakfast and Lunch:**
   • Breakfast and lunch will be provided for ALL attendees on Thursday and Friday Oct. 26th and 27th (breakfast at 7:30 a.m.; lunch at noon).
   • On Wednesday, Oct. 25th, there is a *working lunch scheduled for all Sub-group Chairpersons* to meet with Dr. Rummel et al. to review the Sub-group Charters and writing guidelines (see attached).