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<tbody>
<tr>
<td>Primary Ch-P-1 Determine Solar System bombardment history in first 600 m.y.</td>
<td>What is the chronology of key events (i.e. Imbrium, Serenitatis, Crisium, Nectaris)? What was the magnitude of the proposed period of late heavy bombardment? What was the composition of early impactors?</td>
<td>Concept 1, 6 mGEO-7</td>
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<tr>
<td>Primary Ch-P-2 Determine rate of impacts post-heavy bombardment</td>
<td>Has the rate of bombardment evolved with time? How accurate are age dates for young, small surfaces? Is the Copernican rate spiky?</td>
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<tr>
<td>Engineering Ch-1 Test and improve planetary sampling techniques</td>
<td>Collection efficiency Key technology development Containment adequacy Key technology development Curation facilities on Earth (EEO)? Key technology development Sample handling by humans in space Key technology development Rendezvous and capture of orbiting sample return container Key technology development Accurate landing with autonomous hazard avoidance Key technology development</td>
<td>mGEO-10, mGEO-16 mGEO-10, mGEO-15 mGEO-10, mGEO-15 mGEO-15 mGEO-15 mGEO-15</td>
<td>Land safely 100 m radius of target</td>
<td>Object: FF-A-6</td>
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<td>Secondary Ch-S-1 Investigate space weathering processes and rates</td>
<td>Is space weathering a linear process? How do different materials weather (melt vs. granular)? How do rays weather?</td>
<td>Key technology development Key technology development Key technology development</td>
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<td>OBJ: FF-A-6</td>
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<tr>
<td>Secondary Ch-S-2 Investigate range of materials excavated from whole section of crust</td>
<td>What is the bulk composition of crust and mantle? How did the crust form and evolve?</td>
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<td>Secondary Ch-S-3 Determine extent and carriers of KREEP, and thus lunar thermal history</td>
<td>Support Lunar Geophysical Network mission(s); provide context for SPA sample return</td>
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**Ch-S-1**: Investigate space weathering processes and rates
- **Is space weathering a linear process?** Characterize planetary surfaces to understand how they are modified by geologic processes. Concept 3, 6, 7 mGEO-11. **Object:** Sci-A-4
- **How do different materials weather (melt vs. granular)?** Characterize planetary surfaces to understand how they are modified by geologic processes. Concept 3, 6, 7 mGEO-11. **Object:** Sci-A-4
- **How do rays weather?** Characterize planetary surfaces to understand how they are modified by geologic processes. Concept 3, 6, 7 mGEO-11. **Object:** Sci-A-4

**Ch-S-2**: Investigate range of materials excavated from whole section of crust
- **What is the bulk composition of crust and mantle?** Support Lunar Geophysical Network mission(s); provide context for SPA sample return. Concept 2, 3 mGEO-1, mGEO-5. **Object:** Sci-A-9
- **How did the crust form and evolve?** Origin and diversity of terrestrial planets. Concept 2, 3 mGEO-5. **Object:** Sci-A-5

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**Ch-S-3**: Determine extent and carriers of KREEP, and thus lunar thermal history
- **How complex are lunar differentiation processes?** Support Lunar Geophysical Network mission(s); provide context for SPA sample return. Concept 2, 3 mGEO-1, mGEO-5. **Object:** Sci-A-5
- **What is the volcanic history of the Moon?** Origin and diversity of terrestrial planets. Concept 2, 3, 5 mGEO-5. **Object:** Sci-A-6

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**Ch-P-1**: Determine Solar System bombardment history in first 600 m.y.
- **What is the chronology of key events (i.e. Imbrium, Serenitatis, Crisium, Nectaris)?** Building new worlds, what roles did bombardment by large projectiles play? Concept 1 mGEO-7. **Object:** Sci-A-8, Sci-A-9, Sci-B-1
- **What was the magnitude of the proposed period of late heavy bombardment?** Building New Worlds, history of reshuffling of planetary orbits, when did life emerge on Earth? Concept 1 mGEO-7. **Object:** Sci-A-8, Sci-A-9, Sci-B-1
- **What was the composition of early impactors?** Planetary Habitats, how were volatiles and organics distributed? Concept 1 mGEO-7. **Object:** Sci-A-9, Sci-B-1

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**Ch-P-2**: Determine rate of impacts post-heavy bombardment
- **Has the rate of bombardment evolved with time?** Planetary Habitats - how do changes in bombardment rate affect the origin and evolution of life? Concept 1 mGEO-7. **Object:** Sci-B-1
- **How accurate are age dates for young, small surfaces?** Workings, How has the impact history of the inner solar system influenced the climates of the terrestrial planets? Concept 1 mGEO-7. **Object:** Sci-A-4, Sci-A-8
- **Is the Copernican rate spiky?** NEO Surveys Concept 1, 6, 7 mGEO-7. **Object:** Sci-A-4, Sci-A-8

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**Ch-1**: Test and improve planetary sampling techniques
- **Collection efficiency** Key technology development. **Object:** Sci-A-2
- **Containment adequacy** Key technology development. **Object:** Sci-A-2
- **Curation facilities on Earth (EEO)?** Key technology development. **Object:** Sci-A-2
- **Sample handling by humans in space** Key technology development. **Object:** Sci-A-2
- **Rendezvous and capture of orbiting sample return container** Key technology development. **Object:** Sci-A-2
- **Accurate landing with autonomous hazard avoidance** Key technology development. **Object:** Sci-A-2