10.21 **Ion-Molecule Condensation Reactions: A Mechanism for Chemical Synthesis in Reducing Planetary Atmospheres.**

M. MÜLLER-NEUMANN, The Rockefeller University, New York, N.Y. 10021—Ionization in methane generates CH₃⁺ which undergoes condensation with CH₄ to yield the carbonium ion C₃H₅⁺, s-C₃H₅⁺ and t-C₃H₅⁺. In the presence of NH₃, the carbonium ions react to produce protonated amines in competitive condensation proton transfer reactions, e.g.,

\[
\begin{align*}
C_2H_5⁺ + NH₃ &\rightarrow C₂H₅NH⁺ + CH₄ \\
C₂H₅⁺ + NH₃ &\rightarrow NH₄⁺ + C₂H₅ \\
\end{align*}
\]

The relative significance of condensation to produce protonated amines (RHN⁺) increases with increasing pressure and will be predominant at P > 10 millibars, at T < 450 K. Carbonium ions also undergo gas-phase condensation with HCN to produce alkyl cyanides, e.g.,

\[
\begin{align*}
s-C_3H_7⁺ + HCN &\rightarrow s-C₃H₇CH⁺ + C₄H₆ \\
\end{align*}
\]

HCN also condenses with HCN⁺. Rate constants and thermodynamic values for the condensation reactions were measured by pulsed high pressure mass spectrometry. Similar condensation reactions between carbonium ions and H₂O, or COH₂O were also reported to yield protonated alcohols and carboxylic acids. The possible role of gaseous ionic condensation reactions in the synthesis of organic molecules in methane atmospheres will be discussed.

**SATURDAY, 29 OCTOBER 1977**

Afternoon Session 11:

**Planetary Surfaces, Interiors and Magnetism**

(M.N. Toksoz, Discussion Leader)

Gardner Room, 2:00-6:30 p.m.

11.1 **Particle Motion on Mars Inferred from the Viking Lander Cameras.**

C. SAGAN, D. DIERE, F. FOX, Cornell University; R. E. ARVIDSON, E. A. GUINNESS, Washington University — The cameras of the Viking Lander have uncovered several lines of evidence for fine particle mobility on the martian surface, including particulate drifts, rock-associated raised streaks, and probable ventifacts. Inferred peak wind directions in both Chryse and Utopia are roughly the same, and consistent with peak winds inferred by orbiter photography. A 24° systematic offset between the direction of rock-associated streaks in the Viking 1 landing site and Mariner 9 and Viking observations of crater-associated streaks is consistent both in sign and magnitude with a Coriolis acceleration of particles entrained by high velocity winds in the course of the production of crater-associated streaks. If a significant fraction of the impact energy upon collision goes into deformation, strain and rupture, there should be a preferential destruction of the most easily saltated grains, which are here called kamikaze particles, and a depletion of 150 µm diameter grains. Observations of fine particulates dumped on the VL 1 grid indicate that major saltation events occurred between sols 96 and 207 and were caused by winds > 50 m s⁻¹, normalized to the top of the velocity boundary layer. This is the first observation of saltation on another planet, and a rough confirmation of the usual Bagnold saltation theory when applied to another planet.

11.2 **Topographic Mapping of Mars from Orbit.**

K.R. Blasius, Planetary Science Institute, 283 S. Lake, Suite 218, Pasadena, Ca. 91101 — A semiautomated digital topographic mapping system has been developed for the Viking Orbiter Imaging Team in the Image Processing Laboratory, Jet Propulsion Laboratory. Development of this system was motivated by the desire to reduce costs and shorten the time required to obtain numerical topographic data for geological studies. Specifically, it is now possible to produce a fully documented topographic map from a pair of Viking Orbiter images within one week without:

1. the services of highly trained photogrammetrists
2. the use of expensive single-purpose hardware
3. use of custom photo services to prepare working materials or draftsmen and printers to produce final map products.

The approach adopted has two essential elements. First, digital image data are correlated in a computer to measure parallax of features in stereo images. Second, to allow the use of simple correlation techniques the images are initially identically scaled and rectified to a map projection. The rectified and scaled images also provide bases upon which to overlay topographic data digitally. Following measurement of features and calculation of individual elevations desired mapping products, such as viewable stereo image pairs, contoured topographic maps, or shaded relief maps, are routinely produced, formatted and labeled digitally then output on magnetic tape for recording on 5 inch film. Prints or duplicate transparencies are distributed to users. Examples of Viking Orbiter stereo imaging, compiled topographic maps, and geologically useful information derived from them will be shown. Emphasis will be placed on features of martian impact craters, channels, and canyons.