

Several experiments with various clusters were performed on a molecular beam apparatus. (1) The beam velocities were measured for rare gases and water clusters under various expansion conditions to learn about the supersonic expansions and cluster generation processes. (2) The photodissociation of  $(\text{HBr})_n$  clusters was measured for calibration purposes. (3) The mass spectrometry of clusters of small biomolecules imidazole, pyrazole and pyrrole was investigated. The stabilization of these hydrogen bonded species in the excited states by hydrogen transfer process was revealed, relevant to the stability of biomolecules in general. (4) Finally, the photodissociation of an HI molecule on water clusters  $(\text{H}_2\text{O})_n$  was studied and compared to the photodissociation on  $(\text{Ar})_n$  clusters. It was shown that HI molecules acidically dissociate on  $(\text{H}_2\text{O})_n$  and generate zwitterionic species  $\text{H}_3\text{O}^+ \text{I}^-(\text{H}_2\text{O})_{n-1}$ , which are then excited into biradical states with the neutral hydronium molecule  $\text{H}_3\text{O}$ .