# Molecular Systems group


## Our research focus:
## Understand the Dynamics and Spectroscopy of Charged Molecular Systems

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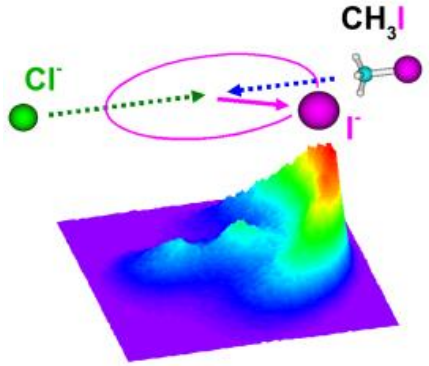
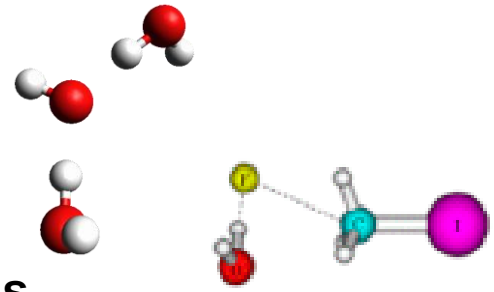
# Dynamics and Spectroscopy of Charged Molecular Systems

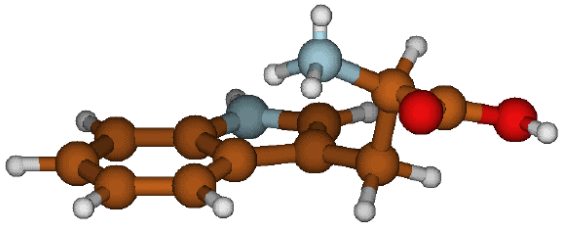
## Ion-molecule reaction dynamics



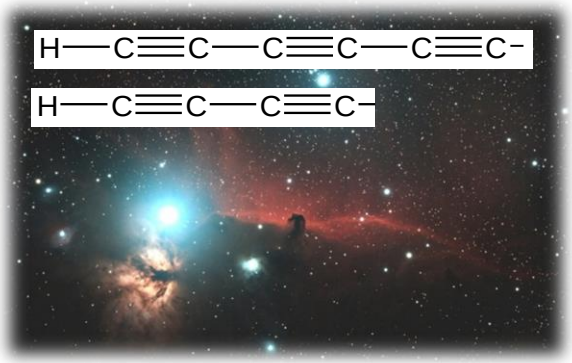

## Micro-hydration effects



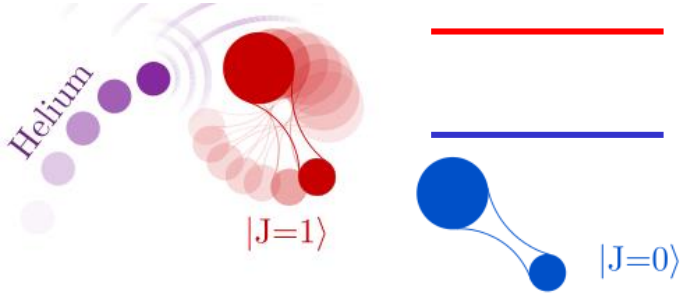
## Biomolecular ions



## Interstellar ion formation




## Cold and state-controlled ions

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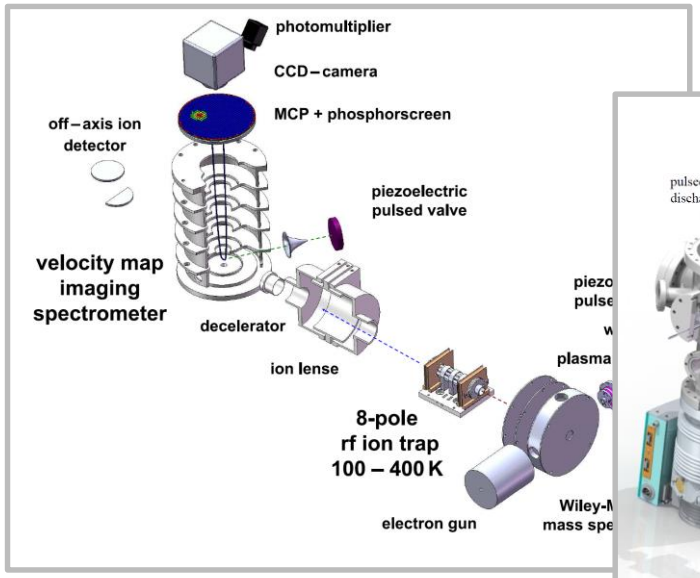
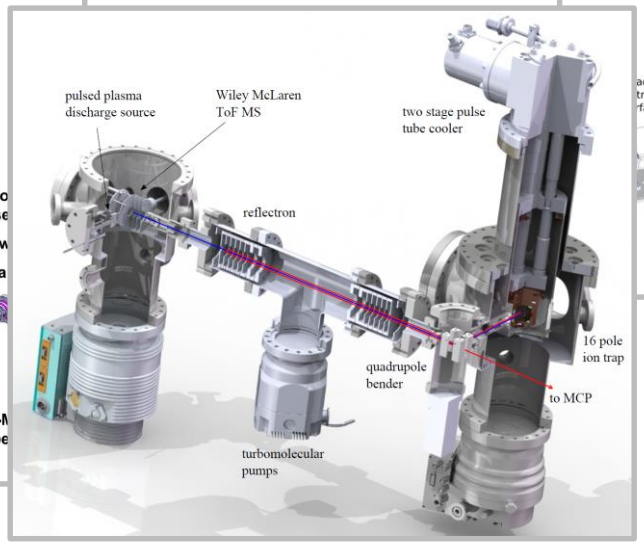
# Dynamics and Spectroscopy of Charged Molecular Systems

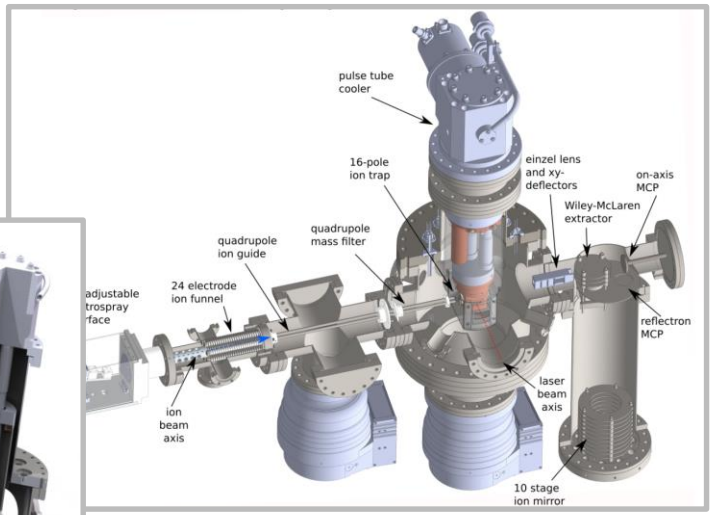
## Experimentelle Aufbauten




Kreuzstrahlspektrometer für Ionen-Molekül-Reaktionsdynamik




4 Kelvin Ionenfalle für Laborastrophysik an interstellarer Ionen




4 Kelvin Elektrospray-Ionenfalle für Spektroskopie an Biomolekülen und Clustern

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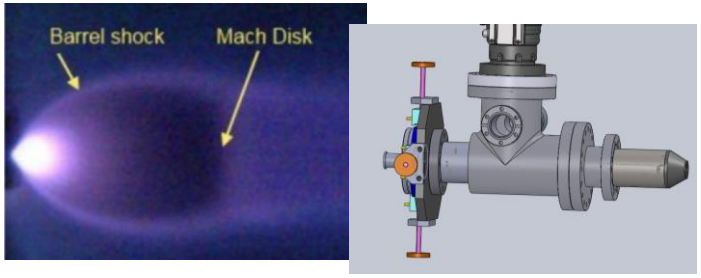
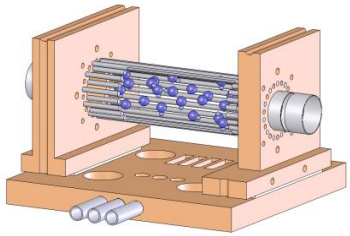
# Dynamics and Spectroscopy of Charged Molecular Systems

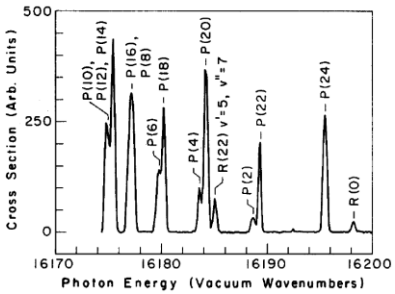
## Themen für Bachelorarbeiten 2020

Test einer neuen Überschallstrahlquelle für kalte Moleküle

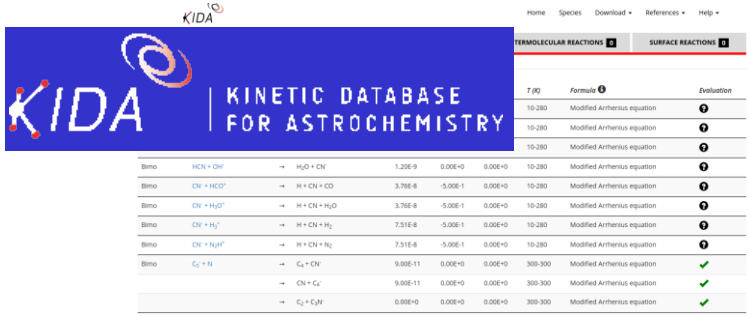



Hochauflösende Spektroskopie an kalten gefangenen Molekülionen






Numerische Modellierung interstellarer Molekülwolken




Erzeugung von VUV Laserstrahlung mittels Frequenzvervielfachung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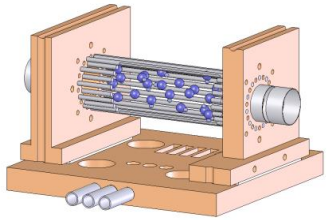
# Dynamics and Spectroscopy of Charged Molecular Systems

**Master thesis**

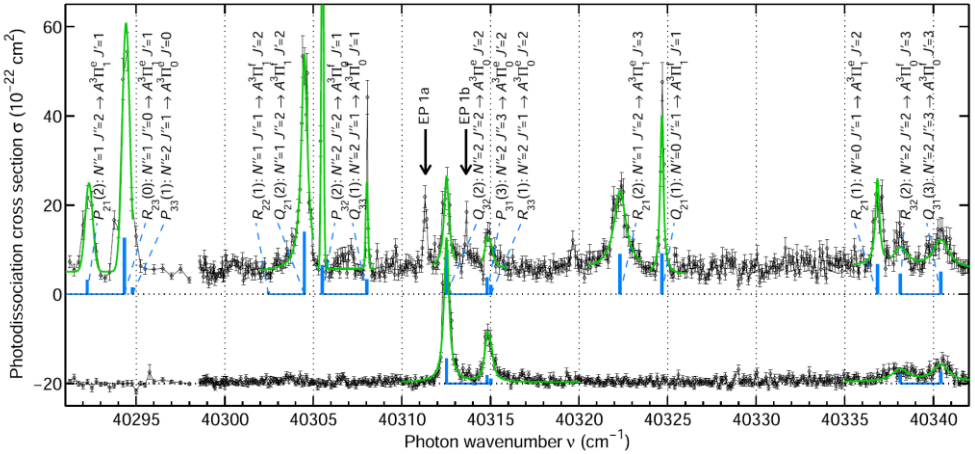
**Quantum state-resolved photodissociation of cold trapped $OH^+$**



*Goal:* Investigate the photodissociation of $OH^+ + hv \rightarrow O^+ + H$ at 10 Kelvin

*Tasks:*

- Learn to experiment with the cryogenic ion trap
- Prepare and investigate $OH^+$ cooled by Helium
- Analyse photodissociation spectra and determine rotational temperatures




Big Goal: Quantum control of rotational states and state-resolved ion-molecule reactions for better understanding of water formation in the universe

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# Dynamics and Spectroscopy of Charged Molecular Systems

**Master thesis**

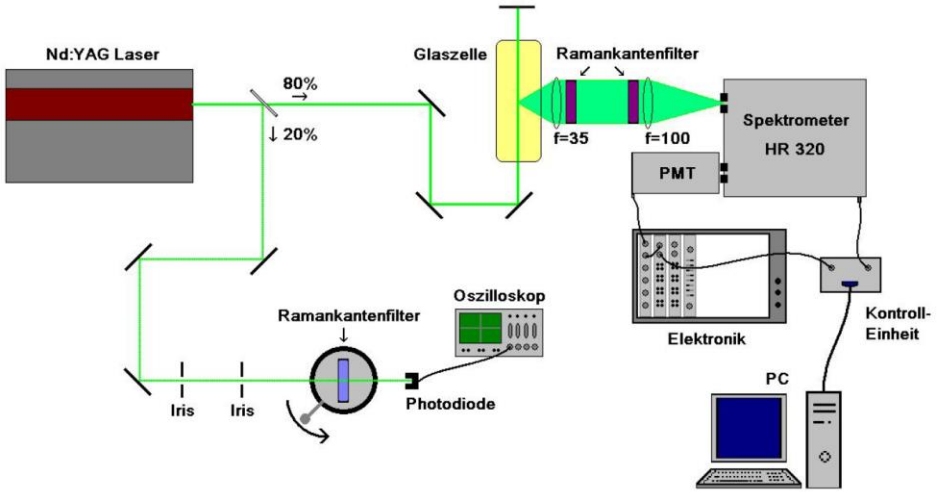
SWAROVSKI

## Raman spectroscopy of gas cavities in 3D-printed glass

*Goal:* Non-destructive identification of molecular species in gas cavities using Raman spectroscopy

*Tasks:*

- Assemble the laser spectroscopy setup
- Gain understanding of molecular spectroscopy
- Perform measurements on gas cavities in glass




Collaboration with physicists and engineers at Swarovski, Wattens
Big Goal: The world's first scalable 3D-glass printer technology

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# Dynamics and Spectroscopy of Charged Molecular Systems

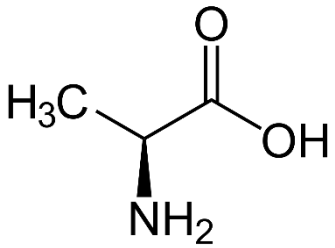
**Master thesis**

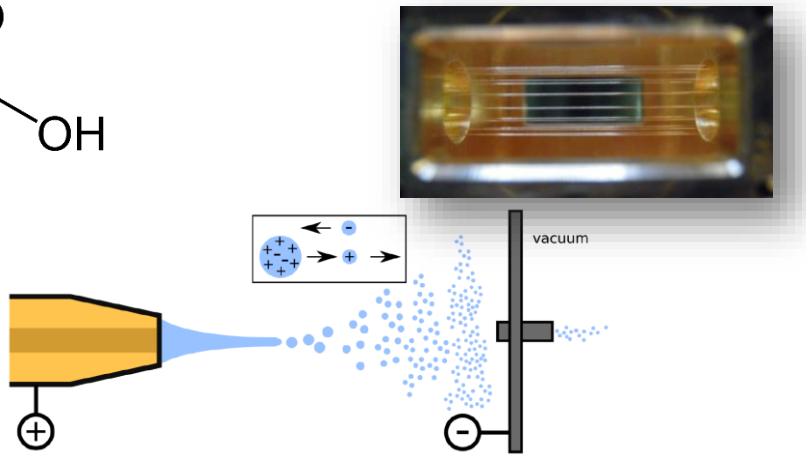
**High resolution spectroscopy of a protonated amino acid**

*Goal:* Investigate vibrational transitions in cold AlaninH$^+$ and analyze the rotational profiles

*Tasks:*

- Learn to experiment with electrospray ionization and a cryogenic ion trap
- Prepare and mass analyze protonated ions tagged with rare gas atoms
- Analyse the line profiles and learn about the structure of the biological molecules




Big Goal: Full rotational resolution for large biomolecular ions and clusters to obtain new and better insight into their spatial structrures

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