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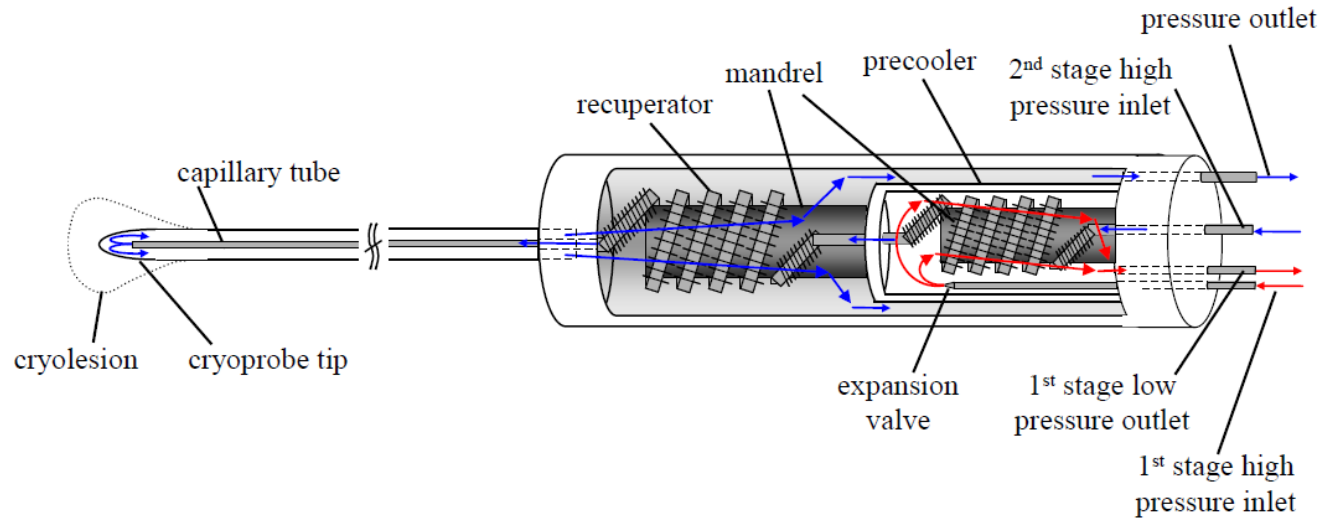
*Thesis:* Empirical Modeling and Mixture Selection for a Precooled Joule-Thompson Cycle for Cryosurgery.

# Motivation

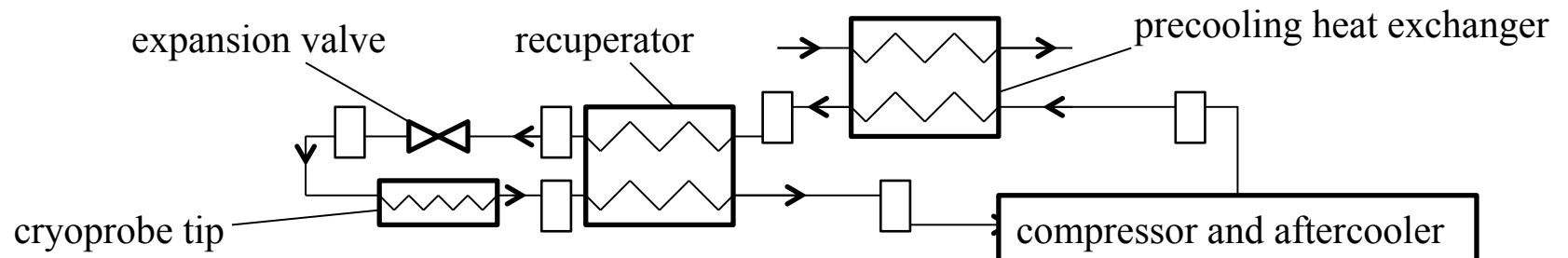
- Cryosurgery is the application of a very low temperature instrument/fluid to destroy undesirable tissue. It is a technique implemented for the treatment of both internal and dermatological diseases/disorders.
- The treatment is reliant on a cryosurgical probe which is inserted into the tissue. The tip of this probe reaches temperatures around 150K.
- The cryosurgical instruments utilized must be compact, easy to use, and minimally invasive.
- Systems utilizing a Joule-Thompson cycle with a mixture of gases as opposed to a pure gas are advantageous as the same level of cooling can be achieved with lower system pressures.



# Mixed Gas JT Cycle for Cryosurgery



Two stage cryoprobe schematic detailing the mixture flow, coiled fin tube heat exchangers and expansion valves [1]



Cryoprobe cycle schematic

# Goals and Objectives

- Complete revised modeling of two stage cryoprobe system including correlations obtained from previous work.
- Verify the ability of the model to predict load curve dependence on mixture composition and ensure accurate calculation of thermodynamic states relevant to cycle performance.
- Experimentally demonstrate the use of the model to select best mixtures for the JT cycle (2<sup>nd</sup> stage) based on constituents selected from previous experimentation and system analysis.
- References:
  - [1] Skye, H. M. 2011. Modeling, Experimentation and Optimization for a Mixed Gas Joule-Thomson Cycle with Precooling for Cryosurgery.

