Automated Chemistry Efforts at LLNL Using Eichrom's DGA Resin

Presented to:
SEVENTH WORKSHOP ON THE CHEMISTRY OF
THE HEAVIEST ELEMENTS
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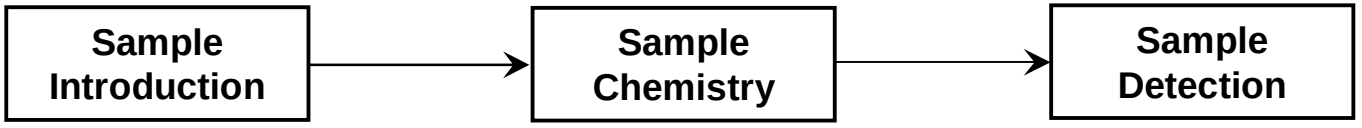
Automated Chemistry Efforts at LLNL Using Eichrom's DGA Resin

- Chemistry Desires for Automation
  - Speed
  - Reproducibility
  - Lower Dose to Operators
- Begin with a Heavy Element application
  - Single Column chemistry
    - Automated column regeneration
    - Long operating periods (months!)
- Basic Design



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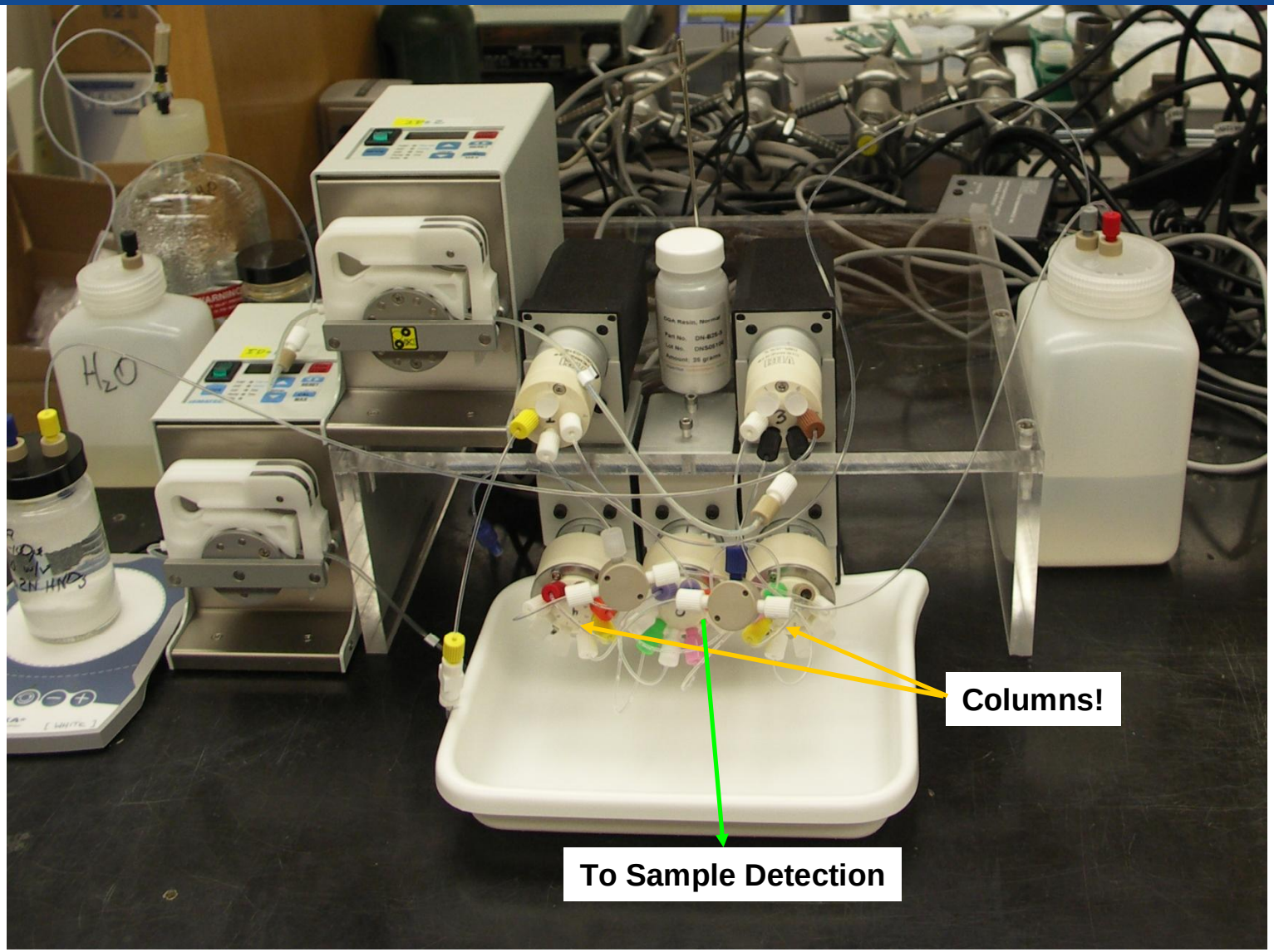

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- System Components
  - Cheminert valves, PEEK material, micro-electric actuation
  - ISCO peristaltic pumps
  - Tubing – FEP – ID = 0.03” (0.762 mm)
  - Columns – FEP tubing, 10cm length
    - Volumes
      - 0.762 mm tubing – 45.6 μl
      - 0.508 mm tubing – 20.3 μl
      - 0.254 mm tubing – 5.1 μl
    - Frits
      - PEEK, 0.5 μ or 2 μ Frit-In-A-Ferrule™

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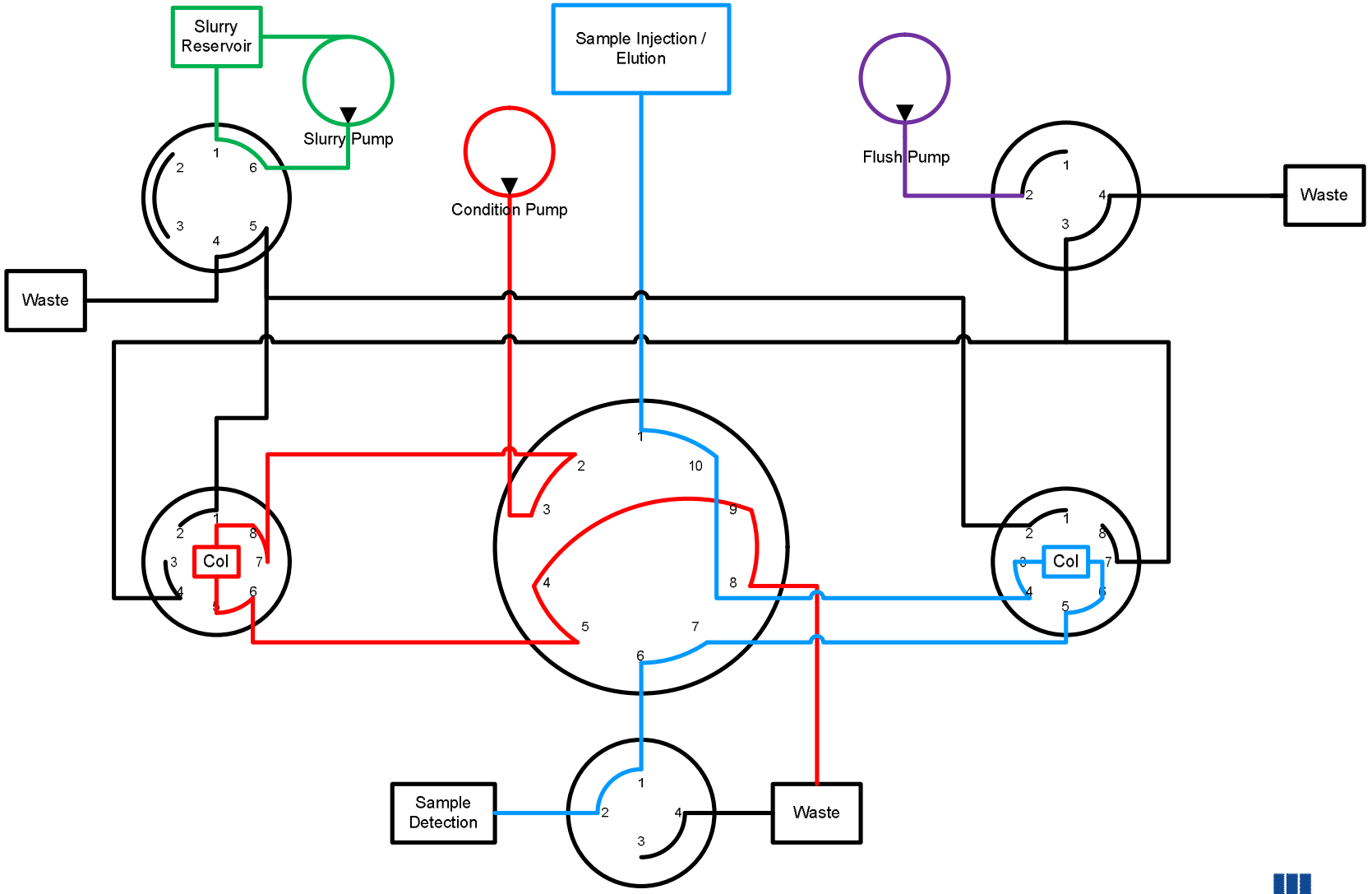

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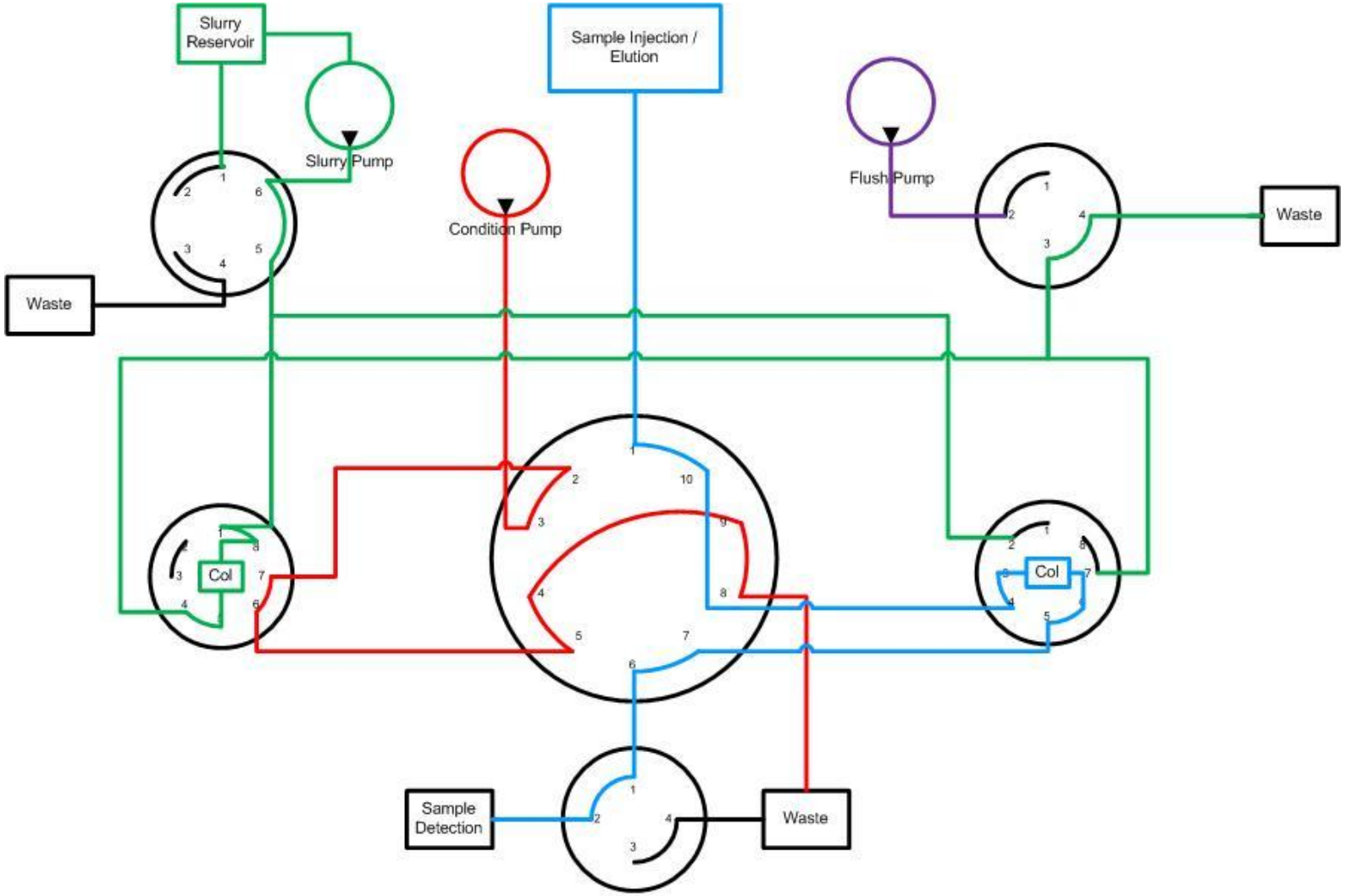

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- System Notes
  - Resin slurry concentration is key
  - Slurry tends to settle out of the load tube from the reservoir
  - DGA seems to work OK; AG-1 does not behave as well
  - As the column fills system back pressure increases

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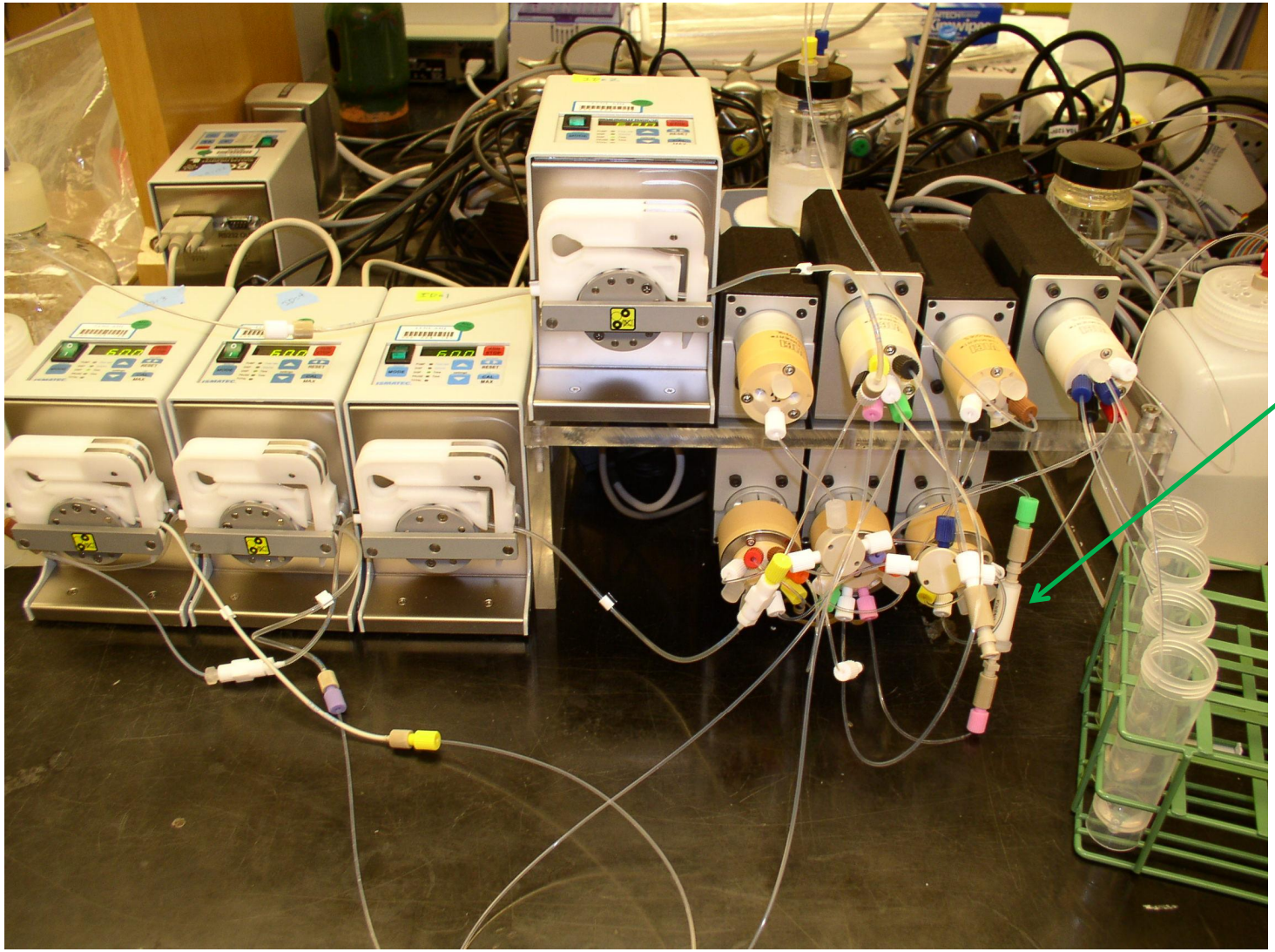

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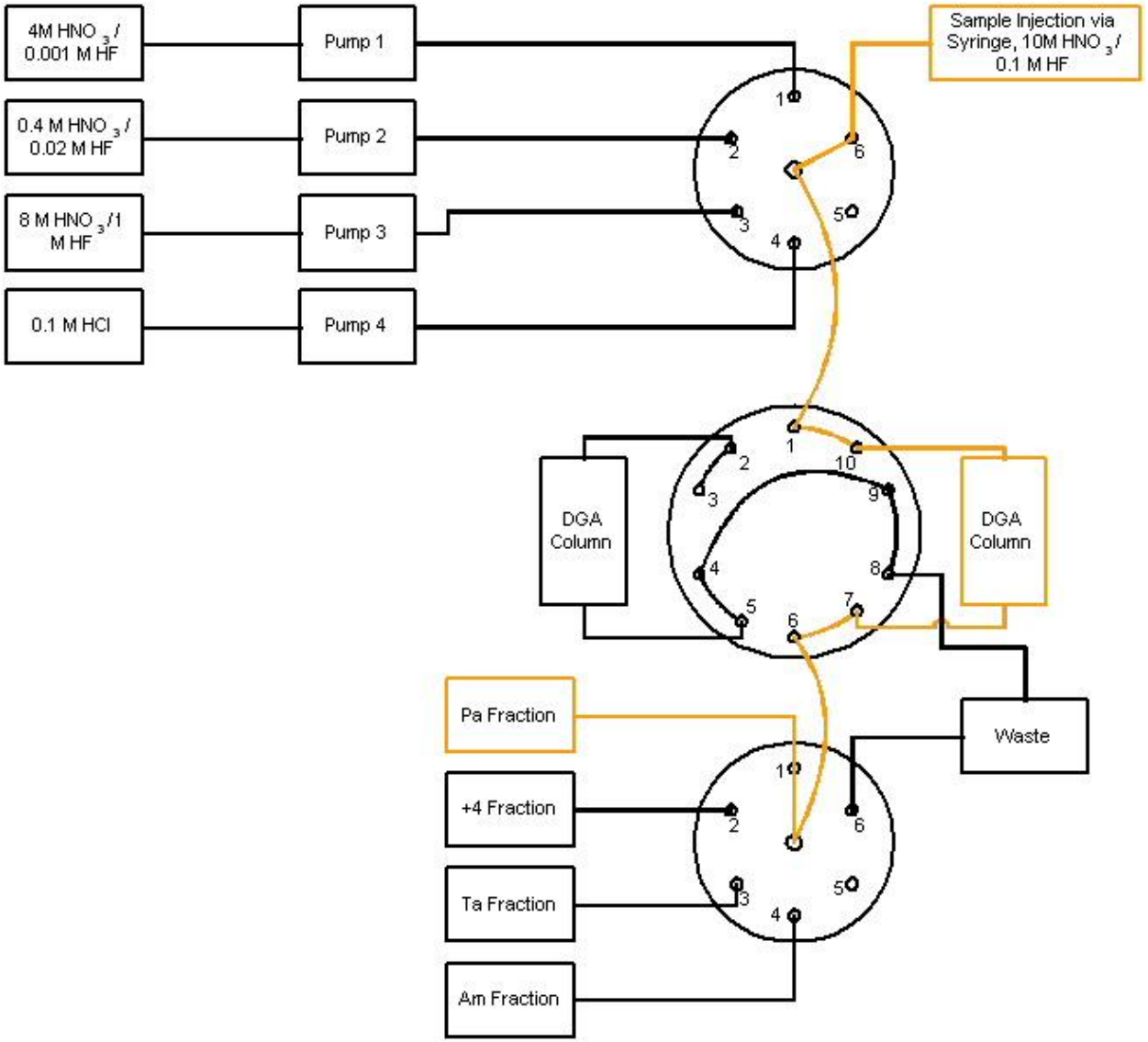

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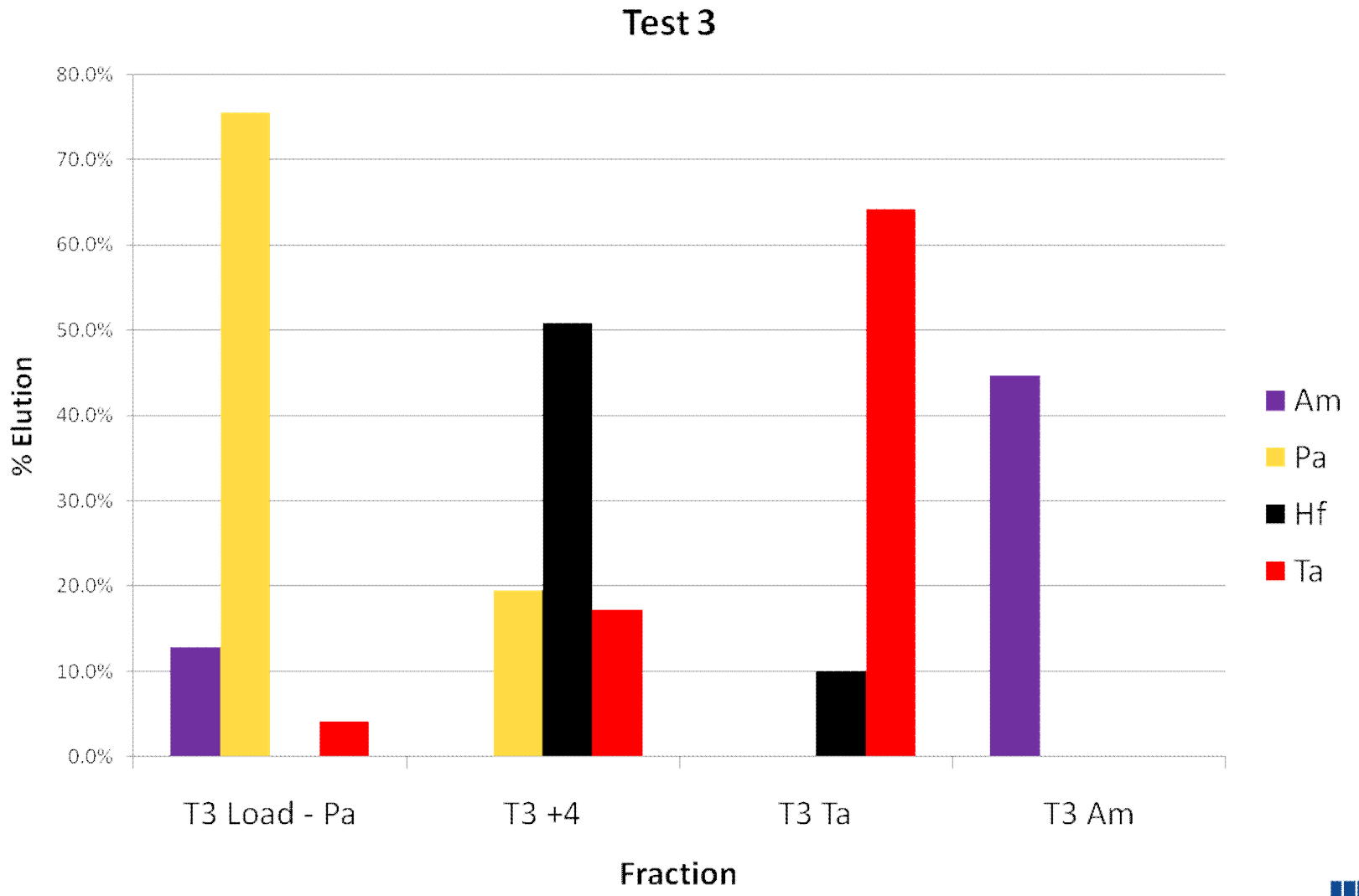

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- Items for Study
  - System dead volumes, how they relate to elution parameters
    - Off-line vs. On-line operation
  - Couple now with automated column generation
  - Kinetics – how fast can we run the pumps?
    - Chemical – Affect on separation capability
    - Mechanical – Column support frit size

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- Future Plans
  - Sample Introduction System
    - Gas jet into a frit
    - Continuous deposition into load solution?
  - Sample Detection System
    - Functionalized surfaces on glass
      - Fast Kinetics
      - Additional Selectivity?
  - On-line tests at an accelerator facility
    - Carrier free activity (not the case currently with Ta)
- Questions?

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