CRETIN

- 1-, 2-, and 3-dimensional non-LTE atomic kinetics / radiation transfer code
- Arbitrary mixtures of elements
- All physics data derived from collisional-radiative models
- Generates screened-hydrogenic atomic models or uses externally-supplied atomic data
- Originally written as an astrophysics research tool to model accretion disks – “cretin” is a contraction of “accretion”
Computer lab - CRETIN

• Execute: “source /home/nfs3/smr3105/hscott/addcr”

• Materials are in $CRDIR
  
  $CRDIR/bin/cretin ← will be in your path
  $CRDIR/Doc/... ← documentation
  $CRDIR/Exercises/... ← exercise files
  $CRDIR/Examples/... ← files used for lecture examples
  $CRDIR/Tests/... ← regression tests
  $CRDIR/Models/... ← atomic models (Z = 1-42)

• Copy documentation and exercises to your space
  “mkdir ~/Cretin”
  “cp –a $CRDIR/Doc $CRDIR/Exercises ~/Cretin”
Extras

- Execute: “source /home/nfs3/smr3105/hscott/addcr2”
- Sets default behaviors for ULTRA with ~/.ultrarc
- Defines function for setting number of threads
e.g. “threads 8”
Simulation setup

1. Atomic model(s)
   – constructed from energy level + transition rate data

2. Physics options
   – LTE/NLTE, radiation transport + frequency mesh, ...
   – time-dependent or steady-state

3. Spatial mesh (w/ material distribution)

4. Initial conditions

5. Desired output quantities

This information is contained in a generator file – ex2.gen

Output quantities are produced in output files – ex2.plt, ex2.ult

ex2.plt is text and can be used with many plotting packages

ex2.ult is binary and can be viewed with ULTRA
Radiation Transport “flavors”

Continuum, lines and spectra are treated separately for efficiency

Iterated to consistency with atomic kinetics (and other processes):
- coarsely-binned continuum radiation over full energy range for evaluating photo rates
- finely-binned line radiation for resolving individual line profiles

Evaluated after convergence:
- spectral radiation on fine bins to resolve features in energy range(s) of interest
Cretin is export controlled - documentation also

Restrictions –
1. You may use the code, but do not copy it
2. You may have a copy of the User Notes, but do not give them to others

The code is available, but only with a collaboration agreement – contact me at hascott@llnl.gov