

Comments for HEATFLOW simulation

HEATFLOW is a finite-element 2-D simulation of temperature rise due to absorption of a heating-laser beam. It assumes a complex longitudinal geometry (objective lens, immersion fluid, glass coverslip, aqueous buffer, glass coverslip, immersion fluid, objective lens) but is radially symmetric. The code is written using Borland Turbo-Pascal, so it must be compiled and run on a 32-bit computer capable of running in MS-DOS mode. Any PC computer with Microsoft-XP usually works OK. Place the entire folder including all files on the desktop. Then there are 2 ways to run the simulation. Either click on the pre-compiled application HEATFLOW.EXE or else click on the application TPX which launches the Pascal compiler. Then pull down the FILE menu, select OPEN and choose file HEATFLOW.PAS. After you see the source code, you can edit it and re-compile. Editing the source code is the only way to change any parameter or the name of the data file that will be generated in the OUTPUT sub-folder.

On launching the program you will see a black screen with a multi-color histogram that grows upward. The vertical axis represents temperature rise at center of the water layer at time t after the laser is turned on. The horizontal axis represents the radial distance that heat conducts away from the optic axis of the heating laser. A menu will appear after a simulated heating time of 10 milliseconds. Push the spacebar if you wish to continue for another 10 ms, each of which takes about 5 minutes in my computer. You may push the spacebar n times if you wish the simulation to proceed for $(n * 10)$ ms. When that time has finished push the 's' key to quit and save various data in the OUTPUT sub-folder. Alternately, push 'q' to simply quit without saving. A blue line tracks the peak temperature for each 10-ms period. If the program hangs and you cannot quit, then press the *system-call* key. An icon for "Turbo Pascal 7.0" will appear in the taskbar at bottom of your screen. Right-click that icon and select "CLOSE" if you wish to abort the program.

On "save" the program writes 3 files into the OUTPUT sub-folder:

- (1) A text file showing the temperature rise at various longitudinal and radial distances along the beam.
- (2) A bitmap image showing the user screen when you pushed the "s" key. The temperature risetime can be inferred from the family of blue curves.
- (3) A bitmap image showing the same temperature profile as given in the text file.

Be sure to edit the filename between runs or else such files will be overwritten by subsequent runs.

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