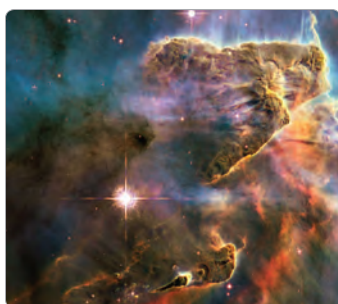


# NINE TIPS

## TO PARALLEL PROGRAMMING HEAVEN

By **Stephen Blair-Chappell**  
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In this interview, Dr. Yann Golanski shares with us his favorite tips on parallel programming. The tips are based on investigative work on parallel n-body simulation code carried out during his doctoral studies.



A cloud of cold interstellar gas

### The Formation of Stars

It is thought that stars are formed from the Inter Stellar Medium (ISM), an area populated with particles of predominantly hydrogen and helium. Within the ISM, there are dense clouds. These clouds are normally in equilibrium, but can collapse if triggered by various events.

In the research work done by Dr. Golanski, the model simulates the collapse of the ISM, by seeding the ISM with coolant from a supernova.

The collapsing cloud continues collapsing until equilibrium is reached. This cloud is known as a protostellar cloud.

Further contraction and fusion of the protostellar cloud takes place, resulting in the eventual formation of a star.

- 1 Just buy a faster machine.**  
First look at how much it will cost you to make your program parallel. If it will take, say two months of coding, can you just buy a faster machine that will give you the speedup you want? Of course, once you reach the limits of a machine's speed, you are going to have to do some parallelization.
- 2 Start small.**  
Don't try to make everything parallel at once, just work on small bits of code.
- 3 Starting from scratch? Use someone else's wheel.**  
If you are starting from scratch, see what other people have done. Learn from others. Don't reinvent the wheel.
- 4 Find a way of logging\ debugging your application.**  
Make sure you have a way of tracing what your application is doing. If necessary, buy some software tools that will do the trick. Prints on their own will probably not help.
- 5 Look at where the code is struggling.**  
Examine the runtime behavior of your application. Profile the code with Intel®VTune™ Performance Analyzer. The hotspots you find should be the ones to make parallel.
- 6 Write a parallel version of the algorithm.**  
Try rewriting the algorithm so it is parallel-friendly.
- 7 Stop when it's good enough.**  
When you think it's good enough, stop. Step back, go for a pint. Have set goals—when you've achieved them, you're done.
- 8 Tread carefully. You are walking on eggs, and some eggs are land mines.**  
Take care with the parallel code. Some innocent errors could blow up your program. Use a good tool to check for any data races and other parallel errors.
- 9 Get the load-balancing right.**  
Once you've made your code parallel, make sure all the threads are doing equal amounts of work.

*The tips were recorded over a pleasant Thai meal in the City of York. Between the various dishes, Dr. Golanski spoke about the advice he'd give to someone starting to parallelize an application. At the end of the meal, the restaurant owner asked if we would mention the restaurant. Well here goes—if you are ever in the center of York, look for Siam House on Goodramgate.*

^Y. Golanski and M. M. Woolfson. A smoothed particle hydrodynamics simulation of the collapse of the interstellar medium. *Monthly Notices Royal Astronomical Society*. 320, 1-11 (2001).

The complete case study, along with hands-on examples, will be available in the WROX book, *Parallel Programming with Intel® Parallel Studio*. Stephen Blair-Chappell and Andrew Stokes, Wiley Publishing Inc. ISBN 9780470891650 (March, 2011)

Photo credit: NASA, ESA, and M. Livio and the Hubble 20th Anniversary Team (STScI)