Research Objective
- Design effective programming methodologies for energy efficient architectures
- Attain high performance without sacrificing productivity

```
#pragma for I,0,NPARTICLES-1
T4 p@I@ = pbuf[NPARTICLES*get_global_id(0) + @I@];
T4 a@I@ = (T4)(0.0,0.0,0.0,0.0);
#pragma endfor
for(uint i = 0; i < n; i += NUNROLL) {
  T4 p, dp;
  T invr;
  #pragma for J,0,NUNROLL-1
  p = pbuf[i+@J@];
  #pragma for I,0, NPARTICLES-1
  dp = p - p@I@;
  invr = rsqrt(FMA(dp.x, dp.x, FMA(dp.y, dp.y,
                                 FMA(dp.z, dp.z, eps))));
  a@I@ = FMA(p.w, invr*invr*invr*dp, a@I@);
  #pragma endfor
  #pragma endfor
}
```

Code snippet depicting the auto-tuning technique for kernel parameterization.

Challenges
- The breakdown of Dennard scaling and the rise of dark silicon
- How to advance computing systems without advance in processing technology
- Ninja gap of 24X

ARL Facilities and Capabilities Available to Support Collaborative Research
- Adapteva’s Epiphany architecture Parallalla boards
- ARM platforms
- Publications
- Achieved high performance for the Epiphany architecture with efficient parallel programming model, threaded MPI

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration
- Approximate computing
- Reconfigurable computing (Arria 10)
- Tile architectures (Tilera, Kalray, etc)
- Power architectures
- Domain specific accelerators