Table 4: **Industrial HPCC Applications 6 to 10: SIMULATION**

Item	Application Area and Examples	Problem Comments	Machine and Software
6 **Sec.** **4.1**	**Environmental Phenomenology** —Complex Systems, (Lead Concentration in blood, acid rain in the Adirondacks)	• Empirical Models • Monte Carlo and Histograms	• Some SIMD but • MIMD more natural • HPF
7 **Sec.** **4.1,** **4.2**	**Basic Chemistry** • Chemical Potentials • Elemental Reaction Dynamics	• Calculate Matrix Elements • Matrix Eigenvalue determination, Inversion, Multiplication	• Probably MIMD with perhaps SIMD possible • HPF
8 **Sec.** **4.2**	**Molecular Dynamics** in Physics & Chemistry • Biochemistry • Discrete Simulation Monte Carlo for CFD (DSMC) • Particle in the Cell (PIC)	• Particle Dynamics with irregular cutoff forces • Fast Multipole Methods • Mix of PDE and Particle methods in PIC and DSMC	• HPF(+) except • need MPF or data parallel C++ for fast multipole
9 **Sec.** **4.1**	**Economic Modelling** • Real Time Optimization • Mortgaged backed Securities • Option Pricing	• Single financial instrument by Monte Carlo	SIMD, HPF [Makivic:95a]
		• Full Simulations of complete portfolios	MIMD or SIMD with Integration Software
10	**Network Simulations** • Electrical Circuit • Microwave and VLSI • Biological (neural) Circuit	• Sparse matrices • Zero structure defined by connectivity	• MIMD • HPF for matrix elements • MPF or library for matrix solve