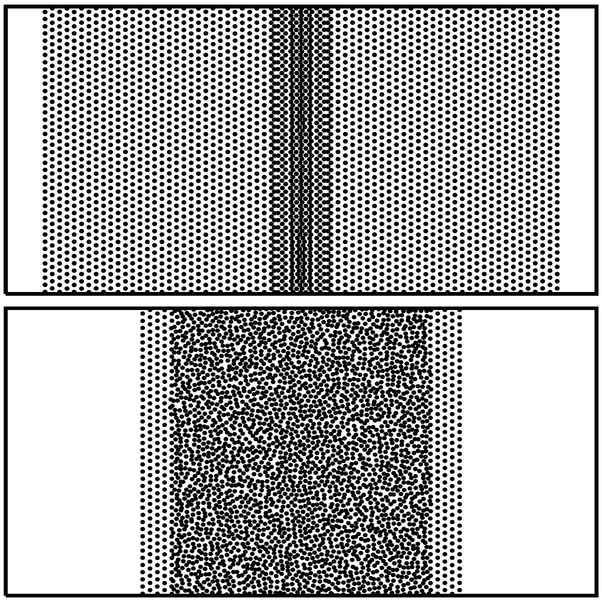

Figure 10: Two snapshots of the collision of two 1600-particle slabs (periodic in the y direction, with height 20 and initial width $20\sqrt{3/4}$. The initial velocities, $u_p = \pm 0.965$ give twofold shock compression, followed by a nearly isentropic free expansion at the free surfaces.

The thermodynamic irreversibility of the shockwave process has an interest independent of the definition of temperature and is worth futher study. The shock process itself obeys purely Hamiltonian mechanics, and Liouville's Theorem[20]. Even so, by using Levesque and Verlet's integer version of the leapfrog algorithm[21] the entire shockwave dynamics can be precisely reversed, to the very last bit. The apparent paradox, a perfectly time-reversible but thermodynamically irreversible process, can most clearly be illustrated by simulating the (inelastic) collision of two zero-pressure blocks of fluid. The collision of the blocks, with velocities $\pm u_p$ generates two shockwaves, with velocities $\pm(u_s - u_p)$. Two snapshots from such a simulation are shown in Figure 10.

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