1033-37-68 **Nikolai Chernov*** (chernov@math.uab.edu), Department of Mathematics, UAB, Birmingham, AL 35294, and **Dmitry Dolgopyat**, Department of Mathematics, PennState University, tate College, PA. *Galton Board: limit theorems and recurrence.*

We study a particle moving in $\mathbb{R}^2$ under a constant (external) force and bouncing off a periodic array of convex domains (scatterers); the latter must satisfy a standard 'finite horizon' condition to prevent 'ballistic' (collision-free) motion. This model is known to physicists as Galton board (it is also identical to a periodic Lorentz gas). Previous heuristic and experimental studies have suggested that the particle's speed $v(t)$ should grow as $t^{1/3}$ and its coordinate $x(t)$ as $t^{2/3}$. We prove these conjectures rigorously; we also find limit distributions for the rescaled velocity $t^{-1/3}v(t)$ and position $t^{-2/3}x(t)$. In addition, quite surprisingly, our analysis shows that the particle's motion is recurrent. That means that a ball dropped onto an idealized Galton board will roll down but from time to time it should bounce all the way back up (with probability one). (Received August 31, 2007)