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Alaa Haj Ali* (hajalia@purdue.edu) and **Donatella Danielli.** *a Penalized Boundary Obstacle Problem for the bi-Laplacian.*

We study a two-phase boundary obstacle problem for the bi-Laplacian in the upper half of the unit ball with boundary condition $(\Delta u)_y = \lambda_-(u^-)^{p-1} - \lambda_+(u^+)^{p-1}$ on the flat part Γ of the boundary. This problem comes from unilateral phenomena for flat elastic plates. When the displacements of the points are small, the governing equation is linear and the relevant operator is the bi-Laplacian, subject to unilateral displacements or rotations of the flat part of the boundary.

We establish the well-posedness of the problem and we study the optimal regularity of a solution. Then we prove some growth rate and non-degeneracy results of the solution at free boundary points and we derive some properties related to the structure of the singular set. This is a joint work with Donatella Danielli. (Received January 11, 2021)