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**Mariana Smit Vega Garcia\***, msmitveg@math.purdue.edu, and **Nicola Garofalo**. *New monotonicity formulas and the optimal regularity in the Signorini problem with variable coefficients.*

We will start by describing the interior Signorini, or lower-dimensional obstacle problem, for a uniformly elliptic divergence form operator  $L = \operatorname{div}(A(x)\nabla)$  with Lipschitz continuous coefficients and discuss the optimal regularity of the solution. Our main result states that, similarly to what happens when  $L = \Delta$ , the variational solution has the optimal interior regularity  $C_{loc}^{1, \frac{1}{2}}(\Omega_{\pm} \cup \mathcal{M})$ , where  $\mathcal{M}$  is a codimension one flat manifold which supports the obstacle and divides the domain  $\Omega$  into two parts,  $\Omega_+$  and  $\Omega_-$ . We achieve this by proving some new monotonicity formulas for an appropriate generalization of the celebrated Almgren's frequency functional. (Received August 26, 2013)