HE MECHANISM BY which cells organize into tissues is fundamental to developmental biology and tissue engineering. Likewise, disruption of cellular order within tissues is a hallmark of many diseases including cancer and atherosclerosis. Tissue formation is regulated, in part, by a balance between cell-cell cohesion and cell-matrix adhesion. In this lecture, I will discuss my laboratory’s investigation into the role of this balance in the formation of vasculature. Specifically, we have found that by decreasing cell-matrix adhesion by either reducing matrix stiffness or matrix ligand density, endothelial cells self-assemble into network-like structures, resembling capillaries. These structures are stabilized by increased localization of VE-cadherin to the cell membrane and the polymerization of the extracellular matrix protein fibronectin. When fibronectin polymerization is inhibited, network formation does not occur. Interestingly this interplay between substrate mechanics, ECM assembly and tissue self-assembly is not limited to endothelial cells, as we have observed it in other cell types as well. These results suggest novel approaches to foster stable cell-cell adhesion and engineer tissues.

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BMES established this award in 2000 to honor Rita M. Schaffer, former BMES Executive Director. Rita’s gift of her estate, along with contributions from her family, friends, and associates, has enabled BMES to create the Rita Schaffer Young Investigator Award, which includes the Rita Schaffer Memorial Lecture.