During early embryogenesis, secreted proteins dictate the body plan of developing individuals. The resulting patterns are thought to be imposed by a graded distribution of molecular signals. To this day, it is not fully understood how signaling gradients are formed, maintained and adjusted to body sizes of differently sized individuals. Two of the most important parameters controlling the range and shape of signaling gradients are the rate at which signaling molecules decay and diffuse. Despite their importance, such biophysical parameters have not been measured or have only been assessed under simplified assumptions or contexts for most developmental systems. In this talk, I will present two assays combined with two novel specialized software packages that allow the assessment of these parameters in living zebrafish embryos. Moreover, I show how to use mathematical modeling equipped with parameters estimated from these assays to describe scale-invariant patterning during germ layer formation in zebrafish development. My model, together with a rigorous multidimensional parameter screen fitted in normal and artificially size-reduced embryos, was able to identify a new mechanism that allows for scaling of the germ layers in differently-sized embryos with realistic parameter configurations.