

Introduction to the Mathematics

She focused her dissertation on the topic of "Regularity of the Singular Set of Two-Dimensional Area-Minimizing Flat Chains Modulo 3 in \mathbb{R}^3 ." This solved the problem on length and smoothness of soap-film triple junction curves, which had puzzled mathematicians for centuries.

The first person to work on soap films was a Belgian professor of Physics and Anatomy by the name of Joseph Plateau. He began to study soap films in 1829, but never proved his theories. Jean Taylor's main work was that of proving Plateau's problem. Plateau's problem stated: if you start with a circle of wire that has been twisted, bent, and stretched into some new shape and dip it into soapy water and pull it out again, what kind of shape will the soap film result in? Surface tension makes the resulting soap film minimize its area while still spanning the wire frame. Taylor proved that a compound soap bubble spanning a wire frame consists of flat surfaces smoothly joined together. She also confirmed that soap bubble surfaces meet in only two ways: either exactly three surfaces meet along a smooth curve of 120 degrees or six surfaces meet at a vertex. When surfaces meet along curves or when curves and surfaces meet at points, they do so at equal angles of about 109 degrees. The pictures below illustrate the symmetry of the angles.

