

## **11.1 Background of Stress Intensity Factors**

The emergence of fracture mechanics as a tool for determining failure loads in materials has come a long way from the early work of A.A. Griffith who, in 1920 presented his treatise on the understanding of the fracture mechanism of glass, "The Phenomena of Rupture and Flow in Solids". Griffith's work was itself building on the earlier work by C.E. Inglis summarized in "Stresses in a Plate due to the Presence of Cracks and Sharp Corners" [1913].

Many researchers followed and built on the original concepts, with a notable leader at the Naval Research Laboratory, Dr. G. R. Irwin, applying the concepts and improving the methodology from the energy based approach of Griffith to the stress intensity approach we use today. The Navy had a vested interest in this analysis technique to understand the fracture of steel ship plate material used in the World War II Liberty ships.

The 1950s and 1960s definitized the methodology by the standardization of some of the test methods and application techniques. What we now view in numerous handbooks as lists of stress-intensity factors (SIF) have each been "hammered out" by a succession of researchers to improve the accuracy and usefulness of the SIFs. Most of the advances have been under the guidance of one or more of the technical societies such as ASTM, ASM, and SAE.