Microdentistry is a science-based tool of operative dentistry, and is an alternative to traditional dentistry. The structures and substructures of teeth have been generally misunderstood. Once these structures are understood, the goal of the microdentist is to identify unsound tooth structure, which is a threat to the long-term stability of the tooth, and then neutralize or remove those structures with minimal disruption of the surrounding sound tooth structure. Minimal disruption of sound tooth structure provides the additional patient benefit of reducing or eliminating the pain associated with traditional dentistry. This article reviews some of the newly discovered structures in human teeth and discusses methods of microdentistry used to preserve these structures.