The discovery of the piezoelectric effect in bone in the late 1950’s ushered in the modern era of bioelectricity. In the century prior to its discovery, several reports appeared describing electrically-induced osteogenesis, but it was the growth-control system based on mechanically-generated electrical signals in bone that was first proposed by Becker in 1963 which led to the present clinical applications of electrical osteogenesis. It was reasoned that if naturally occurring stress-generated electrical signals in bone could alter cell function, then perhaps artificially-applied electrical signals could exert a similar effect. This led to the first demonstration in the modern era of artificially stimulated electrical osteogenesis, published in 1964 by Bassett and Becker. They described the growth of bone in the medullary canals of dogs stimulated with 3–10 microamperes via platinum electrodes, and the work was the forerunner of literally hundreds of similar studies in succeeding years.

Reports of clinically successful applications of electrode-delivered electrical energy appeared in the early 1970’s, and the technique—as well as a noninvasive technique developed by Bassett—was approved for clinical use in the United States in the late 1970’s.

Although it is common for proponents of both techniques to refer to the piezoelectric properties of bone as the underlying rationale for their clinical successes, it is now apparent that neither technique has a direct relationship to piezoelectricity, or to any natural physiological process. The electrical energy supplied to bone in the practice of the present-day techniques is many orders of magnitude greater than can reasonably be expected to be present naturally in bone via the piezoelectric effect. Thus, if piezoelectricity is a truly significant physiological phenomenon, there must exist a range of electrical energies that is many times lower than that in use today which, if artificially simulated, would mimic the natural signals present in bone. There is some direct experimental evidence that supports this view, and I believe that we are on the threshold of a new biology—a biology in which natural electrical control signals that regulate cell function will be discovered and decoded, thereby giving the clinician a measure of control over growth processes.