

FOUNDATIONS Hints of a Helix, circa 1947

Nearly four decades after biochemist Phoebus Levene first postulated his “tetranucleotide hypothesis” in 1910, most scientists still believed that DNA was made up of equal numbers of the four nucleotide bases in a repeating tetrameric structure, with each subunit containing all four bases.

Then in 1947, John Masson Gulland, together with Dennis Oswald Jordan and their colleagues at University College, Nottingham, perfected a method of extracting DNA from calf thymus glands. Importantly, their protocol avoided the use of acid or alkali, which kept the solution at a constant neutral pH, allowing them to isolate pure, fibrous, nondegraded DNA (labeled ‘desoxyribose nucleic acid’ in Gulland’s handwriting on the vial at right). When they added strong acids or bases to the sample, however, electrometric titrations showed that hydrogen bonds rather than covalent bonds linked the amino and hydroxyl groups of the nucleotide bases.

These results, along with Erwin Chargaff’s 1950 discovery that DNA contains equal amounts of adenine and thymine and equal amounts of cytosine and guanine, paved the way for James Watson and Francis Crick’s discovery that the molecule is, in fact, a double helix. As Watson put it in *The Double Helix* (1970): “A rereading of J.M. Gulland’s and D.O. Jordan’s papers... made me finally realize the strength of their conclusion that a large fraction, if not all, of the bases formed hydrogen bonds to other bases.”

Gulland died in a railway accident in northern England on October 26, 1947. “His death means a sad and irreparable loss to us all,” Chagraff wrote in the *Annual Reviews of Biochemistry* in 1948 (17:201–26). ■

Nondegraded DNA from calf thymus.

