Graphs, representation and x-ray diffraction exposure relating to DNA research referenced as 'Dr Fuller'

Contributors

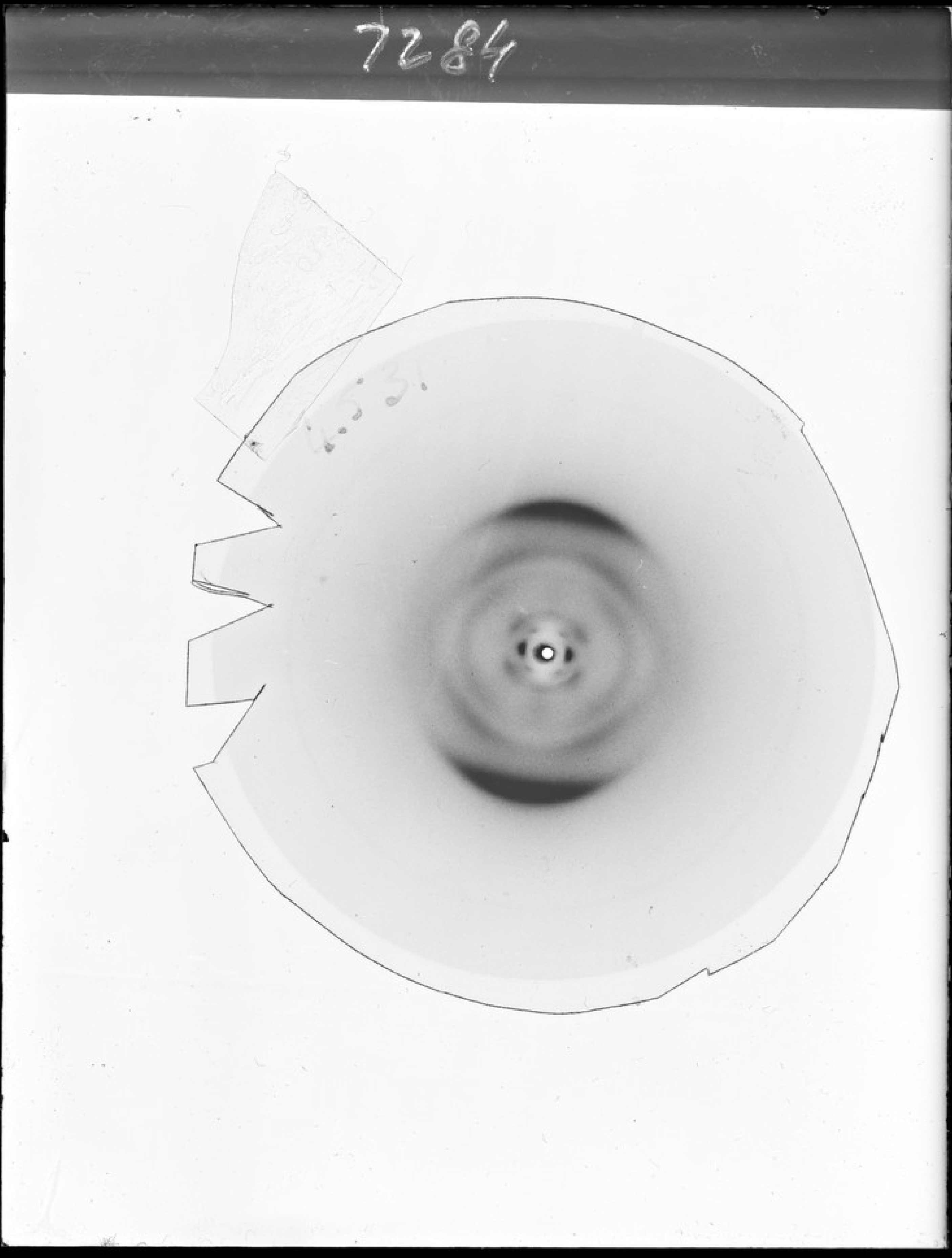
Fuller, Watson, b.1935

Publication/Creation

February 1966

Persistent URL

https://wellcomecollection.org/works/wuafk9zu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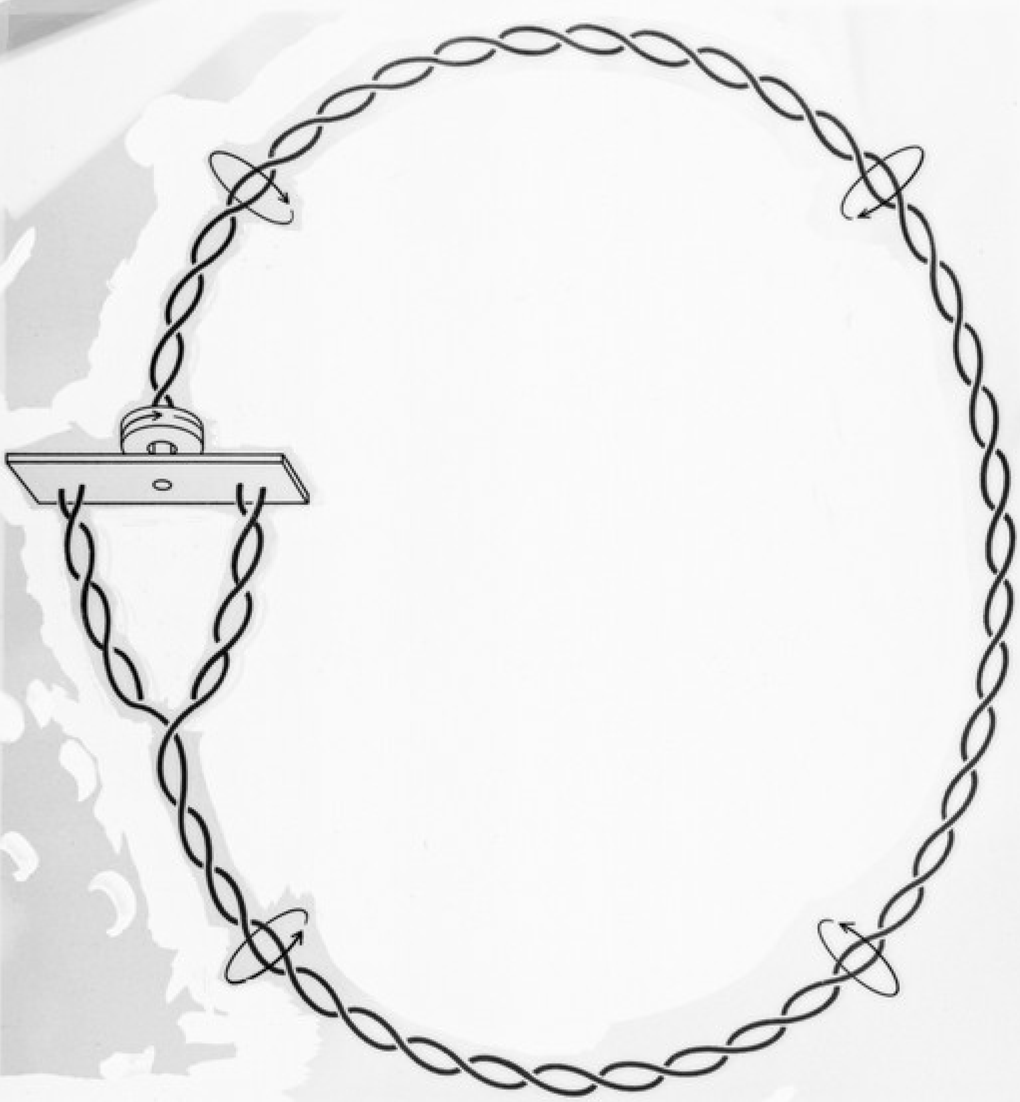
cule with respect to the two new molecules—must hold the latter fast, in other words, just as the far end of a rope must be held if it is to be unwound. A little thought will show that this can be surely accomplished by a ... tached, directly ... mon "ground," ... molecule

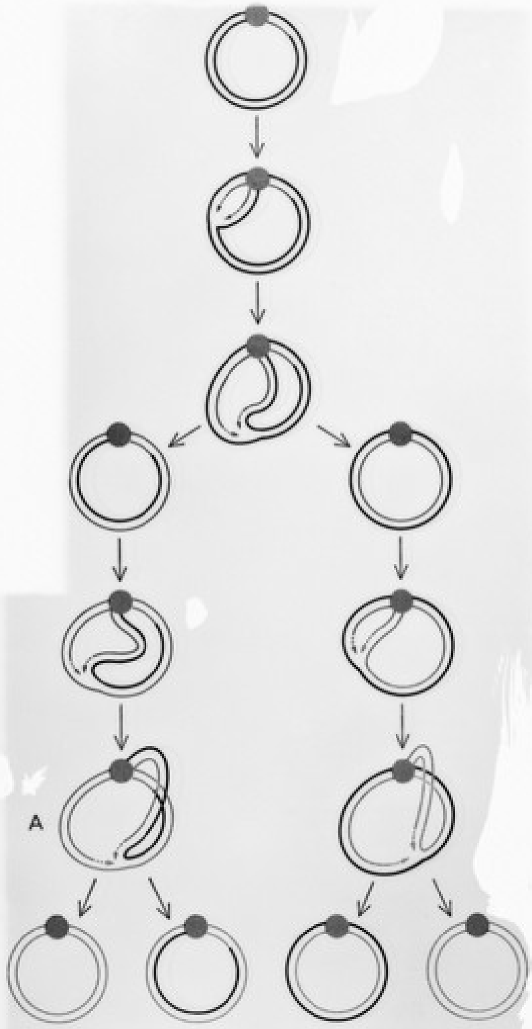
a machine would inevitably unwind the parent molecule one turn.

Although other kinds of unwinding machine can be imagined (one could be located, for example, at the replicating fork), a practical advantage of this particular hypothesis is ... circularity ...

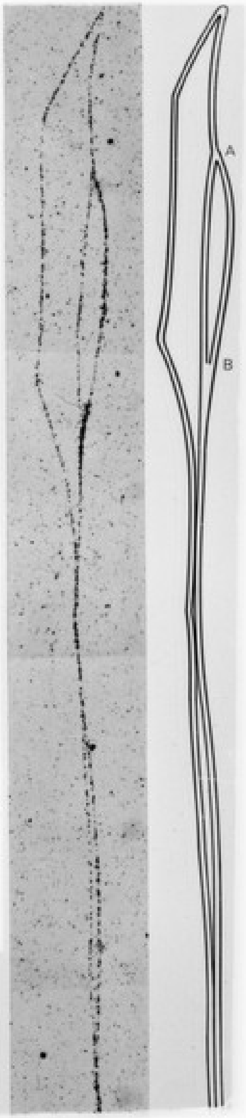
will instantly stop DNA synthesis, no matter how far the break is from the replicating fork. If this prediction is fulfilled, and the unwinding machine acquires the respectability that at present it lacks, we may find ourselves dealing with the first example in nature of something equivalent to a wheel.



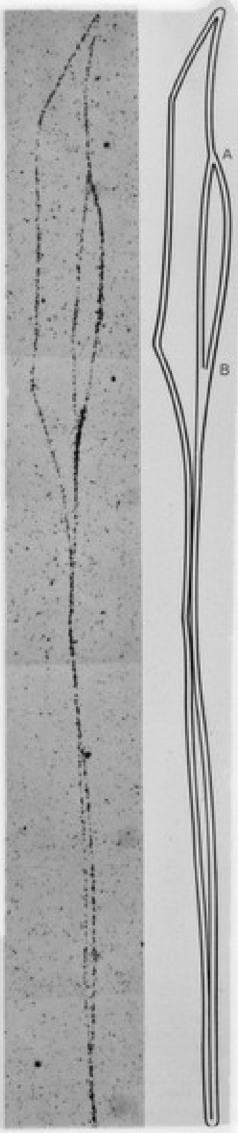
POSSIBLE MECHANISM for unwinding the DNA double helix is a swivel-like machine to which the end of the parent molecule and also the ends of the two daughter molecules are joined. The torque imparted by this machine is considered to be transmitted along the parent molecule, producing unwinding at the replicating fork. If this is correct, chromosome breakage should halt duplication.



BACTERIAL DNA MOLECULE apparently replicates as in this schematic diagram. The two chains of the circular molecule are represented as concentric circles, joined at a "swivel" (gray spot). Labeled DNA is shown in color; part of one chain of the parent molecule is labeled, as are two generations of newly synthesized DNA. Duplication starts at the swivel and, in these drawings, proceeds counterclockwise. The arrowheads mark the replicating "fork": the point at which DNA is being synthesized in each chromosome. The drawing marked *A* is a schematic rendering of the chromosome in the autoradiograph on page 36.



COMPLETE CHROMOSOME is seen in this autoradiograph, enlarged about 370 diameters. Like the chromosome represented on pages 36 and 37, this one is circular, although it happens to have landed on the membrane in a more compressed shape and some segments are tangled. Whereas the first chromosome was more than halfway through the duplication process, this one is only about one-sixth duplicated (*from A to B*).



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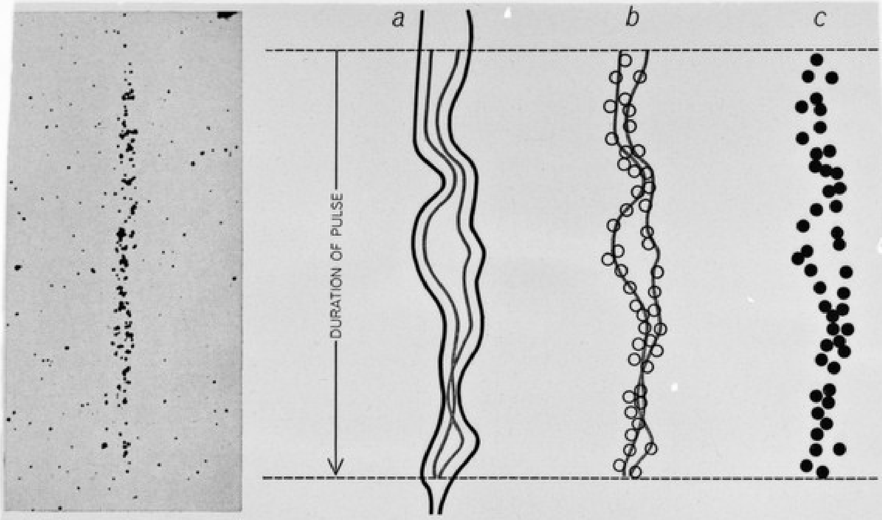

DNA synthesized in *E. coli* fed radioactive thymine for three minutes is visible in an autoradiograph, enlarged 1,200 diameters, as an array of heavy black grains (*left*). The events leading to the autoradiograph are shown at right. The region of the DNA chains synthesized during the "pulse-labeling" is radioactive and is shown in color (*a*). The radioactivity affects silver grains in the photographic emulsion (*b*). The developed grains appear in the autoradiograph (*c*), approximately delineating the new chains of DNA.

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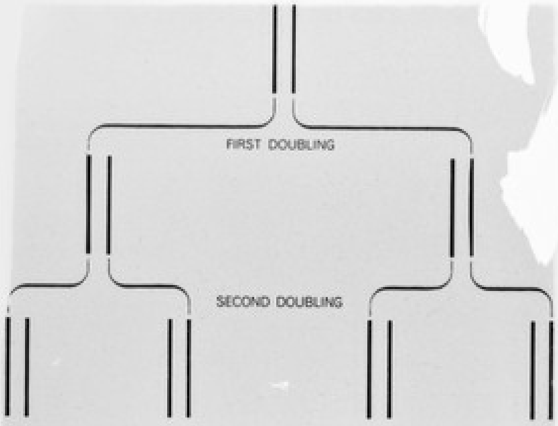
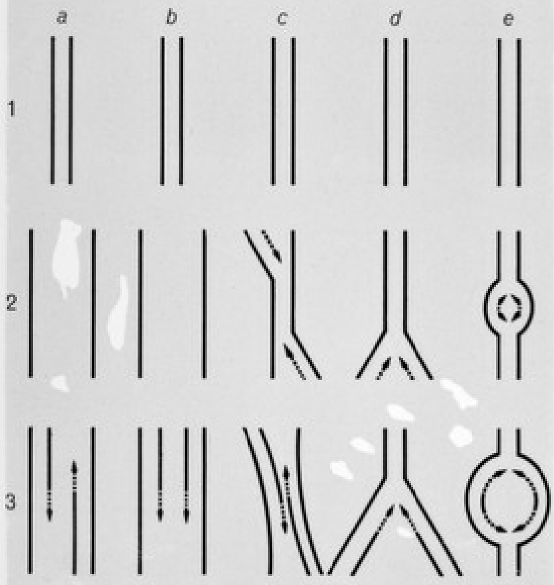


SEMICONSERVATIVE DUPLICATION was confirmed by the Meselson-Stahl experiment, which showed that each DNA molecule is composed of two parts: one that is present in the parent molecule, the other comprising new material synthesized when the parent molecule is duplicated. If radioactive labeling begins with the first doubling, the unlabeled (*black*) and labeled (*colored*) nucleotide chains of DNA form two-chain duplexes as shown here.



DUPLICATION could proceed in various ways (*a–e*). In these examples parental chains are hown as black lines and new chains as colored lines. The arrows show the direction of