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**Liquid Crystal Pre-Patterning for Cell Division** NICHOLAS HILL, DMITRI MIROSHNYCHENKO, University of Glasgow, NIGEL MOTTRAM, University of Strathclyde, JOHN LYDON, University of Leeds — We are examining the hypothesis that the overall geometry of mitosis is determined by liquid-crystal pre-patterning of the cytoplasm. The identification of mitosis with liquid crystalline (LX) phases is at least 50 years old but no attempt has been made to propose a detailed theory, presumably because of the difficulties in applying a theory of liquid crystals (LCs) in a 3D geometry. In this work, we use a mathematical model ( $Q$ -tensor theory) of a nematic LC for the cytoplasm of the cell and solve this numerically to show that the geometry of the prophase and metaphase can be explained using LX phases. The pre-patterning for the spindle is regarded as a bipolar LX assembly with the centrosomes acting as LC poles (centres of LX defects). The centrosomes and the nuclear envelope are both treated as bodies submerged in the LC medium between two spherical shells (the nuclear and cell membranes). The geometries considered are novel and 3D.

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