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Optical properties of large amyloid spherulites MICHAEL SMITH, JAMES SHARP, University of Nottingham — Amyloid Spherulites, consisting of a central core surrounded by radially oriented birefringent fibres (known as amyloid fibrils), have been found to occur in certain pathologies, such as Alzheimer's disease. Typically ∼5 30 m in diameter they can be observed by optical microscopy and easily distinguished by their characteristic maltese cross pattern, seen when viewed under crossed polarisers. Here we report the existence of much larger amyloid spherulites formed from bovine insulin, which grow under a particular set of conditions (10 mgml-1 BPI, pH ∼2.8, T ∼67°C, 25mM NaCl) to diameters of up to ∼500 m. These huge spherulites when viewed under crossed polarisers in addition to the maltese cross feature beautiful coloured rings which change with the size and density of the spherulite. Such rings have been observed in other systems such as fish eye lenses and nematic liquid crystal drops and appear to be related to the rather unusual radially oriented birefringence of their internal structure. Using a ray tracing technique we model the optical path of rays through these spherulites. Taking into account refraction and the radially oriented birefringence of the amyloid fibrils, we elucidate the origin of these beautiful patterns.

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