The optical transmission through colloidal Fe₃O₄ is studied under a magnetic field. Study includes

(1) Change in optical transmissivity under three different conditions namely

(a) The magnetic field applied transverse to the direction of propagation of the incident beam and the incident light being linearly polarised with its electric vector parallel to the direction of the applied field.

(b) The magnetic field applied as in case (a) and the incident light being linearly polarised with its electric vector perpendicular to the applied field.

(c) The magnetic field applied along the direction of the incident light. The incident light is in this case linearly polarised in any arbitrary direction.

(2) The birefringence in the colloid.

A new method is used in determining the birefringence.

It is observed that the behaviour in the optical transmission is strikingly different for the fresh and the aged colloids. Results are compared with the theory which assumes the colloidal particles to be Rayleigh scatterers.

Observations in fresh colloids are not in agreement with the theoretical expressions, but the observations in the aged colloids show complete agreement with the theory.
It is proposed that this anomalous behaviour is due to the
magnetically linked chains of the primary particles in fresh colloids.
On subsequent aging they dissociate and independent particles are
obtained in the aged colloids.

From the experimental observations the particle size and shape
are determined.