Rewriting the introduction:

* We can achieve this thin film of air between two surfaces by having the convex surface of a lens in contact with a plane glass plate. Then if we shine monochromatic light through the lens we can create an interference pattern of concentric rings progressively getting further apart from each other – known as Newton’s Rings. ~~These were studied by Sir Isaac Newton in 1775, and thus named after him.~~

Alternative ending to that paragraph:

These were first observed by Robert Hooke in 1665, and then later studied by Sir Isaac Newton in 1775.

Not sure about adding parts about the Travelling Microscope…

Method, wavelengths:

* (of light used.) For the yellow and green filters respectively, \lambda\_Y = 578\pm0.5nm and \lambda\_G = 546 \pm 0.5nm. [cite lab-book]

Discussion changing

* If we look at the plotted data in Fig. 2. we see that while the points do generally show the linear relationship between $\rho\_m^2$ and $(m-1)\lambda$, more than half do not lie either on or within their respective trendlines with their uncertainties. This could be due to the fact that during data collection, the bright and dark fringes blur into one another so distinguishing where the centre of the bright fringe lay was difficult to do, this would inevitably lead to distances being incorrectly measured. Furthermore, random errors may have arisen due to varying eyesight.
* However, when we use this data to find a value for the radius of curvature, $R\_{IE}=15\pm3$m, we at first doubt it's validity - the uncertainty is very large along with the actual value. But, after collecting data with a Travelling Microscope and using the same analysis, we get $R\_{TM}=24\pm2$m, which is similar to $R\_{IE}$. Given some consideration, we find that the large uncertainty could be due to how we measured the magnification, through measurement of one of the projected tick-marks, if we had in fact measured ten distances individually, the uncertainty would have reduced.
* This is the case for the repeated experiment, $R\_{RP}=18\pm5$, comparable values for radius of curvature although the uncertainty has increased. This is because a different magnification was used, $\times4$ instead of $\times6$ (noting $TM$’s $\times1$.
* Although we do need to consider that it was again difficult to collect data, the bright and dark fringes blur into one another allowing for mistakes to be made, plus random errors may have arisen due to varying eyesight. The latter could be reduced if one person took the results and kept using the same eye.
* There are a range of possible reasons for the differing values of $R$. For example, different filters were used in the investigations - what appeared to be the same colour each time could have been different. This would have lead to different wavelengths of monochromatic light being used. So the value for the radius of curvature would change accordingly, as can be seen by rearranging equation (3). This can also be caused by the non-perfect contact between the lens and glass plate, $d\_0$. If the thickness of the film increases then the wavelength of the light in the film increases, so the radius of curvature will decrease.
* We can see from Table 1 that when we used the Travelling Microscope set-up as shown in Fig. 1(b), the value for $d\_{0-TM}$ is smaller then compared to $d\_{0-IE}$ and $d\_{0-RP}$. This could be due to the geometric path difference of the interfering light waves changing. The value would be decreasing after being reflected at an angle from the screen thus resulting in a decrease of the value for $d\_{0-TM}$.

There are other ways in which the radius of curvature of a lens can be measured precisely using Newton's Rings, one is to use a digital camera and directly image the interference pattern produced - then digital software could be used to measure the fringe radius, avoiding any unnecessary random errors. On the other hand, we could coat the convex lens and the glass plate with high reflecting transparent silverings, this would allow the rings to appear sharper to avoid the issue of focussing the rings, moreover high precision could be attained here as well \cite{manchester}.

* In conclusion, through measurements of Newton's Rings it has been possible to determine a value for the radius of curvature of a planoconvex lens, $R\_{IE}=15\pm3$. A value which at first could be doubted, however after additional investigation it has been possible to compare this value with other ones and verify it is valid along with it’s uncertainty. However, through using a different experimental set-up it could be possible to reduce certain sources of uncertainties, and to remove some of the experimental issues experienced.

MORE ABSTRACT SHIT

* The Newton's Rings interference pattern is a consequence of the wave-like nature of light. By performing analysis of measurements of the diameters of the interference fringes it is possible to calculate the radius of curvature of a planoconvex lens. The value obtained through initial experimentation is $R\_{IE}=15\pm3$m, initially not taken as valid at first due to the large uncertainty. It is not until after subsequent investigations have been made and other values are obtained, $R\_{IE}=15\pm3$m and $R\_{RP}=18\pm5$m, that the initial value should be accepted.