NOTES ON THE CHROMOSPHERE

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Observers at the 1973 eclipse will have a totality sufficiently lengthy to undertake a variety of experiments. With this in mind some simple observations of the chromosphere could be made that might be of interest.

Attention should be paid to the color and relative intensity of the chromosphere and Young's stratum. This writer observed a pronounced change in the chromosphere between the 1963 and 1970 eclipses.

At the 1963 eclipse the chromosphere was of an intense deep ruby red or perhaps a deep wine red color, very electric in intensity and glowing like hot coals. At the 1970 eclipse the chromosphere was of a very faded pink pastel hue, though perhaps brighter. At the 1972 eclipse the chromosphere leaned towards that of 1970, though it was perhaps slightly redder.

Young's stratum, the origin of most of the flash spectrum, was not seen in 1963 nor looked for when it should have appeared, but it is not clearly evident in any of the photographs I have yet seen of that eclipse. It was seen in 1970 and was extremely brilliant. In fact it was bright enough to irradiate visually onto the moon's limb. In color it took on a purplish white cast. It is evident in most color photographs I have seen of that eclipse taken near the end of totality. It was also seen in 1972, though less pronounced than in 1970, and is difficult to see in most photographs.

A brief glance at the literature indicates that spicule orientation and chromosphere height apparently vary with the solar cycle, but I have not so far run across any clear statement that the chromosphere and Young's stratum vary overall in color, intensity or in relation to one another over the course of the solar cycle, though a few observers in the nineteenth century suspected this.

While the observations are limited and the conclusions highly speculative at this time, it seems possible that the chromosphere may vary somewhat as follows:

solar cycle	chromosphere	Young's stratum
sunspot minimum	deep, ruby or wine red, electric, glowing	weak or inevident
intermediate	red	evident, but not strongly so
sunspot maximum	faded pale pastel pink, bright	very strongly evident

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A check of about twenty visual observations of the chromosphere other than my own yields inconclusive results. Most of them are useless or of very little value because of their incompleteness, with one strongly positive observation, and one strongly negative. Future observers, knowing what to look for, should be able within a few eclipses to confirm or deny the suspected changes.

If the chromosphere varies in the above fashion it may prove on investigation to provide a somewhat smoother curve of the solar cycle than sunspot observations.

It should be noted that many photographs labeled the diamond ring are actually Young's stratum. Visually, Young's stratum tends to show an irradiated fuzzy or oblong image, moderately well bounded and overlapping the lunar disk. This is also the case at exposures designed to show the middle corona. The diamond ring, even at exposures that virtually eliminate the inner corona, is so brilliant that it will produce long spikes resulting from multiple reflections in the eye of the observer or from secondary or multiple lenses in an optical system. In color photographs the photosphere also tends towards a yellower hue.

The term "Young's stratum" is of course outmoded in current terminology. In the nineteenth century it was used to designate that layer beneath the chromosphere which caused the flash spectrum. In the earlier part of this century this simplified division broke down when it was realized that many flash spectral lines persisted to the top of the chromosphere. Other kinds of investigations do not seem to have yielded a sharp physical separation, so that Young's stratum has simply been incorporated as part of the lower chromosphere.

Nonetheless, at least in the popular mind, physical non-existence is often interpreted as optical non-existence. This has been further compounded by the tendency to think of Young's stratum too closely with the flash spectrum, as though this were the only way it could manifest itself. Yet Young's stratum is as optically real as solar limb darkening -- and much more spectacular. Indeed, so brilliant was it at some nineteenth century eclipses that a few observers mistook it for the photosphere near the end of totality, producing all sorts of confusion in regards to double observations of third contact. I wonder how many timings of third contact made in this century are really timings of the reappearance of Young's stratum. However gradual the physical merging within the chromosphere, the optical divisions are still quite sharp.

Moderate optical aid is of course valuable for detailed views of the chromosphere and essential in recognizing the spicules. But both layers can be cleanly separated with the unaided eye.

It should be noted that the chromosphere especially, and Young's stratum to a more limited extent on account of some irradiation in unfiltered telescopic views, may prove of some value in studies of the irregularities of the moon's limb. There are some problems here, however, since the chromosphere is not nearly so well bounded as the photosphere.