

COLOR IN SUNSPOTS OBSERVATIONS made by our members.

Shortly after the AAVSO Solar Division was organized by Neal J. Heines, several of our members followed JAMES C. BARTLETT, Jr., Baltimore, Md. in gathering observations on sunspots which showed color.

James C. Bartlett, Jr. observed color regions in sunspots from 1946 on with regularity. He noted two instances already in 1942. In POPULAR ASTRONOMY, Vol. LVI, No.2, Feb. 1948, Bartlett wrote about "Some Experiments with Color in Natural and Artificial Sunspots".

"Be it as it may /wrote Bartlett/, it is a fact that quite early in the art, solar observers reported color in sunspots; and it is interesting to note that all were generally agreed on certain salient facts:

color was a rarity;
it was seldom vivid;
it was confined largely to very large or active spots, i.e. to spots which might reasonably be looked to for something unusual.

Now the same relations are found to hold good at the present time, which is at least a point in favor of the ancient observers."

"As early as 1759, Messier, the unwitting founder of nebular astronomy, reported a deep brown color in 'the great spot' which appeared that year and which was remarkable for a peculiar S-shaped umbra."..."In 1926, Capocci reported violet in the form of a 'haze' surrounding a brilliant bridge over a 'double umbra', and the present writer saw a reddish haze of much the same nature in much the same kind of spot a few months ago /1947, ed/. In 1858 Father Secchi saw a rose-colored "promontory" in a naked-eye spot, and the work of both Schwabe and Schmidt contains many references to reddish, brownish, violet, and yellowish tints. Lockyer saw both violet and copper-red."

In a letter to this editor (10,20,'55), Bartlett tabulated his colored sunspots as follows:

Year	No.	Year	No.
1946	63	1951	32
1947	36	1952	14
1948	22	1953	9
1949	27	1954	2
1950	17	1955	10 (up to Oct.)

As already mentioned, two colored spots were observed in 1942; none in 1940, 41, 43, 44 and 1945. These figures, as Bartlett points out, are only rough indicators of the incidence of colored spots. Their rarity stands out even more when we use Bartlett's total number of spots observed (major spots, not groups) in 15 years (1940-55): total of individual spots: 38,115
individual spots with color: 234

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In COLOR PHENOMENA IN SUNSPOTS, an Informal Report to the Solar Division - AAVSO by WALTER ORR ROBERTS (13 October 1952) we read among other:

"Lockyer, Secchi and others have ascribed the visual colors to the rosy hue shown by solar prominences visible at the sun's limb during eclipse. The "clouds", in their opinions, were simply prominences seen in projection against the sunspots. However the question was never conclusively settled, nor was the reality of the color phenomenon established beyond all reasonable doubt."

Here we may point out Waldmeier's conclusion (A.M. 22:4 cited on page 8), namely: "The red-spots of an umbra are not noticeable in H α -images; they are photospheric phenomena."

Bartlett in his article (P.A. 1948) mentions: "In this connection, Dr. Menzel (and others, Ed.) contributes the thought that spot colors may also be due to superimposition of chromospheric (flares) eruptions". This view is no longer held tenable.

Roberts continued his informal report:

"In 1948, at the suggestion of Mr. Helnes, and with his aid, I asked observers of the Solar Division of the AAVSO to send summaries of any observations of sunspot colors to me. I also collected some data from sources other than the Solar Division. I felt that if the phenomena were beyond all question real -- an interpretation most solar astronomers should admit -- independent simultaneous observations should confirm the colors and locations of the effect. Moreover, if the colors arise from prominences, then they should be very pronounced at the times when large solar flares, the most intense of all prominences, are present above sizeable sunspots."

"A substantial number of visual observations have now come to me, and they suggest the following conclusions:

a. The color phenomena are elusive -- so that colors detected by one observer may go undetected by another working at the same time.

b. The colors are reported with reasonable frequency, but for a decided minority of sunspot groups. Color in sunspots is a much less frequent phenomenon than solar flares, if we judge the evidence correctly.

c. Colors other than "rose" or "red" are reported, with brown, orange, yellow, and violet being commonly recorded.

d. Certain sunspot groups -- usually active ones producing numerous flares -- seem more likely to be reported as days for a given spot-group.

e. The times and locations of the color phenomena do not (Under-scored by Roberts, not Ed.) coincide with the times

and locations of flares. Color observations at or near the times of flares have failed to show correspondence with the flares themselves. And many pronounced color reports have been for times when there were clearly no flares in progress. But flare-producing groups seemed to be favoured as color-producers."

"On 11 April 1950, for example, two observers independently reported colors in a large spot group about 15° N of the equator and 25° east of the central meridian of the sun. One reported red, and one brown, but at times about two hours apart. The region was a great producer of flares."

"The observations are yet too scattered to allow certain identification of the features of one observer's color map with those of another, or with photographs of flares..."

In Waldmeier's classic "Ergebnisse und Probleme der Sonnenforschung" 1941 (Results and Problems of Solar Research), p. 148 "Fig. 54 (see below) show such a case /of color in spots/; These grey to brown-red appearing areas can be observed for several days and can be identified on photographs. Apparently these umbral regions have a higher temperature than the normal umbra has."



Fig. 54. "Brown-red (dotted) and grey (shaded) areas within an umbra of a sunspot."

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Editor's notes: For personal reasons, this Editor was unable to bring out any Solar Bulletins since the May-September 1959 issue. However, while this issue is being distributed, additional bulletins are already in preparation. These will include all data usually published (sunspot numbers, Mt. Wilson sunspot data, etc.), as well as other material.

The Summary Table, showing all sunspot observations by our members, is again being issued and distributed directly to the observers. We are greatly indebted to Dr. Sarah J. Hill and to Miss Carolyn McGiffert. Miss McGiffert has most ably assisted Dr. Hill in the computations and tabulation of our data.

More data and comments on "color" in sunspots in the next issue.

H.L.Bondy