ERRATUM

The following correction should be made to Royal Observatory Annals No. 6, Photoheliographic Results 1962, 1963 and 1964:

Page 88, Photoheliographic Results for 1963, penultimate line before table

for towards read forwards
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PHOTOHELIOGRAPHIC RESULTS 1965

INTRODUCTION

1. GENERAL

The photographs from which these measures were made were taken at the Royal Greenwich Observatory, the Royal Observatory, Cape of Good Hope, and the Kodaikanal Observatory, Southern India. In addition, one photograph was supplied by the Mount Wilson and Palomar Observatories, California, U.S.A.

The photographs of the Sun obtained at Herstmonceux were taken with the 4-inch photoheliograph, of which the original object-glass was replaced in 1910 by a Grubb photographic objective. The equivalent focal length of the photoheliograph with its present enlarging system (supplied in 1926 by Ross, Ltd.) is 67½ feet, the diameter of the Sun's image at the secondary focus being approximately 7½ inches.

The photographs of the Sun obtained at the Cape Observatory were taken under the superintendence of Her Majesty's Astronomer at the Cape, Dr. R. H. Stoy, and those at Kodaikanal under the superintendence of the Director, Dr. M. K. Vainu Bappu. At the Cape Observatory the instrument employed was a 4-inch photoheliograph giving an image of the Sun about 7½ inches in diameter; at Kodaikanal a Cooke photo-visual objective of 6 inches aperture was used, the image of the Sun which was obtained being of about the same size.

Photographs of the Sun were available for measurement on 365 days in 1965, those finally selected for measurement being supplied by the different observatories as under:

<table>
<thead>
<tr>
<th>Observatory</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herstmonceux</td>
<td>226</td>
</tr>
<tr>
<td>Cape</td>
<td>132</td>
</tr>
<tr>
<td>Kodaikanal</td>
<td>6</td>
</tr>
<tr>
<td>Mount Wilson</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>365</strong></td>
</tr>
</tbody>
</table>

The names of the measurers of the photographs for the year 1965 were as follows:

- P. S. Laurie
- Miss D. M. Hobden
- G. W. Rickett
- Miss M. E. Winter

At the primary focus of the photoheliographs at Herstmonceux and the Cape two spider-wires are fixed by which the zero of position angles on the photographs can be determined. These wires are inclined at an angle of 45° to the celestial equator. In the Kodaikanal instrument there is one wire fixed parallel to the equator.

The precise zero of position angles for the photoheliographs has been determined by three different methods.

(i) **Zero Photographs.** Plates were exposed twice, with an interval of about 100 seconds between the two exposures, the instrument being firmly clamped. Two images of the Sun, overlapping each other by about a fifth part of the Sun's diameter, were thus produced upon the plates. The exposures were so made that the line joining the cusps passed approximately through the centre of the plates and the inclinations of the two spider-wires to this line were measured. A small correction for the inclination of the Sun's path was applied. Two or three zero photographs were usually taken each month at Herstmonceux, the Cape and Kodaikanal.

(ii) **Transits.** At Herstmonceux and the Cape, transits of the Sun were taken visually, the times of contact of the first and second limbs of the Sun with the two wires being noted by an eye-and-ear method. The ratio of the time taken by the Sun to pass over the NE-SW wire to the time taken to pass over the SE-NW wire was used in order to find the angle made by the Sun's path with the
bisectors of the wires. From this, again incorporating a correction to allow for the inclination of
the Sun's path, the orientation of the wires with respect to the N–S line could be inferred. Transits
were usually taken at Herstmonceux and the Cape on four or more days during each month.

(iii) Supplementary Zero Photographs. At Herstmonceux, supplementary partial images of the
Sun were occasionally recorded on otherwise normal photographs, a second exposure being made
after clamping the instrument firmly for 130 seconds. The small portion of the Sun's limb visible
at the western edge of the plate can be used, together with the main image which it does not
intersect, to deduce the orientation of the wires in a way similar to that used for the zero photo-
graphs. Six to ten supplementary zero photographs were taken at Herstmonceux each month. The
values for the zero of position angles deduced from them were given half weight in the adoption
of zero corrections to be used in the reduction of photographs.

2. Reductions

(i) Method of Measurement. The measures of the photographs were made with a large position-
micrometer that can be used for photographs of the Sun up to 12 inches in diameter. In this
micrometer the photograph is held with its film-side uppermost on three pillars fixed on a circular
plate, which can be turned through a small angle about a pivot in its circumference by means of
a screw and antagonistic spring acting at the opposite extremity of the diameter. The pivot of this
plate is mounted on the circumference of another circular plate which can be turned by a similar
screw-action about a pivot in its circumference. This pivot, 90° distant from that of the upper
plate, is mounted on a third circular plate, with a position-circle graduated in divisions of
30 minutes of arc, which may be rotated about its centre. By this means small movements in two
directions at right angles to each other can be readily given and the photograph can be accurately
centred with respect to the centre of rotation of the position-circle. When this has been done, a
Ramsden eyepiece, having at its anterior focus a glass diaphragm ruled with cross-lines into squares
with sides of one hundredth of an inch (for measurement of areas), is moved along a slide adjusted
so that the centre of the eyepiece moves diametrically across the photograph, the diaphragm being
nearly in contact with the photographic film, so that parallax is negligible. The distance of a spot
or facula from the centre of the disk is read from a scale and vernier to 1/250th of an inch,
corresponding to 0.001 of the Sun's radius for images 8 inches in diameter. The position angle
is read from the large position-circle which rotates with the photographic plate. The photograph
is illuminated by diffused light reflected from white paper placed at an angle of 45° below the
photograph.

In the case of large or complex groups of spots, the chief components were measured indi-
vidually; so also in the case of groups near to the east or west limbs of the Sun where the effects
of foreshortening are appreciable. In other cases the position of the centre of a group was estimated
by the measurer at the micrometer or derived during the computation.

When required, corrections have been applied to the measured distances and position angles
allow for differential refraction. The details of this correction were given in the Introduction to
the Greenwich Photo-Heliographic Results for 1909. It is necessary to apply this correction to about
twenty per cent of the photographs taken at Herstmonceux in the months October to March.

(ii) Calculations of Heliographic Longitude and Latitude. The calculations are made from formulae
given by W. de la Rue, B. Stewart and B. Loewy, Phil. Trans., 1869. The system of heliographic
co-ordinates may be defined as follows. The inclination of the Sun's axis to the ecliptic is assumed
to be 82° 45', the longitude of the ascending node of the Sun's equator on the ecliptic for 1965-0 to
be 75° 16.3', and the period of the Sun's sidereal rotation to be 25.38 days. The meridian which
passed through the ascending node on 1854 January 1, Greenwich mean noon, is taken as the
zero meridian and longitudes increase from east to west. The mean synodic rotation period is
27-2753 days; synodic rotation periods are counted from 1853 November 9, in continuation of Carrington's series.

Let \( r \) be the measured distance of a spot from the centre of the Sun's apparent disk and \( \chi \) the position angle of the spot from the Sun's axis, \( R \) the measured radius of the Sun on the photograph, \( S \) the tabular semi-diameter of the Sun in arc, and \( \rho, \rho' \) the angular distances of a spot from the centre of the apparent disk, as viewed from the Sun's centre and from the Earth respectively. \( \rho \)—the heliocentric angle—is obtained from the following equations:

\[
\rho' = \frac{r}{R} S \quad \text{and} \quad \sin (\rho + \rho') = \frac{r}{R}
\]

If \( B_0 \) and \( \phi \) are the heliographic latitudes and \( L_0 \) and \( \lambda \) the heliographic longitudes of the Earth and the spot respectively,

\[
\sin \phi = \cos \rho \sin B_0 + \sin \rho \cos B_0 \cos \chi
\]

\[
\sin (L_0 - \lambda) = \sin \chi \sin \rho \sec \phi
\]

\( \chi \) is found from the position angle measured eastwards from the north point of the Sun's disk by subtracting \( P \), the position angle of the north end of the Sun's axis also measured eastwards from the north point. The three quantities \( P, B_0 \) and \( L_0 \) for the time of the exposure of each photograph are derived from the Ephemeris for Physical Observations of the Sun, given on page 308 of the Astronomical Ephemeris for 1965.

3. DESCRIPTION OF TABLES

(i) Positions and Areas of Sunspots for each Day. The measured positions and areas of sunspots are given for each day in the year (pp. 12–31). The positions are referred firstly to a system of apparent polar co-ordinates on the Sun's disk and secondly to a system of heliographic co-ordinates. A new format has been adopted as follows:

| Col. 1 | The month given numerically, the date and decimal of day reckoned from midnight |
| Col. 2 | Position angle of the Sun's axis from the north point |
| Col. 3 | Heliographic longitude of the centre of the disk |
| Col. 4 | Heliographic latitude of the centre of the disk |
| Col. 5 | Number of spot group in order of appearance and in continuation of the group numbers given for 1964 in Royal Observatory Annals No. 6, 1971. If a group transits the Sun with little or no apparent change in its appearance, the principal and most stable components are normally indicated by single figures beneath the number of the spot group. None appeared in 1965. Groups seen on one day only are distinguished by the number of the rotation during which they were observed and prefixed by a number giving the order of their appearance. |
| Col. 6 | Distance of spot group from Sun's centre in units of the Sun's radius |
| Col. 7 | Position angle of spot group measured from the north pole of the Sun's axis in the direction N. E. S. W. N. |
| Col. 8 | Heliographic longitude of spot group derived from the measures |
| Col. 9 | Heliographic latitude of spot group similarly derived |
| Col. 10 | Area of umbrae corrected for foreshortening and expressed in millionths of the Sun's visible hemisphere |
| Col. 11 | Area of whole spots comprising the group similarly expressed. |

Notes on the sunspot groups are given at the end of this section (pp. 32–34).

(ii) General Catalogue of Groups of Sunspots

(a) This catalogue (pp. 36–37) contains particulars of every group of sunspots which lasted for two or more days, group numbers being in continuation of those given in 1964 and previous years. The table includes an indication of those groups which may be considered to be members
PHOTOHELIOGRAPHIC RESULTS 1965

of "recurrent series" of groups which were selected upon the following plan. If any spot when first seen was 60° or more to the east of the central meridian, the Catalogue and, if necessary, the Daily Results also (pp. 12-31), were searched some fifteen to sixteen days earlier to ascertain whether a spot group of similar heliographic longitude and latitude was then near the west limb of the Sun. Similarly, if any spot group when last seen was 60° or more to the west of the central meridian, a search was made fifteen to sixteen days later. When there appeared to be a case of probable continuity between groups in consecutive rotations of the Sun, the character of the groups, their areas and their longitude and latitude were carefully compared before accepting them as a recurrent group.

It should be noted that longitudes are based on the ephemeris given in the Astronomical Ephemeris, assuming a solar rotation period constant at all latitudes. After an interval of one rotation, recurring groups will, therefore, show in general—apart from any proper motion they may have of their own—apparent drifts in longitude varying in amount according to their respective latitudes. The following table, derived from the formula \( \xi = 14^\circ\cdot37 - 2^\circ\cdot60 \sin^2 \phi \), gives the apparent drift in longitude appropriate to different latitudes after an interval of 27 days, a drift forwards corresponding to an increase in heliographic longitude.

<table>
<thead>
<tr>
<th>Latitude</th>
<th>Drift forwards</th>
<th>Latitude</th>
<th>Drift backwards</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>5°</td>
<td>20°</td>
<td>3°</td>
</tr>
<tr>
<td>5°</td>
<td>4.5°</td>
<td>25°</td>
<td>7.5°</td>
</tr>
<tr>
<td>10°</td>
<td>3°</td>
<td>30°</td>
<td>12.5°</td>
</tr>
<tr>
<td>15°</td>
<td>0.5°</td>
<td>35°</td>
<td>18°</td>
</tr>
</tbody>
</table>

Groups lasting for two or more days are tabulated as follows:

Col. 1. Group numbers of sunspots
Col. 2. U.T. of the central meridian passage of each group as deduced from its mean longitude (given in Col. 10). For those groups which are in existence at the time of the central meridian passage of their longitude, the time is given to 0.01, corresponding to 0°.13 of solar longitude. In other cases, in which groups disappear before or appear after the central meridian, the deduced time is given to 0.01.

Col. 3. Duration of each group in days. Intermittent groups, i.e. groups which are not seen upon the photographs for every day between their first and last appearances, are indicated by a fraction, the numerator of which represents the number of days on which they are actually observed, the denominator being the number of days covering the extreme limits of observation.

Col. 4. Date on which each group is first seen
Col. 5. Heliographic longitude from the meridian passing through the centre of the Sun's disk at the time of observation when the group is first seen. Longitudes west of the centre are reckoned as positive.

Col. 6. Date on which each group is last seen
Col. 7. Heliographic longitude from the meridian passing through the centre of the Sun's disk at the time of observation when the group is last seen. Longitudes west of the centre are reckoned as positive.

Col. 8. Mean areas for umbrae, corrected for foreshortening and expressed in millionths of the Sun's visible hemisphere.
Col. 9. Mean areas for whole spots, similarly expressed
Col. 10. Heliographic longitude of each group
Col. 11. Heliographic latitude of each group
When a group is 80° or more from the Sun's central meridian, or in cases of close proximity to the Sun's limb when only part of the group is visible, the measures for that day are not included in deriving the mean area or the mean longitude and latitude of the group.

Col. 12. Reference to recurrent groups. The numeration is in continuation of the recurrent series given in Ledger I of the Greenwich Photo-Heliographic Results for 1955; bracketed numbers indicate the order of a group in the series.

(b) The second part of the catalogue (pp. 38) contains groups of sunspots seen on one day only. These appear in the Daily Results with a distinctive numeration comprising the number of the rotation during which each was observed prefixed by a number given in order of appearance. These short-lived groups were usually composed of one or two very small spots. The deduced time of the central meridian passage of each spot is given in the fourth column of the table.

(iii) Total Areas of Sunspots and Faculae. This table (pp. 40–42) contains total areas of sunspots and faculae (the latter separated into west and east hemispheres) for each day in the year.

The place where the photograph was taken is indicated in the second column. Photographs taken at Herstmonceux are indicated by the letter H, and those taken at the Cape, Kodaikanal and Mount Wilson by the letters C, K and W respectively.

The projected area is the area as it is measured on the photograph, uncorrected for foreshortening and expressed in millionths of the Sun's apparent disk.

The area corrected for foreshortening is expressed in millionths of the Sun's visible hemisphere.

4. SUMMARY OF RESULTS

The rotations adopted in the tables below (which are in continuation of those for the years 1873–1964; see page 136, R. Obs. Annals No. 6, 1971) correspond to the synodic rotation of the Sun, and the commencement of each is defined by the coincidence of the assumed prime meridian with the central meridian, the assumed prime meridian being that meridian which passed through the ascending node of the Sun's equator on the ecliptic at mean noon on 1854 January 1, and the assumed period of the Sun's sidereal rotation being 25.38 days. The numeration of the rotations is in continuation of Carrington's series (Observations of Solar Spots made at Redhill by R. C. Carrington, F.R.S.), No. 1 being the rotation commencing 1853 November 9. The dates of commencement of the rotations are given in U.T.

(i) Mean Areas of Sunspots and Faculae. The areas have been formed by taking the means of the areas for each day of observation throughout each rotation of the Sun, the projected areas being the areas as measured on the photographs and expressed in millionths of the Sun's apparent disk, and the areas corrected for foreshortening being expressed in millionths of the Sun's visible hemisphere.

(ii) Mean Heliographic Latitude of Sunspots. The heliographic latitude of each spot for each day has been multiplied by its area (corrected for foreshortening), and the sum of the products, for spots north of the equator, has been divided by the sum of the corresponding areas to form the mean heliographic latitude of spotted area north of the equator; similarly for spots south of the equator. In forming the mean heliographic latitude of entire spotted area, the algebraic sum of the products for spots north and south of the equator has been divided by the sum of the areas; for the mean distance from the equator of all spots, the numerical sum of the products, without regard to the sign of latitude, has been similarly divided.

The mean areas have been formed by dividing the sum of the daily areas (corrected for foreshortening) by the number of days of observation for each rotation of the Sun and are expressed in millionths of the Sun's visible hemisphere.
PHOTOHELIOGRAPHIC RESULTS 1965

MEAN AREAS OF SUNSPOTS AND FACULAE FOR EACH ROTATION OF THE SUN
FROM 1964 DECEMBER 24 TO 1966 JANUARY 9

<table>
<thead>
<tr>
<th>No. of Rotation</th>
<th>Rotation Commenced</th>
<th>Days Photographed</th>
<th>Mean Projected Daily Area</th>
<th>Mean Corrected Daily Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whole Umbrae</td>
<td>Spots</td>
</tr>
<tr>
<td>1489</td>
<td>1964 December 23-51</td>
<td>27</td>
<td>34</td>
<td>184</td>
</tr>
<tr>
<td>1490</td>
<td>1965 January 19-85</td>
<td>27</td>
<td>56</td>
<td>207</td>
</tr>
<tr>
<td>1491</td>
<td>February 16-19</td>
<td>25</td>
<td>19</td>
<td>54</td>
</tr>
<tr>
<td>1492</td>
<td>March 15-52</td>
<td>14</td>
<td>20</td>
<td>56</td>
</tr>
<tr>
<td>1493</td>
<td>April 11-81</td>
<td>27</td>
<td>5</td>
<td>37</td>
</tr>
<tr>
<td>1494</td>
<td>May 9-66</td>
<td>28</td>
<td>78</td>
<td>410</td>
</tr>
<tr>
<td>1495</td>
<td>June 5-27</td>
<td>27</td>
<td>14</td>
<td>125</td>
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<tr>
<td>1496</td>
<td>July 2-46</td>
<td>28</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>1497</td>
<td>July 29-67</td>
<td>28</td>
<td>28</td>
<td>148</td>
</tr>
<tr>
<td>1498</td>
<td>August 25-90</td>
<td>27</td>
<td>58</td>
<td>307</td>
</tr>
<tr>
<td>1499</td>
<td>September 22-16</td>
<td>27</td>
<td>31</td>
<td>261</td>
</tr>
<tr>
<td>1500</td>
<td>October 19-45</td>
<td>28</td>
<td>11</td>
<td>36</td>
</tr>
<tr>
<td>1501</td>
<td>November 15-75</td>
<td>27</td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>1502</td>
<td>December 13-07</td>
<td>28</td>
<td>31</td>
<td>191</td>
</tr>
</tbody>
</table>

Mean Areas of Sunspots and Faculae for 1965

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>145</th>
<th>342</th>
</tr>
</thead>
<tbody>
<tr>
<td>365</td>
<td>25</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td></td>
<td>287</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>113</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MEAN HELIOGRAPHIC LATITUDE OF SUNSPOTS FOR EACH ROTATION OF THE SUN
FROM 1964 DECEMBER 24 TO 1966 JANUARY 9

<table>
<thead>
<tr>
<th>No. of Rotation</th>
<th>Rotation Commenced</th>
<th>Days Photographed</th>
<th>Mean Daily Hel. Area</th>
<th>Mean Daily Hel. Lat.</th>
<th>Mean Daily Hel.</th>
<th>Mean Dist. from Equator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Spots</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1489</td>
<td>1964 December 23-51</td>
<td>27</td>
<td>142</td>
<td>24'47</td>
<td>2</td>
<td>5'76</td>
</tr>
<tr>
<td>1490</td>
<td>1965 January 19-85</td>
<td>27</td>
<td>170</td>
<td>16'11</td>
<td>0</td>
<td>16'11</td>
</tr>
<tr>
<td>1491</td>
<td>February 16-19</td>
<td>28</td>
<td>43</td>
<td>23'71</td>
<td>3</td>
<td>5'57</td>
</tr>
<tr>
<td>1492</td>
<td>March 15-52</td>
<td>27</td>
<td>31</td>
<td>24'46</td>
<td>0</td>
<td>24'46</td>
</tr>
<tr>
<td>1493</td>
<td>April 11-81</td>
<td>27</td>
<td>27</td>
<td>14'29</td>
<td>5</td>
<td>8'86</td>
</tr>
<tr>
<td>1494</td>
<td>May 9-66</td>
<td>27</td>
<td>251</td>
<td>22'68</td>
<td>33</td>
<td>10'72</td>
</tr>
<tr>
<td>1495</td>
<td>June 5-27</td>
<td>28</td>
<td>18</td>
<td>27'29</td>
<td>54</td>
<td>15'28</td>
</tr>
<tr>
<td>1496</td>
<td>July 2-46</td>
<td>27</td>
<td>80</td>
<td>19'28</td>
<td>1</td>
<td>32'55</td>
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<td>1497</td>
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<td>27</td>
<td>10</td>
<td>31'09</td>
<td>8</td>
<td>30'61</td>
</tr>
<tr>
<td>1498</td>
<td>August 25-90</td>
<td>27</td>
<td>111</td>
<td>20'87</td>
<td>0</td>
<td>20'87</td>
</tr>
<tr>
<td>1499</td>
<td>September 22-16</td>
<td>27</td>
<td>168</td>
<td>20'91</td>
<td>55</td>
<td>20'04</td>
</tr>
<tr>
<td>1500</td>
<td>October 19-45</td>
<td>28</td>
<td>146</td>
<td>24'31</td>
<td>37</td>
<td>15'87</td>
</tr>
<tr>
<td>1501</td>
<td>November 15-75</td>
<td>27</td>
<td>26</td>
<td>26'86</td>
<td>1</td>
<td>19'94</td>
</tr>
<tr>
<td>1502</td>
<td>December 13-07</td>
<td>28</td>
<td>131</td>
<td>14'00</td>
<td>22</td>
<td>28'09</td>
</tr>
</tbody>
</table>

Mean Heliographic Latitude of Sunspots for 1965

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>17'29</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>365</td>
<td>20'59</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+15'19</td>
<td>20'12</td>
<td></td>
</tr>
</tbody>
</table>
5. SUMMARY OF SOLAR ACTIVITY FOR THE YEAR 1965

Chief features of the record for 1965 are as follows:

(1) Activity remained at a very low level, although the mean daily area rose to 113 millionths from 56 millionths in 1964.

(2) The largest spot group crossed the Sun's central meridian on May 21.0 in latitude 22° N; its mean area was 416 millionths. There were no groups with mean areas exceeding 500 millionths.

(3) There were 75 spot-free days during the year.

(4) The ratio of mean corrected areas of faculae/sunspots was 3.03 and that of mean corrected areas of umbrae/whole spots 0.159.

(5) The number and distribution, northern and southern hemispheres, of spot groups of
   (a) two days' duration or longer
   (b) one day's duration

   were as follows:

   Northern spots | (a) | (b)
   --- | --- | ---
   64 | 19 |
   14 | 7 |
   --- | --- |
   78 | 26 |

(6) The following table gives the mean daily areas of sunspots (projected and corrected values) and faculae (corrected only) for each calendar month:

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6. ACKNOWLEDGEMENTS

These results were compiled, under the supervision of P. S. Laurie, by G. M. Appleby, Miss C. Y. Hohenkerk, Miss C. M. Ladley and P. J. Rudd.

Royal Greenwich Observatory
Herstmonceux Castle
Hailsham, Sussex, BN27 1RP

1973 January
Positions and Areas of Sunspots

Daily Results 1965
### POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

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### POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

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PHOTOHELIOGRAPHIC RESULTS 1965

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PHOTOHELIOGRAPHIC RESULTS 1965
(R. O. ANNALS

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

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## POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

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PHOTOHELIOGRAPHIC RESULTS 1965

POSITIONS AND AREAS OF SUNSPOTS FOR EACH DAY IN THE YEAR

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### PHOTOHELIOGRAPHIC RESULTS 1965

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NOTES ON SUNSPOT GROUPS 1965

Group 20710 Jan. 3-12 At first a single spot; this breaks up into a small cluster on January 6 and dies out before reaching the limb.

Group 20711 Jan. 3-10 One or two small spots, not seen on January 7.

Group 20712 Jan. 14-22 A small spot until January 17, when other following spots appear.

Group 20713 Jan. 18-27 A small variable spot, not seen between January 21 and 26. On January 27, two small spots near the west limb represent the position.

Group 20714 Jan. 20-22 Short-lived group of tiny spots.

Group 20715 Jan. 22-30 One or two small spots.

Group 20716 Jan. 23-30 A cluster of small spots.

Group 20717 Jan. 29-Feb. 9 A regular spot with following companions until February 3.

Group 20718 Feb. 6-7 Tiny spots.

Group 20719 Feb. 6-18 A regular spot, with an occasional companion. Return of Group 20712.

Group 20720 Feb. 9-16 A small spot, with occasional companions.

Group 20721 Feb. 24-Mar. 1 A small spot, with companions on February 28.

Group 20722 Feb. 24-Mar. 1 A small spot.


Group 20724 Mar. 4-8 A small group of variable spots.

Group 20725 Mar. 6-7 A tiny spot on March 6; two small spots on March 7.

Group 20726 Mar. 6-7 A few tiny spots.

Group 20727 Mar. 10-12 Several small spots, only one of which remains on March 12.

Group 20728 Mar. 12-21 A small spot, with following companions on March 14, growing into a small stream on March 18.

Group 20729 Mar. 12-18 A cluster of small spots, of which only one remains by March 15.

Group 20730 Mar. 24-30 A cluster of small spots.

Group 20731 Mar. 27-28 A tiny spot.

Group 20732 Apr. 12-20 Two spots, of which the leader alone remains after April 15, and breaks up into tiny pores by April 19.

Group 20733 Apr. 15-20 A cluster of tiny spots, not seen on April 19.

Group 20734 Apr. 21-27 At first a small stream, of which only one or two variable spots remain after April 23.

Group 20735 Apr. 26-28 Scattered spots.

Group 20736 May 1-5 Two or three scattered spots.

Group 20737 May 7-10 A small group of scattered spots, only partially visible on May 10.

Group 20738 May 11-19 At first a tiny spot, which develops into a small stream on May 13.

Group 20739 May 12-13 A small cluster of spots, of which only one remains on May 13.

Group 20740 May 15-26 A composite group, which breaks up into a stream on May 18 and decays slowly, only a few spots remaining on May 26.

Group 20741 May 17-26 A cluster of small spots which dies out before reaching the west limb.

Group 20742 May 17-26 A small cluster, of which only a few spots remain on May 25.

Group 20743 May 18-22 A few spots developing into a small stream.
Group 20744 June 1-9 At first a small spot. Other spots appear by June 2, the leader of which becomes a regular spot on June 5 and is the sole survivor after June 7.

Group 20745 June 3-7 A cluster of small spots, developing until June 5, and then slowly dying out.

Group 20746 June 7-9 One or two tiny spots.

Group 20747 June 7-10 A single spot.

Group 20748 June 17-22 A small cluster, becoming more scattered by June 19.

Group 20749 June 19-22 A few small spots, only one of which remains on June 22.

Group 20750 June 27-July 2 One or two variable spots.

Group 20751 July 2-9 A few scattered spots, not seen on July 7 or 8. On July 9 a single spot remains.

Group 20752 July 6-14 A small cluster developing into a moderate-sized stream.

Group 20753 July 9-17 Intermittent. A few small spots from July 9 to 11; a single spot from July 15.

Group 20754 July 11-12 A few tiny spots.

Group 20755 July 12-13 One or two tiny spots.

Group 20756 July 30-31 One or two small spots.

Group 20757 Aug. 3-4 A few tiny spots.

Group 20758 Aug. 6-14 Two or three small spots, not seen on August 7, 8 and 9.

Group 20759 Aug. 6-11 A single spot, growing into a small cluster.

Group 20760 Aug. 22-24 A tiny spot on August 22; a few small spots on August 24.

Group 20761 Aug. 26-Sept. 1 A group of small, variable spots.

Group 20762 Aug. 29-Sept. 5 A few small spots, developing into a stream by September 1. Only the leading components remain by September 4.

Group 20763 Sept. 2-14 A few rapidly developing spots. The leader, a regular spot, is the sole survivor on September 11.

Group 20764 Sept. 11-18 A diminishing regular spot.

Group 20765 Sept. 16-17 One or two tiny spots.

Group 20766 Sept. 23-27 An extended stream led by a small regular spot. Only the rear portion remains on September 27.

Group 20767 Sept. 26-Oct. 8 Spots developing into a complex stream by September 29; the whole begins to disintegrate after October 2. A single spot remains on October 8.

Group 20768 Sept. 27-Oct. 2 An unstable spot, not seen on September 30 and October 1.

Group 20769 Oct. 3-7 A moderate-sized group, appearing west of the Central Meridian.

Group 20770 Oct. 4-5 Tiny scattered spots.

Group 20771 Oct. 9-16 A small regular spot, with scattered companions on October 10, which breaks up into a few small spots on October 14. Not seen on October 15; a single spot represents the position on the next day.

Group 20772 Oct. 19-24 A few spots, of which only one remains on October 24.

Group 20773 Oct. 22-Nov. 3 A regular spot, with companions on October 27 and 28. Return of Group 20769.

Group 20774 Oct. 24-26 A small spot on October 24 and 25; several tiny spots on October 26.

Group 20775 Nov. 1-6 A group of small spots appearing just west of the Central Meridian.
| Group 20776 | Nov. 1-13 | Intermittent. One or two small spots on November 1 and 2. On November 5, a single spot appears and develops rapidly into an elongated stream which breaks up as it approaches the west limb. |
| Group 20777 | Nov. 3-4 | A few tiny spots. |
| Group 20778 | Nov. 5-10 | A few scattered spots, of which only one remains on November 8. |
| Group 20779 | Nov. 9-17 | A few small spots, developing rapidly into a small stream. The following spots die out by November 17. |
| Group 20780 | Nov. 28-Dec. 8 | A slowly diminishing regular spot until December 6, after which two small spots represent the position. Return of Group 20776. |
| Group 20781 | Dec. 8-20 | One or two tiny scattered spots, not seen from December 11 to 14. On December 15, a small developing group appears west of the Central Meridian. |
| Group 20782 | Dec. 12-13 | A cluster of tiny spots on December 12; a single spot on December 13. |
| Group 20783 | Dec. 21-24 | A small spot on December 21, developing into a small stream which dies out before reaching the west limb. |
| Group 20784 | Dec. 24-31 | A few small spots developing into a sizeable cluster by December 27. |
| Group 20785 | Dec. 27-Jan. 5 | Tiny spots on December 27, which have developed, by the next day, into a simple group, of which the leader alone remains on January 1. |
| Group 20786 | Dec. 28-Jan. 5 | A small cluster, of which a single component remains on January 2. |
| Group 20787 | Dec. 29-31 | One or two tiny, scattered spots. |
General Catalogue
of
Sunspots
### PHOTOHELIOGRAPHIC RESULTS 1965

#### GENERAL CATALOGUE OF SUNSPOTS

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#### Detailed Data

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  - 10 55
  - 143.5 +22.9

- **20715**
  - 27.99
  - 9 22 - 73
  - 30 +31
  - 10 52
  - 252.7 +23.3

- **20720**
  - 15.18
  - 8 9 - 75
  - 16 +15
  - 12 53
  - 13.2 +29.6

- **20725**
  - 2.5
  - 2 6 +52
  - 7 +63
  - 2 20
  - 171.6 +20.3

- **20730**
  - 29.84
  - 7 24 - 75
  - 30 +7
  - 5 29
  - 171.1 +10.7

- **20735**
  - 23.8
  - 3 26 +33
  - 28 +62
  - 4 38
  - 202.0 +4.0

- **20740**
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  - 12 15 - 76
  - 26 +70
  - 5 416
  - 202.0 +22.4

- **20745**
  - 2.1
  - 5 3 +18
  - 7 +70
  - 17 92
  - 420.0 -11.5

- **20750**
  - July 1.62
  - 6 27 - 55
  - July 2 +9
  - 4 38
  - 11.2 +30.5

- **20755**
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  - 2 12 +29
  - 13 +44
  - 0 5
  - 259.1 +1.6

- **Aug.**
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  - 2 30 - 50
  - 31 -35
  - 2 17
  - 301.4 +30.8

- **Sept.**
  - 5.1
  - 3 32 - 62
  - 2 13
  - 275.9 +35.4

- **Oct.**
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  - 6 6 - 97
  - 14 +57
  - 4 24
  - 211.3 -30.6

- **Nov.**
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  - 6 6 - 71
  - 11 -9
  - 2 22
  - 186.5 +36.1

**Mean Position**

- Date C.M.
- Umbrae Spots
- Long. Lat. Reference

**Mean Area**

- Corrected
- Mean

**Long. Lat.**

- Reference

**Dates**

### General Catalogue of Sunspots

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SUNSPOTS SEEN ON ONE DAY ONLY

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### PHOTOHELIOGRAPHIC RESULTS 1965 (R. O. ANNALS)

**TOTAL AREAS OF SUNSPOTS AND FACULAE FOR EACH DAY IN THE YEAR**

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