VARIABLE STAR NOTES

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NOTES ON U GEMINORUM AND Z CAMELopardalis TYPE VARIABLES DURING 1976.

213843 SS Cygni. Increased interest of astronomers in this brightest U Geminorum type variable provided a strong drive for visual observers all around the world to monitor it very closely. For the year 1976 a record high of 4360 observations have been recorded on SS Cygni. This total includes the 3522 observations by observers of A.A.V.S.O.; 319 by eight members of Astronomisk Selskab, kindly made available for us by Ole Klinting; 48 by five members of the Variable Star Section of the Netherlands Association of Astronomy and Meteorology (Report 30, Kapteyn Astronomical Laboratory); and 409 by members of the Variable Star Section of the Scandinavian Union of Amateur Astronomers (Report 1976, 1 and 2). All outbursts were very well observed and there were only 6 nights throughout the year with no observations.

SS Cygni underwent eight maxima in 1976. At the end of the year SS Cygni underwent its 591st outburst. Each maximum has been numbered consecutively since its discovery in 1896 by L.D. Wells of Harvard Observatory. All outbursts of this year were of Class A which is characterized by a very rapid rise to maximum. The numerical subdivisions within each class stand for the widths of the maxima. The mean interval between outbursts of the year was 45.96 days and the mean interval for the 591 outbursts since discovery is 49.55 days.

The following table gives the types of the outbursts, dates when SS Cygni reached 10% on the ascending and descending branches and the dates and mean magnitudes of individual maxima.

### 1976 Maxima of SS Cygni

<table>
<thead>
<tr>
<th>Max. No.</th>
<th>Type</th>
<th>10% I J.D.</th>
<th>Diff.</th>
<th>Max. J.D.</th>
<th>Diff.</th>
<th>10% D J.D.</th>
<th>Diff.</th>
<th>Max. Mag.</th>
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<tr>
<td>584</td>
<td>A4</td>
<td>2800</td>
<td>34</td>
<td>2801</td>
<td>33</td>
<td>2807</td>
<td>34</td>
<td>8.6</td>
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<tr>
<td>585</td>
<td>A8</td>
<td>2858</td>
<td>58</td>
<td>2862</td>
<td>61</td>
<td>2873</td>
<td>66</td>
<td>8.2</td>
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<tr>
<td>586</td>
<td>A2</td>
<td>2919</td>
<td>61</td>
<td>2921</td>
<td>59</td>
<td>2927</td>
<td>54</td>
<td>8.5</td>
</tr>
<tr>
<td>587</td>
<td>A7</td>
<td>2959</td>
<td>40</td>
<td>2964</td>
<td>43</td>
<td>2963</td>
<td>36</td>
<td>8.4</td>
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<tr>
<td>588</td>
<td>A6</td>
<td>3018</td>
<td>59</td>
<td>3021</td>
<td>57</td>
<td>3030</td>
<td>67</td>
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<tr>
<td>589</td>
<td>A1</td>
<td>3069</td>
<td>51</td>
<td>3071</td>
<td>50</td>
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<tr>
<td>590</td>
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<td>3098</td>
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<td>591</td>
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<td>3130</td>
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<td>3135</td>
<td>34</td>
<td>3145</td>
<td>40</td>
<td>8.4</td>
</tr>
</tbody>
</table>

The accompanying light curve is a computer plot of all the observations of SS Cygni for 1976. Data are plotted, magnitude versus Julian Date, with each dot representing one observation. This light curve has been prepared for publication by Robert S. Hill using the plotting program written by Richard Strazdas. We expect to publish future A.A.V.S.O. data in this format where each observation is plotted individually.

Notes on the dates and magnitudes of outbursts of some of the well observed U Geminorum variables, and the behaviour of the Z Camelopardalis stars in our observing program are given below for 1976. All dates of outbursts are in Julian Days, where the first three figures of 244 have been omitted to avoid repetition. The visual magnitude estimate in each case follows the date.

Z: 005840 RX And. It varied between 10.6 and 13.9 with 10 to 15 day intervals between maxima until November. Then its amplitude decreased to 1.5 magnitudes and the interval of variation shortened to 6 to 9 days. At the beginning of December, it resumed variability between 10.9 and 13.4 with 12 days between the last two maxima of the year.

UG: 012031 TY Psc. The following outbursts were observed: 2819, 12.3; 2954, 12.5; 3069, 11.1 (broad, brighter than 12.5 for 11 days); 3116, 12.9 (one observation by C. Scovil).

UG: 012457 KU Cas. Two outbursts were observed: 3017, 12.9; 3116, 13.0. There is an approximately 14m star very close to this variable which some observers are misidentifying with KU Cas. Extreme care should be taken in identification, particularly when KU Cas has an outburst.

Z: 013050 KT Per. Varied from 11m5 to 15m5 with intervals between 25 and 31 days. There were twelve outbursts.

UG: 013937 AR And. Eight outbursts were observed: 2795, 12.7; 2819, 12.8; 2844, 12.0; 3026, 11.1 (broad, brighter than 12m for five days); 3054, 12.9; 3077, 12.0; 3102, 11.5 (broad, brighter than 12m for six days); 3129, 11.7.

UG: 020356a UV Per. No outburst was reported.

Z: 020657a TZ Per. Varied between 12m6 and 13m9 until mid-July when it entered into a stillstand for about four months. From mid-November until the end of the year the variation was from 12m8 to 14m2.
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UG: 054705 CN Ori. The brightness ranged from 11\textsuperscript{m}9 to 14\textsuperscript{m}7 with 14 to 22 day intervals between maxima.

UG: 060547 SS Aur. Seven outbursts were observed: 2810, 10.7 (broad, brighter than 11\textsuperscript{m}5 for six days); 2876, 10.9; 2929, 10.9; 2983, 11.2; 3035, 10.8; 3081, 10.7 (broad, brighter than 11\textsuperscript{m}5 for eight days); 3140, 10.8.

UG: 061115 CZ Ori. The following eight outbursts were observed: 2781, 11.9; 2806, 12.3; 2823, 12.3; 2844, 12.3; 2872, 11.5; 3043, 11.7; 3100, 12.0; 3134, 11.9.

UG: 064128 IR Gem. The following outbursts were observed: 2823, 12.3 (single observation by E. Mayer); 2837, 11.7; 2858, 11.5; 2886, 11.5; 3020, 11.3; 3083, 11.8.

UG: 071628 AW Gem. One well observed maximum on 2868, 12.7

UG: 074922 U Gem. This variable, prototype of its kind, had two well observed outbursts of short duration: 2837, 9.3; 3055, 9.6. On both maxima, U Gem was brighter than 10\textsuperscript{m} for three days.

UG: 080362 SU Uma. Fourteen outbursts were observed: 2806, 12.2; 2838, 12.3; 2854, 12.0; 2877, 12.0; 2896, 11.7; 2923, 11.9; 2938, 12.6 (one observation by T. Cragg); 2996, 12.1; 3040, 11.2 (broad, brighter than 13\textsuperscript{m}0 for 12 days); 3061, 12.6; 3085, 12.8; 3107, 11.7; 3124, 12.4; 3143, 12.4.

UG: 080428 YZ Cnc. A very active year with twenty-one confirmed and three unconfirmed outbursts: 2784, 11.6; 2798, 12.1; 2806, 12.0; 2813, 11.8; 2827, 11.8; 2834, 12.0; 2842, 12.5; 2858, 11.6; 2870, 10.5 (broad, brighter than 12\textsuperscript{m}0 for 10 days); 2885, 12.2; 2891, 12.1; 2897, 12.1; 2906, 12.4; 2922, 12.3; 2929, 12.0 (single observation by P. Steffey); 3059, 12.4 (suspected by R. Annal); 3069, 12.1 (single observation by R. Annal); 3076, 12.1; 3083, 12.1; 3095, 12.3; 3104, 12.2; 3111, 11.7; 3128, 11.6; 3139, 10.6 (broad, brighter than 12\textsuperscript{m}0 for 6 days).

Z: 081473 Z Cam. This variable, prototype of its kind was at the peak of an outburst when the year began. It was active between January and mid-June undergoing eight outbursts with intervals from 32 to 20 days between maxima and varying between 10\textsuperscript{m}2 and 13\textsuperscript{m}9. From mid-June until the end of the year it was at a stillstand with a mean magnitude of 11\textsuperscript{m}5.

Z: 085518 SY Cnc. Varied between 10\textsuperscript{m}4 and 13\textsuperscript{m}8 with intervals of 24 to 30 days between outbursts.

UG: 094512 X Leo. Fourteen confirmed and five unconfirmed outbursts were observed: 2797, 12.0; 2820, 12.2; 2833, 12.0; 2849, 12.0; 2864, 12.1; 2876, 12.1; 2888, 12.3; 2901, 12.0; 2916, 12.0 (broad, brighter than 13\textsuperscript{m}0 for seven days); 2932, 12.8 (single observation by B. Szegedi); 2944, 12.9 (one observation by R. Annal); 2952, 12.0 (one observation by R. Thomas); 2978, 12.1 (single observation by N. Taylor of New Zealand); 3053, 12.0; 3069, 12.3 (one observation by R. Annal); 3083, 12.1; 3103, 12.6; 3116, 12.7; 3131, 12.0 (broad, brighter than 13\textsuperscript{m}0 for seven days).

UG: 095968 CH Uma. One very well observed, broad maximum on 2889, 10.7. The rise and decline to and from maximum was slow. The variable was brighter than 12\textsuperscript{m}0 for 10 days. The previously observed maximum was on 2521 at 10\textsuperscript{m}8.

UG: 114003 TW Vir. The following outbursts were observed: 2801, 13.5 (single observation by T. Wilson); 2832, 11.2; 2865, 12.0; 2888, 12.2; 2914, 13.0 (by N. Taylor, A. Jones of New Zealand); 2952, 12.5; (N. Taylor, O. Hull of New Zealand); 2982, 13.3 (single observation by N. Taylor); 3103, 12.6; 3129, 12.4.

Z: 164025 AH Her. Varied between 10\textsuperscript{m}8 and 15\textsuperscript{m}0 with 17 to 31 day intervals between outbursts.

UG: 180514 UZ Ser. The following outbursts were observed: 2866, 13.5 (one observation by D. Overbeek); 2903, 13.6 (single observation by D. Overbeek); 2936, 13.0; 2948, 13.2 (single observation by D. Overbeek); 2984, 13.6; 3013, 12.8; 3034, 13.4; 3044, 13.4; 3069, 13.4.

UG: 184137 AY Lyr. Ten well observed and two unconfirmed maxima: 2779, 12.5 (broad,
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brighter than $13^m5$ for nine days); 2811, 13.5 (single observation by R. Annal); 2899, 13.2; 2925, 13.2; 2942, 13.1; 2965, 13.0; 2984, 12.6 (broad, brighter than $13^m5$ for 12 days); 3012, 13.3; 3039, 13.6 (one observation by A. C. Montague); 3048, 13.3; 3074, 13.0; 3099, 12.9 (reported by L. Peltier); 3108, 13.0.

UG: 184826 CY Lyr. Eighteen maxima were observed: 2811, 13.8; 2845, 12.8; 2873, 13.1; 2898, 13.2 (broad, brighter than $14^m$ for five days); 2916, 13.2; 2933, 13.0; 2945, 13.8; 2958, 12.8 (broad, brighter than $14^m$ for seven days); 2974, 13.4; 2987, 13.0; 3002, 13.3; 3019, 12.8 (broad, brighter than $14^m$ for six days); 3040, 13.8; 3056, 13.2; 3072, 12.9 (broad, brighter than $14^m$ for eight days); 3091, 13.3; 3103, 13.3; 3120, 13.3.

UG: 195109 UU Aql. The following four outbursts were observed: 2921, 11.2; 2973, 12.0; 3027, 11.6; 3081, 11.8.

Z: 195377 AB Dra. Variations between $11^m5$ and $14^m6$ with 14 to 30 days intervals between maxima.

UG: 220912 RU Peg. Three outbursts were observed: 2790, 10.1; 2874, 10.1 (reported by T. Wilson); 3032, 10.2 (broad, brighter than $11^m$ for ten days).

The data for the stars reported above have been contributions of the observers of A.A.V.S.O. In several cases to make the data more complete observations of N. Taylor, O. Hull, and A. Jones of the Variable Stars Section of R.A.S.N.Z., reported in the A.A.V.S.O. Circular have been included. I acknowledge the observations of all the contributors with thanks.