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# A Finding List of Faint UV-Bright Stars in the Galactic Plane. VII.

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**ABSTRACT.** Five plates from the Sandage two-color survey of the Galactic plane have been examined, yielding 161 UV-bright sources and one potential new planetary nebula. The plates were obtained using the Palomar 48 inch (1.2 m) Oschin Schmidt telescope, and each covers a field of view of 43 deg$^2$. The plates were centered at the Galactic longitude ($l$) and latitude ($b$) coordinates (13°.1, +0°), (104°.1, +0°), (128°, +0°), (179°, +0°), and (179°, −6°). Identified sources range in $U-B$ color from $U-B \sim -0.1$ to $\sim -1.2$, and in magnitude from $m_B \sim 9.3$ to ~20. Finding charts and accurate J2000.0 coordinates are provided for all the UV candidates. Proper motions from the USNO-B survey have also been included for sources with catalog values greater than 10 mas yr$^{-1}$. The more interesting sources are discussed, and previously identified objects are noted.

## 1. INTRODUCTION

This paper is the seventh in a series of catalogs providing identifications of faint UV-bright sources found in the continuing program to examine plates from the Sandage two-color survey of the Galactic plane. This program was first described by Lanning (1973; hereafter Paper I). The Sandage two-color photographic survey was originally begun with the goal of identifying and studying the optical counterparts of newly detected X-ray sources found by the *Uhuru* X-ray satellite. More than 100 plates measuring 6°.6 on a side were obtained with the Palomar 48 inch (1.2 m) Oschin Schmidt telescope. Since the X-ray sources were expected to lie along the Galactic plane, the survey plates were centered at Galactic latitudes of +6°, 0°, and −6°, covering a range of Galactic latitude of ±9° and extending throughout most of the northern plane ($l$ = 0°–227° ). To avoid gaps in the survey, adjacent plate fields were slightly overlapped. Each plate was double-exposed, with one image taken in the UV (UG1 filter) and the second image in the blue (GG13), separated by 12″. Exposure times for the plates were scaled to produce a $U-B = 0$ for equal-sized images. Offsets in the color difference calibration of up to 0.5 mag have been noted for some plates presented here. In all cases, the balance offset indicated an equal-sized pair was bluer than $U-B = 0$. The larger image in the $U$ filter typically suggests the presence of bluer objects such as low-luminosity stars, white dwarfs, novae, cataclysmic variables, normal early B stars, and blue subdwarfs. This multicolor photographic technique has been described by Haro & Herbig (1955).

The data presented in this paper represent a careful visual examination of five plates from the survey centered at Galactic coordinate ($l$, $b$) regions (13°.1, +0°), (104°.1, +0°), (128°, +0°), (179°, +0°), and (179°, −6°). However, it should not be assumed that every potential UV source present on these plates was found. We noted previously (Lanning & Meakes 1997) that several plates had been scanned using the KPNO PDS microdensitometer at 10 $\mu$m sampling. It was found, however, that the extreme crowding of images in the Galactic plane fields often made it difficult to reliably detect visually obvious UV-bright sources. Setting an aperture threshold that would allow electronic detection of all UV-bright sources was not possible, thus limiting the range and accuracy of source identifications. Visual examinations of sources in crowded fields, however, clearly revealed their bluer nature, a feature attributed to the increased dynamic range of the eye. It was therefore concluded that continuation of the visual scanning of plates in the Sandage survey was strongly justified.

While the original intent of the Sandage two-color survey was to support the optical identification of X-ray sources, as noted above, the UV-bright sources found during this analysis do not necessarily correspond to previously discovered X-ray sources. The sources represent a comprehensive survey of the entire 43 deg$^2$ field on each Schmidt plate that was examined.

The complete survey comprises a suite of 124 Galactic plane fields. Although plates have generally been selected at random for examination, a large number of plates remain in dense regions approaching the Galactic center, where fields exhibit a much greater degree of crowding. To date, 48 plates have been scanned, representing 39% of the fields observed.

TABLE 1
Finding List of UV Sources

| Lanning Number (1) | Sandage Plate ID (2) | R.A. (J2000.0) (3) | Decl. (J2000.0) (4) | $m_B$ (5) | $U-B$ (6) | $\mu_{\text{R.A.}}$ (mas yr$^{-1}$) (7) | $\mu_{\text{decl.}}$ (mas yr$^{-1}$) (8) | Notes (9) |
|---|---|---|---|---|---|---|---|---|
| 589 ...... | 128+0 | 01 12 53.74 | +61 47 07.7 | 19.0 | −1.0 | 24.0 | 4.0 | |
| 601 ...... | 128+0 | 01 15 11.81 | +60 14 12.7 | 20.0 | −0.5 | | | |
| 607 ...... | 128+0 | 01 15 45.16 | +65 12 11.8 | ... | ... | | | Possible planetary nebula; single image |
| 584 ...... | 128+0 | 01 16 16.73 | +63 31 53.1 | 12.5 | −0.4 | | | LSI +63°140 |
| 576 ...... | 128+0 | 01 16 38.27 | +65 14 45.9 | 19.5 | −0.9 | 26.0 | −4.0 | |
| 590 ...... | 128+0 | 01 17 12.66 | +61 46 37.5 | 12.6 | −0.6 | | | |
| 588 ...... | 128+0 | 01 17 46.42 | +61 55 44.8 | 13.0 | −0.5 | | | |
| 587 ...... | 128+0 | 01 17 56.38 | +62 38 18.7 | 12.2 | −0.3 | | | |
| 602 ...... | 128+0 | 01 19 36.13 | +59 56 07.9 | 19.8 | −0.7 | 20.0 | −6.0 | |
| 597 ...... | 128+0 | 01 20 49.48 | +60 57 07.0 | 17.0 | −0.6 | | | Contamination |
| 594 ...... | 128+0 | 01 21 30.86 | +61 28 42.0 | 20.0 | −0.7 | | | |
| 593 ...... | 128+0 | 01 22 32.56 | +61 32 58.6 | 12.2 | −0.4 | | | LSI +61°19; Bpe |
| 591 ...... | 128+0 | 01 24 20.50 | +61 43 16.6 | 18.5 | −0.6 | −20.0 | −16.0 | |
| 573 ...... | 128+0 | 01 27 43.60 | +65 25 41.3 | 20.0 | −0.5 | | | |
| 578 ...... | 128+0 | 01 29 02.57 | +64 44 29.5 | 18.5 | −0.6 | | | |
| 583 ...... | 128+0 | 01 32 47.76 | +63 52 29.6 | 12.4 | −0.2 | | | |
| 596 ...... | 128+0 | 01 35 54.30 | +61 01 37.5 | 19.5 | −0.6 | | | |
| 577 ...... | 128+0 | 01 36 01.66 | +64 53 24.3 | 11.8 | −0.2 | | | |
| 600 ...... | 128+0 | 01 36 08.72 | +60 28 21.6 | 18.5 | −0.8 | | | |
| 599 ...... | 128+0 | 01 37 24.41 | +60 35 38.1 | 14.5 | −0.2 | | | |
| 579 ...... | 128+0 | 01 38 27.85 | +64 40 21.6 | 12.4 | −0.1 | | | |
| 581 ...... | 128+0 | 01 39 33.93 | +64 35 55.8 | 12.1 | −0.3 | | | |
| 604 ...... | 128+0 | 01 39 54.08 | +59 34 41.1 | 11.6 | −0.5 | | | CSI +59−01365; B0 V |
| 580 ...... | 128+0 | 01 40 31.23 | +64 49 34.4 | 12.1 | −0.4 | | | |
| 582 ...... | 128+0 | 01 40 32.97 | +64 14 59.9 | 19.5 | −0.5 | | | |
| 606 ...... | 128+0 | 01 42 06.84 | +59 23 28.2 | 19.0 | −0.9 | | | 1RXS J014206.4+592508 ? |
| 605 ...... | 128+0 | 01 42 19.37 | +59 26 32.9 | 18.2 | −0.4 | | | |
| 592 ...... | 128+0 | 01 45 57.57 | +61 35 15.5 | 20.0 | −0.9 | 18.0 | −6.0 | |
| 574 ...... | 128+0 | 01 50 03.24 | +65 22 01.7 | 19.5 | −0.7 | | | |
| 603 ...... | 128+0 | 01 51 08.60 | +59 40 41.6 | 19.0 | −0.8 | | | |
| 598 ...... | 128+0 | 01 51 55.07 | +60 50 47.2 | 20.0 | −1.2 | | | |
| 586 ...... | 128+0 | 01 53 01.19 | +63 14 39.0 | 19.0 | −0.7 | 16.0 | 2.0 | |
| 595 ...... | 128+0 | 01 57 15.81 | +61 12 43.6 | 20.0 | −1.0 | | | |
| 608 ...... | 128+0 | 02 03 40.62 | +64 57 34.8 | ... | ... | | | PN G130.4+03.1 |
| 585 ...... | 128+0 | 02 07 03.00 | +63 17 35.7 | 19.3 | −0.6 | 28.0 | −32.0 | |
| 575 ...... | 128+0 | 02 10 23.79 | +65 00 28.1 | 19.2 | −0.6 | 188.0 | −90.0 | |
| 622 ...... | 179−6 | 05 03 24.34 | +30 23 00.9 | 13.2 | −0.4 | | | |
| 623 ...... | 179−6 | 05 04 40.82 | +30 15 29.6 | 10.5 | −0.6 | 8.0 | −20.0 | |
| 634 ...... | 179−6 | 05 05 48.16 | +28 56 03.8 | 18.5 | −0.4 | −20.0 | −4.0 | |
| 619 ...... | 179−6 | 05 10 40.78 | +32 09 27.5 | 17.5 | −0.7 | | | |
| 611 ...... | 179−6 | 05 13 28.65 | +32 37 37.5 | 10.6 | −0.5 | −6.0 | −24.0 | |
| 614 ...... | 179−6 | 05 13 29.84 | +32 13 52.6 | 11.3 | −0.3 | | | 1RXS J051330.0+321353 |
| 609 ...... | 179−6 | 05 14 21.58 | +32 48 17.5 | 11.0 | −0.7 | | | |
| 610 ...... | 179−6 | 05 14 40.48 | +32 46 17.7 | 10.4 | −0.6 | | | HD 241747 |
| 615 ...... | 179−6 | 05 14 42.56 | +32 15 40.0 | 10.8 | −0.7 | | | |
| 612 ...... | 179−6 | 05 15 03.40 | +32 39 02.8 | 11.0 | −0.7 | | | |
| 616 ...... | 179−6 | 05 16 07.64 | +32 18 02.6 | 10.8 | −0.6 | | | |
| 613 ...... | 179−6 | 05 16 17.64 | +32 25 39.9 | 10.6 | −0.6 | | | |
| 644 ...... | 179−6 | 05 17 58.35 | +27 02 35.7 | 10.6 | −0.4 | 84.0 | −100.0 | |
| 630 ...... | 179−6 | 05 20 40.74 | +29 22 32.8 | 10.7 | −0.6 | | | |
| 645 ...... | 179−6 | 05 20 46.25 | +27 54 57.7 | 14.0 | −0.2 | | | |
| 618 ...... | 179−6 | 05 20 57.18 | +32 06 30.5 | 18.5 | −0.6 | 28.0 | −16.0 | |
| 635 ...... | 179−6 | 05 21 34.26 | +28 56 08.2 | 14.3 | −0.8 | | | |
| 636 ...... | 179−6 | 05 21 47.19 | +28 35 33.3 | 18.5 | −0.3 | 28.0 | −44.0 | |
| 633 ...... | 179−6 | 05 22 55.71 | +29 08 50.3 | 13.0 | −0.6 | | | |
| 617 ...... | 179−6 | 05 23 09.42 | +32 16 22.7 | 20.0 | −0.9 | −276.0 | −298.0 | |
| 627 ...... | 179−6 | 05 24 04.61 | +29 38 03.4 | 20.0 | −0.9 | 34.0 | −52.0 | 1RXS J052406.7+293742 ? |

TABLE 1 (*Continued*)
FINDING LIST OF UV SOURCES

| Lanning Number (1) | Sandage Plate ID (2) | R.A. (J2000.0) (3) | Decl. (J2000.0) (4) | $m_B$ (5) | $U-B$ (6) | $\mu_{R.A.}$ (mas yr$^{-1}$) (7) | $\mu_{decl.}$ (mas yr$^{-1}$) (8) | Notes (9) |
|---|---|---|---|---|---|---|---|---|
| 639 ...... | 179−6 | 05 25 23.38 | +28 03 58.4 | 10.3 | −0.5 | −32.0 | −16.0 | |
| 631 ...... | 179−6 | 05 25 27.20 | +29 17 11.5 | 10.5 | −0.5 | | | LS V +29°3; B |
| 626 ...... | 179−6 | 05 25 33.63 | +29 55 33.8 | 11.1 | −0.5 | | | |
| 640 ...... | 179−6 | 05 26 20.60 | +27 47 41.6 | 10.6 | −0.5 | | | |
| 620 ...... | 179−6 | 05 26 45.04 | +31 52 50.9 | 11.0 | −0.6 | | | |
| 624 ...... | 179−6 | 05 26 48.95 | +30 07 55.1 | 10.3 | −0.6 | | | |
| 642 ...... | 179−6 | 05 27 41.24 | +27 37 21.0 | 11.0 | −0.4 | | | |
| 628 ...... | 179−6 | 05 27 41.40 | +29 42 31.7 | 11.0 | −0.6 | 6.0 | −12.0 | |
| 621 ...... | 179−6 | 05 27 46.29 | +31 42 15.8 | 10.2 | −0.6 | | | HD 243760 |
| 638 ...... | 179−6 | 05 27 51.00 | +28 14 50.6 | 15.0 | −0.3 | | | |
| 629 ...... | 179−6 | 05 27 58.91 | +29 37 04.4 | 10.2 | −0.7 | | | |
| 637 ...... | 179−6 | 05 28 16.02 | +28 37 01.9 | 11.4 | −0.6 | | | |
| 641 ...... | 179−6 | 05 28 28.30 | +27 37 51.8 | 10.8 | −0.6 | | | |
| 632 ...... | 179−6 | 05 28 31.73 | +29 07 41.1 | 12.8 | −0.6 | | | |
| 643 ...... | 179−6 | 05 28 35.36 | +27 16 49.9 | 15.0 | −0.5 | | | |
| 648 ...... | 179+0 | 05 28 41.73 | +31 48 20.1 | 18.0 | −0.3 | | | |
| 625 ...... | 179−6 | 05 28 47.81 | +30 01 33.3 | 10.0 | −0.7 | | | LS V +29°5; B5 |
| 650 ...... | 179+0 | 05 31 22.19 | +30 48 47.7 | 11.0 | −0.4 | | | HD 244337; B8 |
| 652 ...... | 179+0 | 05 31 59.06 | +30 26 45.5 | 17.0 | −0.6 | | | T Aur (Nova Aur 1891) |
| 658 ...... | 179+0 | 05 37 24.74 | +28 42 39.3 | 18.3 | −0.8 | | | |
| 656 ...... | 179+0 | 05 38 57.58 | +29 41 41.1 | 20.0 | −1.0 | 8.0 | −18.0 | |
| 661 ...... | 179+0 | 05 44 49.29 | +28 13 18.2 | 10.7 | −0.2 | | | |
| 663 ...... | 179+0 | 05 45 25.73 | +28 02 41.4 | 20.0 | −1.2 | | | WD 0544+280 |
| 647 ...... | 179+0 | 05 46 41.27 | +32 19 42.8 | 19.0 | −1.0 | | | |
| 657 ...... | 179+0 | 05 46 57.99 | +29 36 34.7 | 19.0 | −1.1 | | | |
| 664 ...... | 179+0 | 05 47 46.97 | +28 02 00.1 | 19.8 | −0.9 | | | Contamination |
| 659 ...... | 179+0 | 05 47 48.30 | +28 35 11.0 | 15.5 | −0.9 | 10.0 | −6.0 | FS Aur (1RXS J054748.5 +283512); dwarf nova |
| 651 ...... | 179+0 | 05 49 59.17 | +30 33 46.4 | 12.0 | −0.4 | | | |
| 646 ...... | 179+0 | 05 53 48.84 | +32 56 01.2 | 11.5 | −0.3 | | | |
| 653 ...... | 179+0 | 05 54 14.89 | +30 07 48.5 | 10.5 | −0.5 | | | LS V +30°22; B; emission-line star |
| 660 ...... | 179+0 | 05 55 12.12 | +28 23 05.5 | 10.2 | −0.4 | | | |
| 662 ...... | 179+0 | 05 55 46.13 | +27 53 01.3 | 19.5 | −1.0 | −16.0 | −14.0 | |
| 655 ...... | 179+0 | 05 56 01.19 | +29 42 45.0 | 10.2 | −0.7 | | | |
| 654 ...... | 179+0 | 05 56 42.34 | +29 47 52.1 | 18.5 | −0.7 | | | |
| 649 ...... | 179+0 | 05 58 23.46 | +31 26 36.0 | 10.8 | −0.5 | | | |
| 678 ...... | 13.1+0 | 18 02 51.20 | −17 31 34.5 | 12.7 | −0.5 | | | ALS 4582; B+ |
| 699 ...... | 13.1+0 | 18 03 51.43 | −18 27 45.8 | 19.3 | −0.7 | | | |
| 675 ...... | 13.1+0 | 18 04 48.59 | −17 12 14.5 | 17.5 | −0.4 | | | |
| 679 ...... | 13.1+0 | 18 08 52.70 | −17 34 35.8 | 18.5 | −0.7 | −28.0 | −80.0 | |
| 715 ...... | 13.1+0 | 18 09 31.83 | −20 18 27.6 | 16.5 | −0.9 | | | |
| 687 ...... | 13.1+0 | 18 09 36.67 | −17 42 49.4 | 17.5 | −0.4 | | | |
| 693 ...... | 13.1+0 | 18 10 40.75 | −18 05 24.1 | 18.7 | −0.9 | −2.0 | −34.0 | |
| 672 ...... | 13.1+0 | 18 11 00.11 | −15 51 09.2 | 19.0 | −1.0 | | | |
| 707 ...... | 13.1+0 | 18 11 09.68 | −20 07 14.1 | 13.0 | −0.3 | | | |
| 666 ...... | 13.1+0 | 18 11 24.79 | −14 55 32.5 | 16.5 | −0.3 | 2.0 | −16.0 | UZ Ser; U Gem–type variable |
| 676 ...... | 13.1+0 | 18 13 33.42 | −17 10 45.0 | 15.6 | −0.8 | | | |
| 714 ...... | 13.1+0 | 18 14 03.21 | −20 18 07.1 | 10.6 | −0.5 | | | HD 312980; O+ |
| 667 ...... | 13.1+0 | 18 14 38.05 | −14 57 44.6 | 13.5 | −0.3 | | | LS IV −14°16; B |
| 716 ...... | 13.1+0 | 18 14 39.24 | −20 28 07.7 | 11.0 | −0.6 | | | HD 312988; B8 |
| 713 ...... | 13.1+0 | 18 14 50.94 | −20 22 38.3 | 10.2 | −0.6 | | | HD 167172; B3 III |
| 674 ...... | 13.1+0 | 18 15 03.70 | −16 58 32.9 | 15.5 | −0.4 | −6.0 | −14.0 | |
| 712 ...... | 13.1+0 | 18 15 36.37 | −20 22 03.9 | 09.5 | −0.7 | | | HD 312973; O+; emission-line star |
| 717 ...... | 13.1+0 | 18 15 51.89 | −20 26 16.8 | 12.0 | −0.6 | | | |
| 694 ...... | 13.1+0 | 18 16 27.91 | −18 13 24.6 | 17.8 | −0.8 | | | |
| 711 ...... | 13.1+0 | 18 16 59.07 | −20 15 16.7 | 10.0 | −0.5 | | | HD 167639; B7 Ib/II |
| 710 ...... | 13.1+0 | 18 17 14.70 | −20 23 19.1 | 10.3 | −0.4 | | | HD 313115; B9 |
| 709 ...... | 13.1+0 | 18 17 19.26 | −20 17 30.6 | 11.5 | −0.5 | | | |

TABLE 1 (*Continued*)
FINDING LIST OF UV SOURCES

| Lanning Number (1) | Sandage Plate ID (2) | R.A. (J2000.0) (3) | Decl. (J2000.0) (4) | $m_B$ (5) | $U-B$ (6) | $\mu_{R.A.}$ (mas yr$^{-1}$) (7) | $\mu_{decl.}$ (mas yr$^{-1}$) (8) | Notes (9) |
|---|---|---|---|---|---|---|---|---|
| 700 ...... | 13.1+0 | 18 18 36.06 | −18 36 41.1 | 16.5 | −0.7 | | | |
| 701 ...... | 13.1+0 | 18 19 52.82 | −18 42 35.3 | 11.5 | −0.3 | | | HD 313175; B5 |
| 718 ...... | 13.1+0 | 18 20 19.22 | −20 30 24.5 | 09.3 | −0.7 | | | HD 168421; B2/B3 Iab |
| 686 ...... | 13.1+0 | 18 20 25.26 | −17 44 31.2 | 17.0 | −0.6 | | | |
| 704 ...... | 13.1+0 | 18 20 40.70 | −19 44 13.4 | 19.0 | −0.7 | −22.0 | −24.0 | |
| 708 ...... | 13.1+0 | 18 22 20.77 | −20 04 00.9 | 09.3 | −0.6 | | | HD 313321; B0.5 II |
| 685 ...... | 13.1+0 | 18 23 14.65 | −17 45 17.6 | 12.0 | −0.5 | | | ALS 4993; B |
| 706 ...... | 13.1+0 | 18 23 47.56 | −19 54 50.5 | 11.5 | −0.4 | | | HD 313315; A |
| 671 ...... | 13.1+0 | 18 23 55.52 | −15 47 49.0 | 11.6 | −0.3 | | | |
| 695 ...... | 13.1+0 | 18 24 21.99 | −18 20 14.7 | 10.5 | −0.6 | | | HD 169208; B9 Ib |
| 705 ...... | 13.1+0 | 18 24 22.30 | −19 55 31.0 | 18.5 | −0.6 | | | |
| 688 ...... | 13.1+0 | 18 24 35.03 | −17 54 58.8 | 10.2 | −0.4 | | | HD 313260; B5 |
| 696 ...... | 13.1+0 | 18 24 42.50 | −18 16 50.7 | 09.6 | −0.6 | | | HD 169271; B3 II |
| 698 ...... | 13.1+0 | 18 24 49.61 | −18 25 13.3 | 12.5 | −0.4 | | | ALS 5012; B+ |
| 670 ...... | 13.1+0 | 18 25 01.86 | −15 38 52.9 | 10.6 | −0.5 | | | LS IV −15°45; B |
| 692 ...... | 13.1+0 | 18 25 15.50 | −18 06 25.5 | 10.7 | −0.4 | | | HD 313264; A0 |
| 680 ...... | 13.1+0 | 18 25 15.51 | −17 31 07.4 | 10.0 | −0.5 | | | HD 169419; B2 Ia/Iab |
| 669 ...... | 13.1+0 | 18 25 27.64 | −15 16 01.3 | 11.6 | −0.5 | | | |
| 677 ...... | 13.1+0 | 18 25 27.75 | −17 06 50.3 | 13.4 | −0.4 | | | |
| 684 ...... | 13.1+0 | 18 25 45.40 | −17 37 25.7 | 11.4 | −0.4 | | | |
| 673 ...... | 13.1+0 | 18 25 49.45 | −16 55 57.8 | 12.3 | −0.3 | | | ALS 5027; B |
| 668 ...... | 13.1+0 | 18 26 19.41 | −15 03 55.0 | 13.8 | −0.4 | | | |
| 689 ...... | 13.1+0 | 18 26 28.75 | −17 58 34.1 | 13.0 | −0.3 | 24.0 | −6.0 | |
| 697 ...... | 13.1+0 | 18 26 41.54 | −18 19 15.8 | 10.2 | −0.5 | | | |
| 690 ...... | 13.1+0 | 18 26 42.17 | −17 56 19.2 | 12.0 | −0.4 | | | |
| 683 ...... | 13.1+0 | 18 27 11.83 | −17 35 59.1 | 11.0 | −0.4 | | | |
| 665 ...... | 13.1+0 | 18 27 25.88 | −14 42 08.0 | 11.6 | −0.6 | | | LS IV −14°68; B |
| 681 ...... | 13.1+0 | 18 27 30.74 | −17 24 33.8 | 11.3 | −0.3 | | | |
| 703 ...... | 13.1+0 | 18 27 35.71 | −19 10 03.9 | 11.8 | −0.4 | −26.0 | −4.0 | |
| 682 ...... | 13.1+0 | 18 27 43.64 | −17 39 28.6 | 10.8 | −0.6 | | | HD 169935; B8 Ib |
| 702 ...... | 13.1+0 | 18 27 45.59 | −19 09 09.6 | 10.8 | −0.5 | | | HD 313351; B8 |
| 691 ...... | 13.1+0 | 18 27 46.11 | −18 06 05.4 | 11.6 | −0.7 | | | ALS 5058; B |
| 723 ...... | 104.1+0 | 22 00 51.25 | +59 07 11.1 | 16.0 | −0.4 | | | |
| 720 ...... | 104.1+0 | 22 17 23.09 | +59 47 02.2 | 18.0 | −0.5 | | | |
| 719 ...... | 104.1+0 | 22 20 45.37 | +60 03 29.1 | 11.0 | −0.2 | | | |
| 721 ...... | 104.1+0 | 22 22 30.44 | +59 45 06.6 | 11.2 | −0.3 | | | |
| 734 ...... | 104.1+0 | 22 24 18.37 | +54 48 01.0 | 10.6 | −0.2 | | | LS III +54°58; B5 |
| 733 ...... | 104.1+0 | 22 31 13.79 | +54 51 44.9 | 10.8 | −0.3 | | | LSIII +54°66; B |
| 730 ...... | 104.1+0 | 22 32 17.60 | +56 10 27.4 | ... | ... | | | PN G104.4−01.6 |
| 722 ...... | 104.1+0 | 22 34 32.29 | +59 48 52.7 | 17.5 | −0.4 | | | |
| 732 ...... | 104.1+0 | 22 36 11.77 | +55 00 11.9 | 10.6 | −0.3 | | | LS III +54°68; B; emission-line star |
| 726 ...... | 104.1+0 | 22 42 25.66 | +57 13 11.4 | 11.0 | −0.3 | | | |
| 731 ...... | 104.1+0 | 22 43 29.29 | +55 13 52.4 | 10.4 | −0.2 | | | LS III +54°72; B; emission-line star |
| 725 ...... | 104.1+0 | 22 43 33.60 | +58 05 47.9 | 10.8 | −0.3 | | | LS III +57°67; B |
| 727 ...... | 104.1+0 | 22 44 42.52 | +56 55 58.4 | 10.8 | −0.4 | | | |
| 729 ...... | 104.1+0 | 22 45 24.36 | +56 11 09.5 | 10.5 | −0.1 | | | LS III +55°100; B |
| 728 ...... | 104.1+0 | 22 46 57.62 | +56 40 23.6 | 10.2 | −0.2 | | | LS III +56°96; B |
| 724 ...... | 104.1+0 | 22 47 12.57 | +58 08 41.0 | 17.5 | −0.3 | | | NGC 7380 HOAG 8; B0.5 V |

NOTE.—Units of right ascension are hours, minutes, and seconds, and units of declination are degrees, arcminutes, and arcseconds.

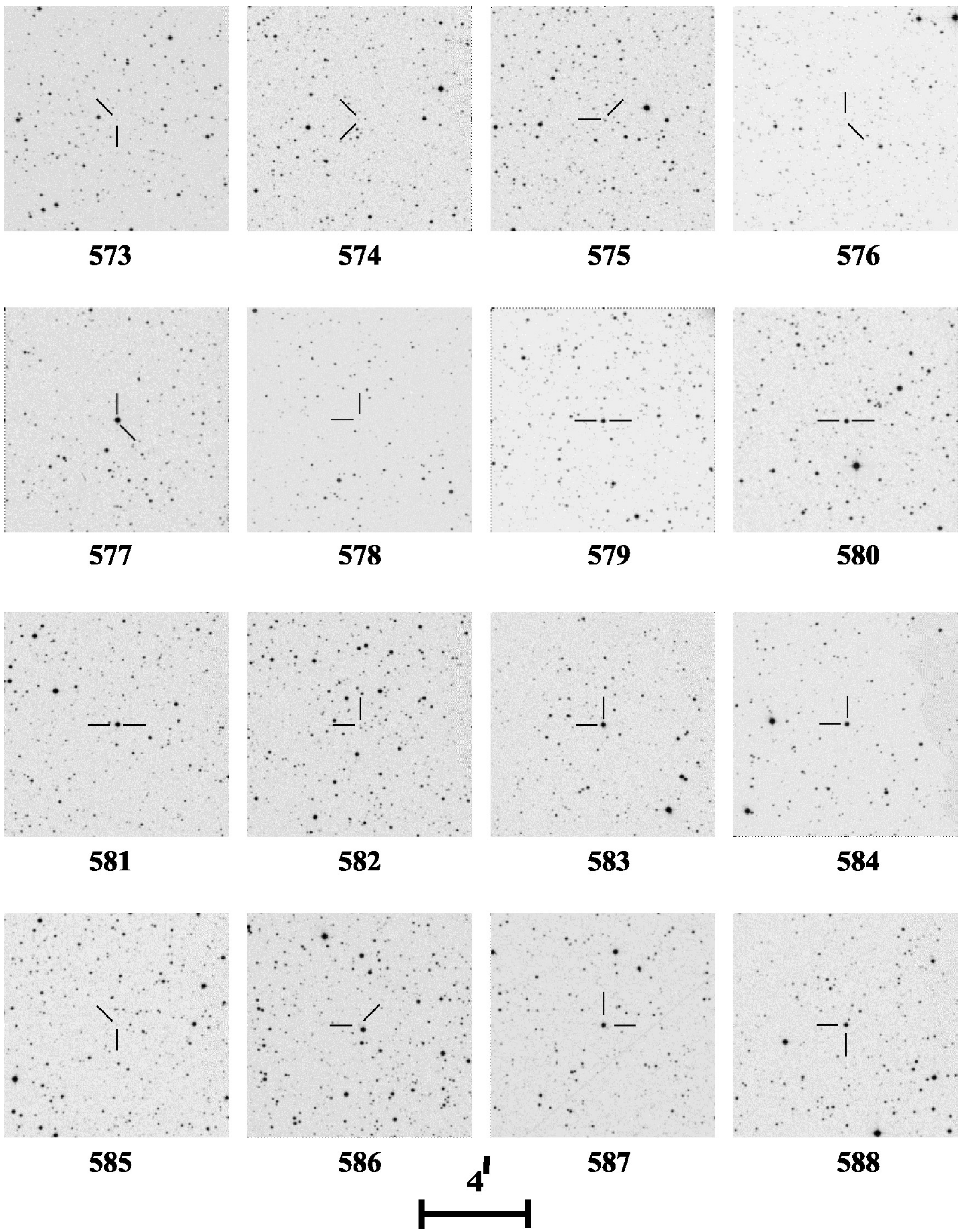



FIG. 1.—Scale of all charts is ~11″ mm$^{-1}$. North is up and east to the left.

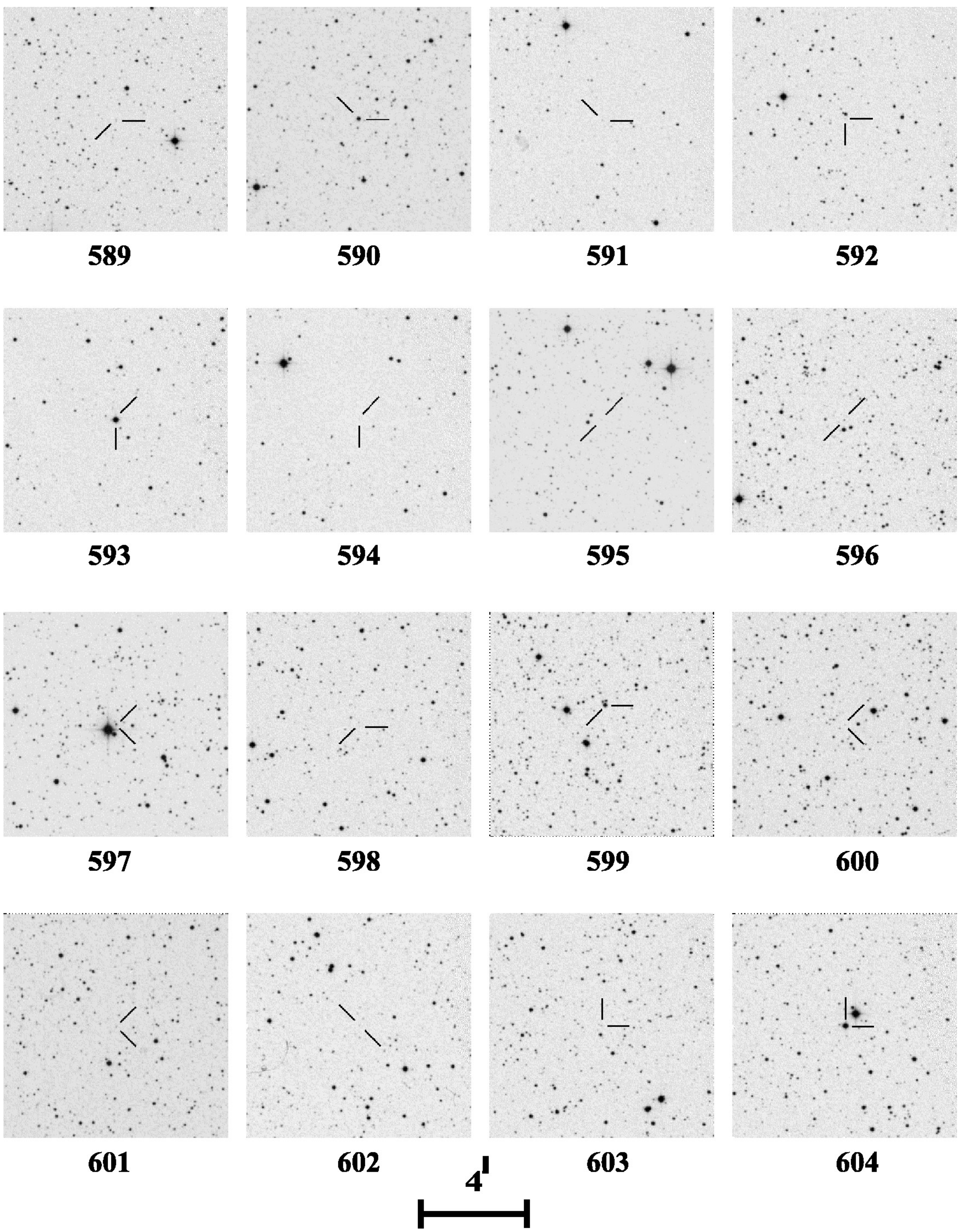



FIG. 2.—Magnitude and color estimates for Lanning 597 may be uncertain, because of contamination from an adjacent bright field star.

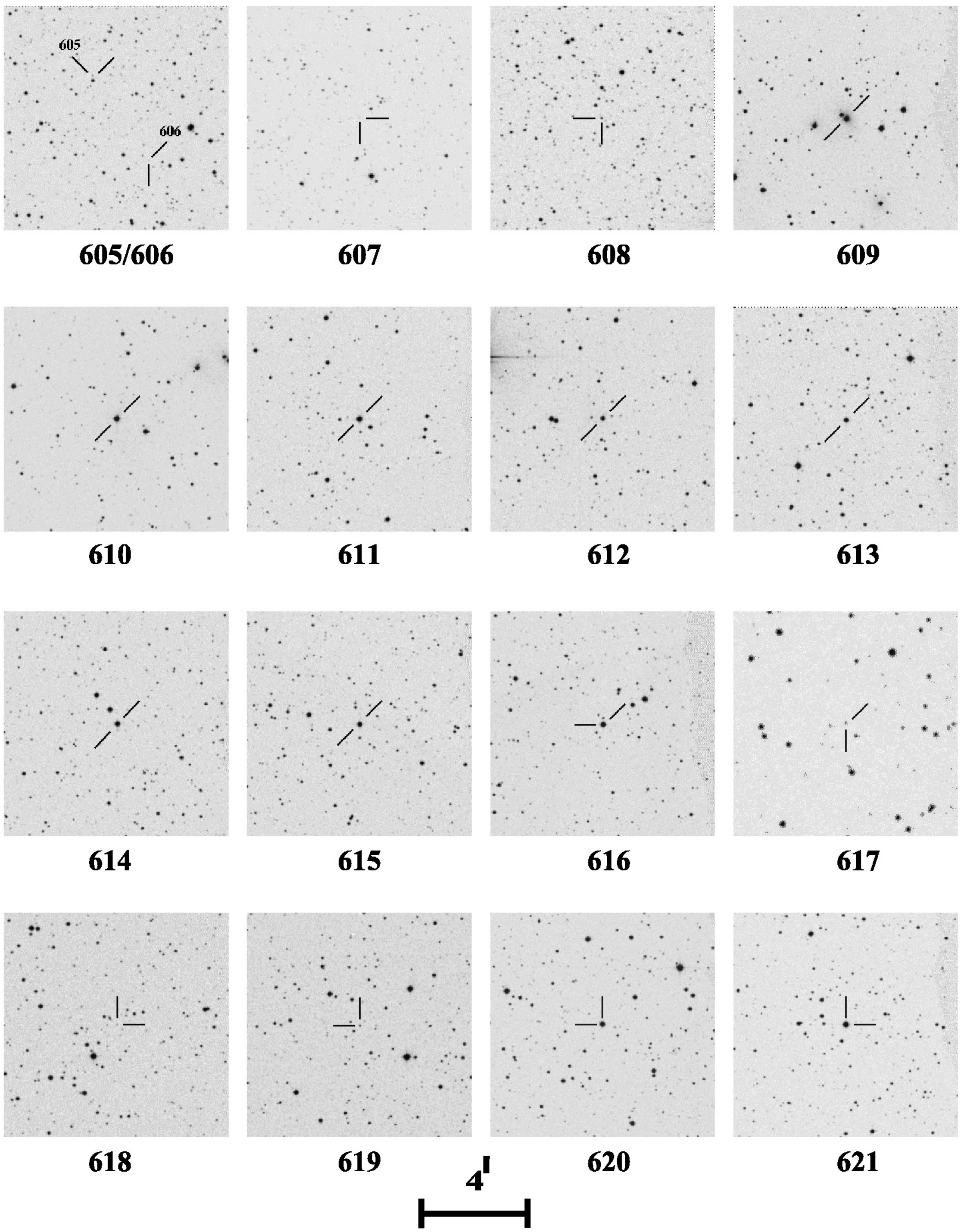



FIG. 3.—Lanning 606 is in the region of the *ROSAT* X-ray source 1RXS J014206.4+592508. The source noted for Lanning 607 is a possible previously unidentified planetary nebula. Lanning 608 is the cataloged planetary nebula PN G130.4+03.1. The *ROSAT* X-ray source 1RXS J051330.0+321353 has been identified as Lanning 614. The image for Lanning 617 is taken from the POSS blue plate.

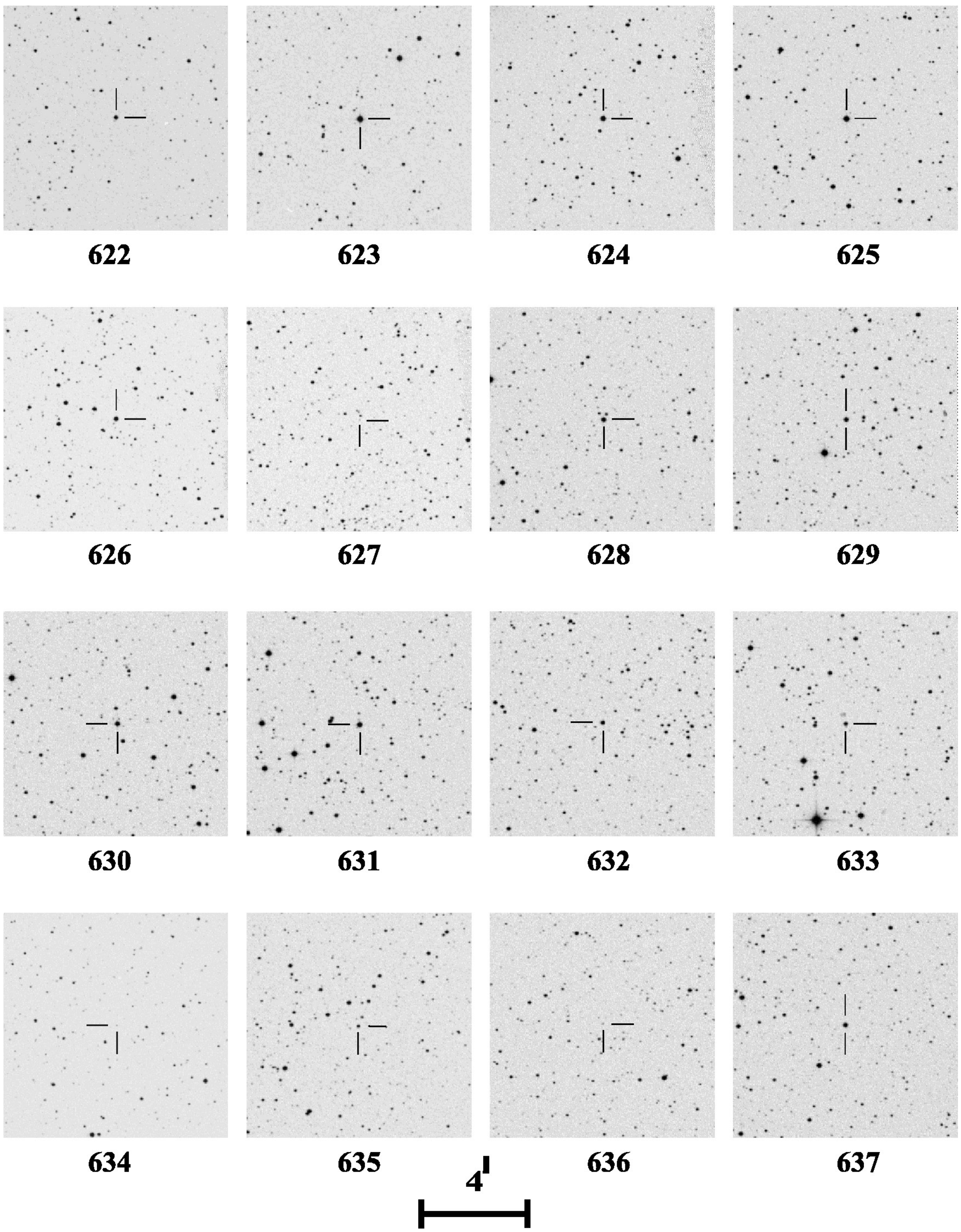



FIG. 4.—Lanning 627 is located in the region of the *ROSAT* X-ray source 1RXS J052406.7+293742.

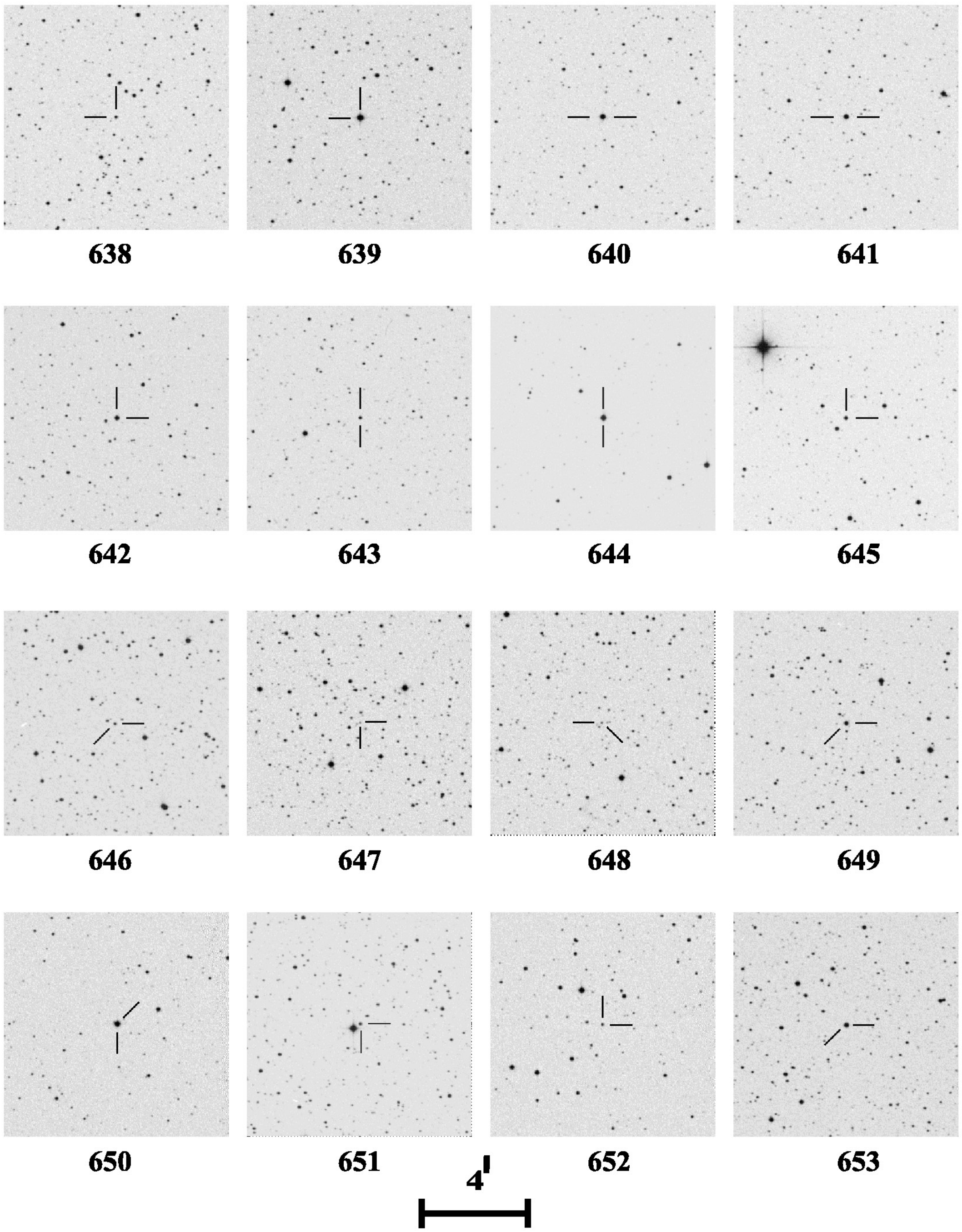



FIG. 5.—Lanning 652 is the nova T Aur (Nova Aur 1891). The image for Lanning 644 is taken from the POSS blue plate.

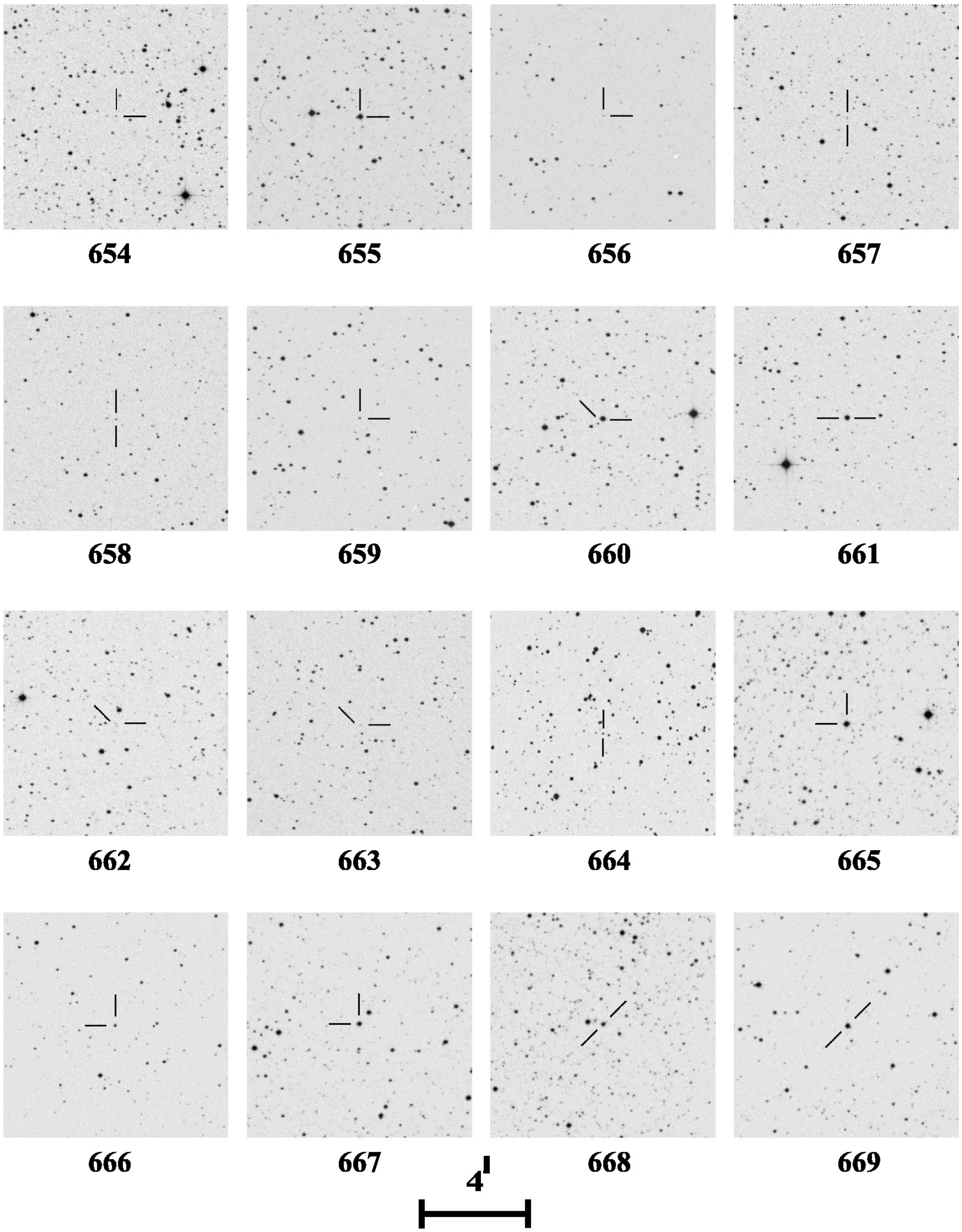



FIG. 6.—Lanning 659 is the dwarf nova FS Aur. The white dwarf designated as WD 0544+280 in the literature has been identified as Lanning 663. Lanning 666 is the U Gem–type variable UZ Ser. The images for Lanning 663 and Lanning 664 are taken from the POSS blue plate.

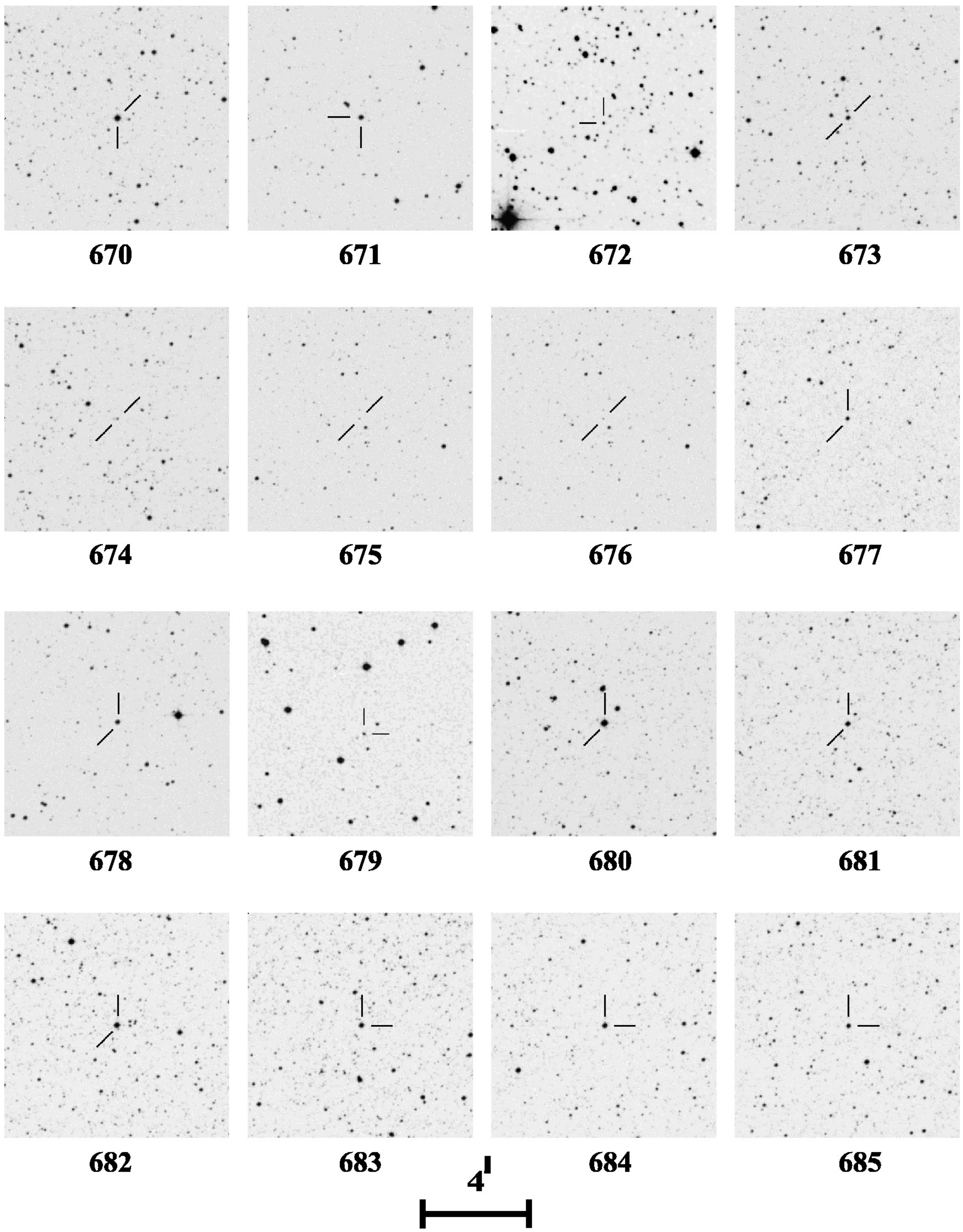



FIG. 7.—Images for Lanning 672 and Lanning 679 are taken from the POSS blue plate.

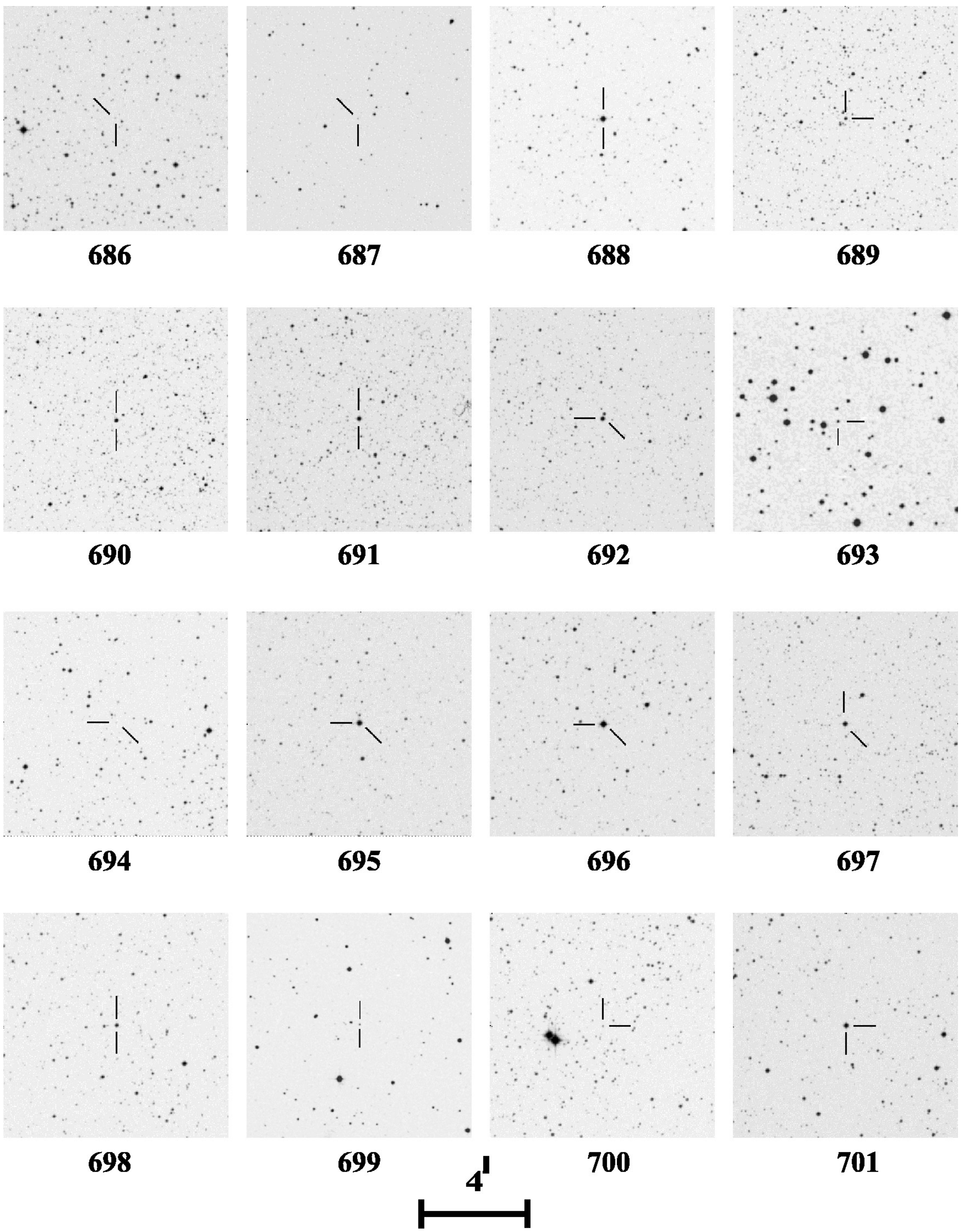



FIG. 8.—Image for Lanning 693 is taken from the POSS blue plate. The $B$ magnitude for the UV-bright source Lanning 696 was brighter than the normal $B = 10.0$ bright limit for this survey, but the $U-B$ color was clearly very blue.

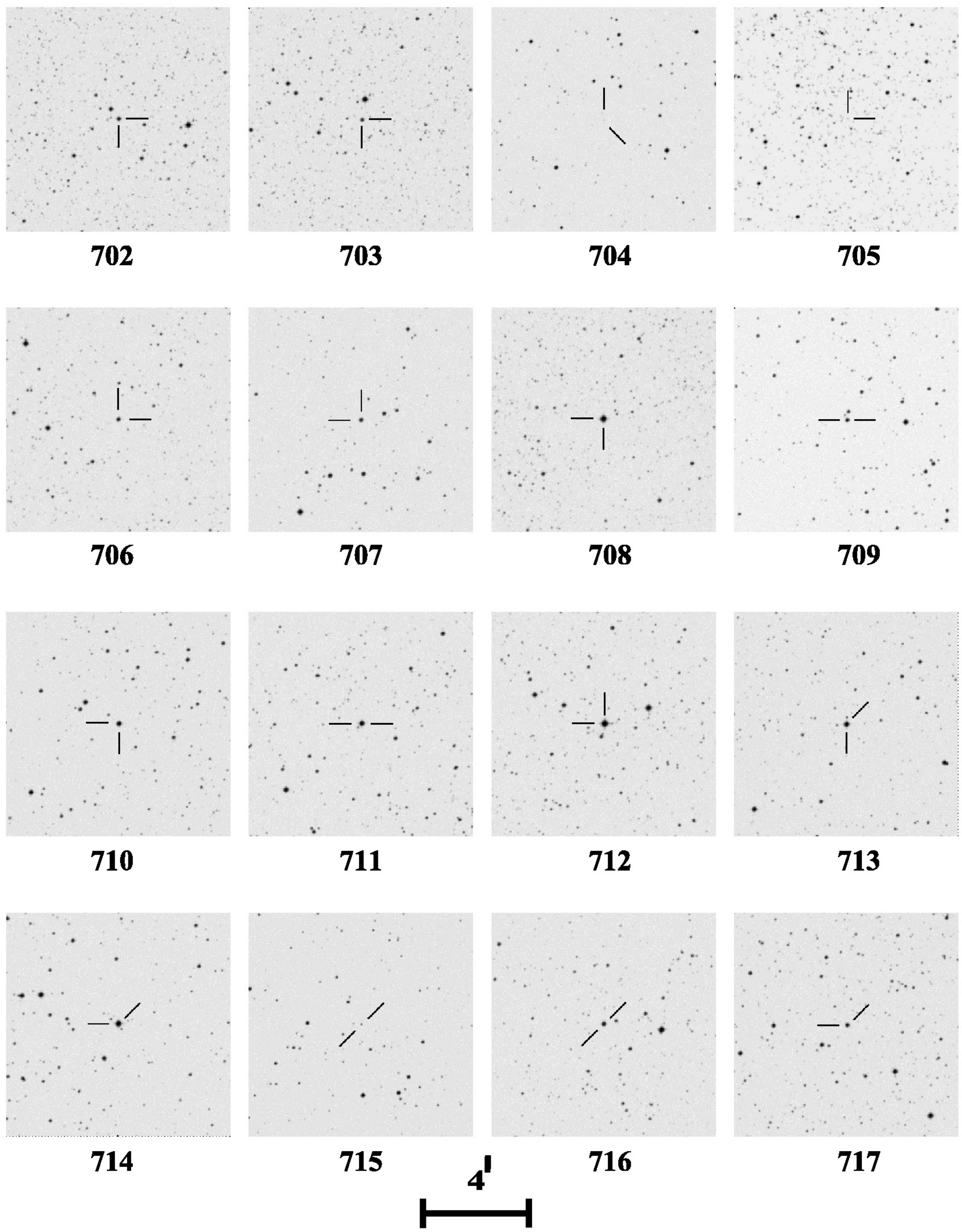



FIG. 9.—$B$ magnitude for the UV-bright sources Lanning 708 and Lanning 712 are brighter than the normal $B = 10.0$ bright limit for this survey, but the $U-B$ color was clearly very blue for both.

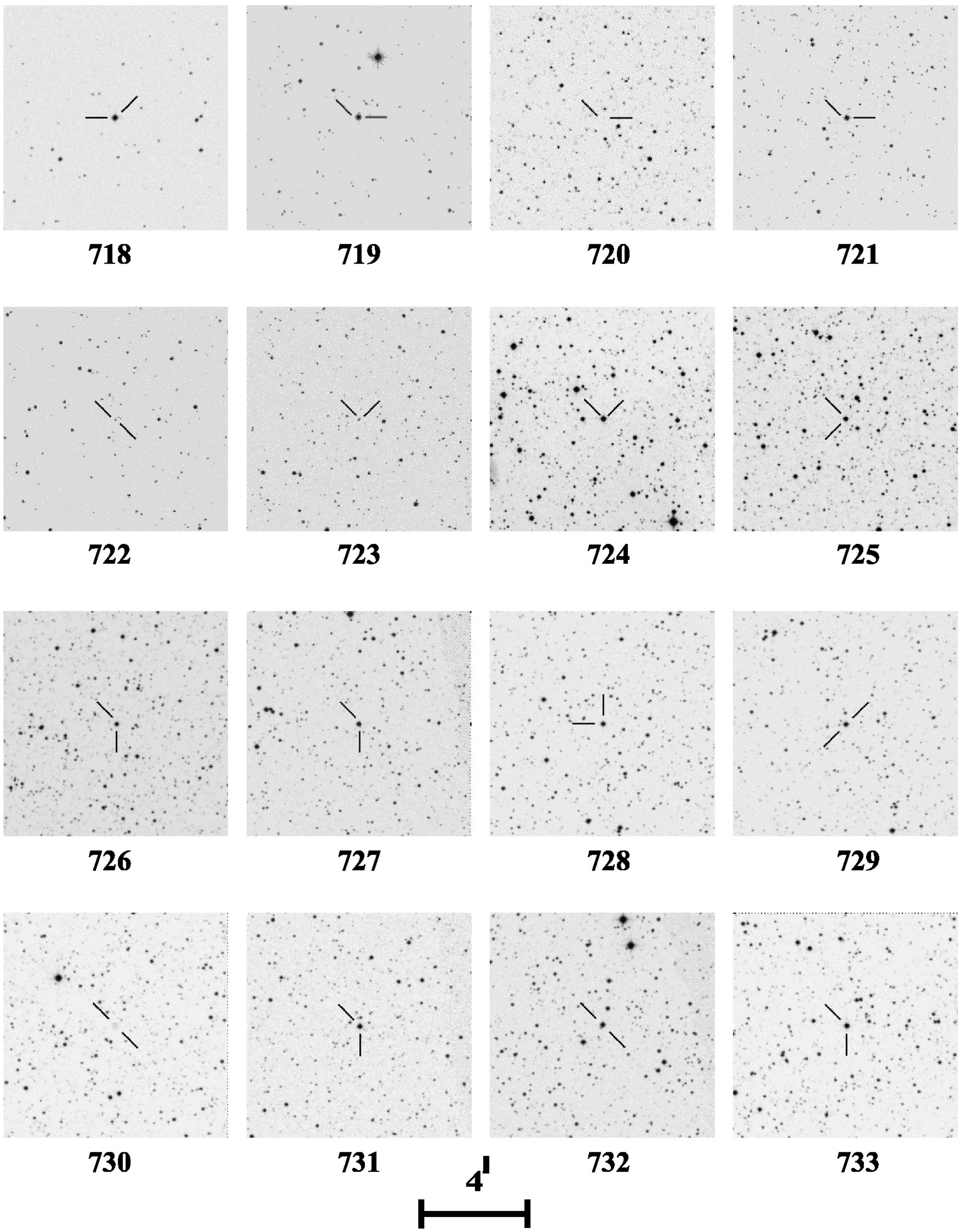
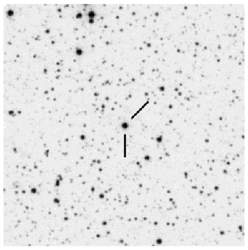



Fig. 10.—Lanning 730 is the UV-bright planetary nebula PN G104.4−01.6. The $B$ magnitude for the UV-bright source Lanning 718 was brighter than the normal $B = 10.0$ bright limit for this survey, but the $U-B$ color was clearly very blue.



**734**

FIG. 11.—North is up and east to the left. Scale is same as for Figs. 1–10.

## 2. THE FINDING LIST

Table 1 contains the list of 161 UV objects and one possible new planetary nebula found on the plates examined for this paper. Each plate was scanned in a raster pattern on a plate rack using a stereoscopic microscope. The fields were overlapped slightly to prevent omission of potential sources at the edges of the microscope field of view. Estimates of the blue magnitude and color ($U-B$) for each source were determined by visual inspection of the plates. Where possible, photoelectric measurements determined by Hoag et al. (1961) for Galactic cluster fields were used to calibrate the magnitudes and colors of the identified UV sources. Alternatively, photometry of field stars provided by Blanco et al. (1970) and Giclas et al. (1971) was used for plates containing no Galactic clusters. Magnitude and color estimates are typically good only to $\pm 0.5$ mag, because of such contributing factors as variation in the $U-B$ balance or image distortion resulting from guiding errors or other mechanical factors (e.g., plate holder nonuniformities and general uncertainties related to obtaining accurate visual estimates from photographic plates). Magnitude and color estimates for sources in previous papers were compared to published $B$ and $U-B$ values. An accuracy of $\pm 0.5$ mag remains valid for the $B$ magnitude, although selected differences may range as high as 1.1 mag, particularly for brighter sources and distorted images. The computed accuracy for the $U-B$ colors was found to be much better, typically in the range of $\pm 0.15$ mag. Selected differences due to various plate effects may be as high as 0.45 mag. Tabulation of UV-bright sources identified during this analysis was generally restricted to objects with $m_B \sim 10$ or fainter, because of uncertainties associated with the merging of images for the brighter sources. Sources brighter than $m_B \sim 10$ were only included if they were clearly brighter in the UV.

The format of Table 1 is as follows: (1) the Lanning source number, (2) the Sandage plate identification (plate center in Galactic coordinates), (3) right ascension (equinox J2000.0), (4) declination (equinox J2000.0), (5) estimated photographic blue magnitude, (6) estimated $U–B$ color difference, (7) $\mu_{\rm R.A.}$, (8) $\mu_{\rm decl.}$, and (9) corresponding identifications with previously known objects, along with general notes (e.g., the spectral type and $U-B$ color stored in SIMBAD). The UV source numbers follow the convention established by the SIMBAD database entries for Paper I. Sources are sorted in order of right ascension for the five plates presented in this work.

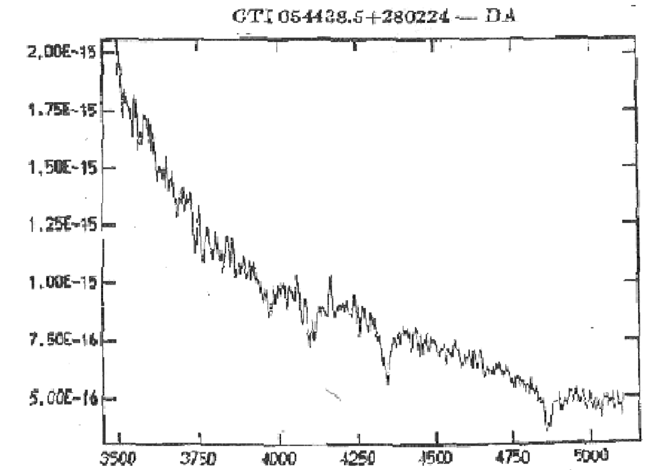



FIG. 12.—Unpublished spectrum of the previously identified DA white dwarf WD 0544+280 (Lanning 663) was kindly provided for inclusion in this study by J. D. Kirkpatrick (see text).

The Guide Star Astrometric Support Program (GASP) was used to determine accurate positions of the sources listed in Table 1. These positions were measured from images retrieved from the Space Telescope Science Institute (STScI) collection of guide star digital plate scans. Variations in plate characteristics and edge effects yield an estimated uncertainty of positions from the Guide Star Catalog images of 0″.2–0″.8 (Russell et al. 1990).

A newly released resource that was not available for previous papers devoted to this study now provides the opportunity to extract proper motions for many of the potential UV sources identified here. The USNO-B catalog (Monet et al. 2003) is an all-sky catalog derived from scans of 7435 Schmidt plates taken from various sky surveys and is complete to a limiting magnitude of $V = 21$ with a 0″.2 astrometric accuracy. The entire list of J2000.0 positions for the 161 sources presented in this study were processed with the assistance of Stephen Levine at the United States Naval Observatory, Flagstaff Station. Significant proper motions were evident for ~17% of the sources. Values of $\mu_{\rm R.A.}$ and $\mu_{\rm decl.}$ greater than 10 mas yr$^{-1}$ have been tabulated in Table 1.

The SIMBAD database was queried to identify any correlations between the UV-bright sources presented in this work and previously identified objects. A radius of 5′ around each position listed in Table 1 was used in the search. Corresponding identifications, along with the spectral type, are included in the table. The SIMBAD search was completed on a database updated effective 2004 January.

## 3. THE FINDING CHARTS

Finding charts (Figs. 1–11) are reproduced from FITS images extracted from the STScI GASP system and have been provided for all sources listed in Table 1. These images were first retrieved from the guide star image archive and converted to GIF format. The images were then imported into FrameMaker for placement of identification marks and other annotations for each source chart, and for the creation of each page of charts presented in the figures. The scale for all charts is approximately 11″ mm$^{-1}$, with a full field of 8′ on a side. Except where noted in the figure captions, all images used for the finding charts were reproduced from the Quick-V collection of plates. For some of the faintest sources, deeper blue sensitive images were extracted.

## 4. DISCUSSION

We discuss some of the more interesting objects found during the course of this portion of the survey analysis.

In order to avoid introducing any bias in the scanning of the plates, no attempt was made to identify known white dwarfs or other peculiar UV-bright sources prior to the examination of the plates. Only after accurate positions and magnitude and color estimates were completed for all sources were correlations confirmed using information returned from SIMBAD.

A search of previously identified white dwarfs was made for the five plates scanned. Using the latest version of the McCook & Sion catalog of spectroscopically identified white dwarfs (McCook & Sion 1999) and online updates, six white dwarfs were noted to be coincident with these plates. Of these, only WD 0544+280 was confirmed (see discussion below for Lanning 663). The 14 mag DA white dwarf WD 0512+326 was buried within the contaminating halo of a very bright field star. The DA6 16 mag white dwarf WD 0517+307 was marginally blue at best, with a $U-B$ of 0.0 to $-0.1$, and therefore avoided visual detection. This source is listed as $U-B = -0.59$, suggesting the plate balance was, as is typical, at least 0.5 mag off. No UV image was detected near the 16 mag DA white dwarf WD 0526+271, listed as $U-B = -0.15$. Similarly, the very close-by DA white dwarf WD 0525+271, which is listed as $U-B = -0.8$, was also not detected, although there was a plate flaw in the field. Finally, the 17 mag DA4 white dwarf WD 0533+322 was hidden by an overlapping $B$ image of a brighter field star and could not be seen.

*Lanning 575*.—This UV-bright source is faint but very strong, with an estimated $m_B = 19.2$ and $U-B = -0.6$. We also note that the source exhibits a significant proper motion. The source was notably displaced between the POSS red image extracted (epoch 1953.8) and the GASP Quick-V image (1983.8). We have measured both positions, determining a rate of motion of ~0″.264 yr$^{-1}$. The J2000.0 positions determined for both images are: POSS red: R.A. = $02^h10^m22^s.9$, decl. = +65°00′33″.6; GASP Quick-V: R.A. = $02^h10^m23^s.8$, decl. = +65°00′28″.1.

The proper motions tabulated in the USNO-B catalog confirm this source exhibits significant motion with $\mu_{\rm R.A.} = 188$ mas yr$^{-1}$ and $\mu_{\rm decl.} = -90$ mas yr$^{-1}$. The very blue nature of this source, along with the high proper motion, strongly suggest it is a white dwarf.

*Lanning 607*.—A single image was detected that appears, in image character, to be similar to typical planetary nebulae. A search of the SIMBAD database failed to provide any corresponding identification with a previously cataloged planetary nebula (PN), suggesting this may be a new PN.

*Lanning 608*.—This is another single-image source, similar to Lanning 607. This source, however, was confirmed to be the planetary nebula PN G130.4+03.1.

*Lanning 617*.—A large proper motion value was reported in the USNO-B catalog for the most likely corresponding candidate for this UV-bright source ($U-B = -0.9$). The values may be suspect, however, because of the faintness of the source ($B = 20.0$, near the plate limit). Very large uncertainties are noted in the USNO-B tables. Another field star that was included in the table is consistent with what was observed on the two-color survey plate. Thus, the confidence in the identification is high, and the proper motion is probably significant, but one should use caution in accepting the reported magnitude of the motion.

*Lanning 652*.—The 17 mag UV-bright source Lanning 652, estimated at $U-B = -0.6$, was confirmed to be the previously identified Nova T Aur (Nova Aur 1891). The source ranges in photographic magnitude from 4.2 to 15.2 and exhibits a period of 0.2 days (Downes 1986). The times of observation for the source on this plate were JD 2,440,507.00914 (UV image) and JD 2,440,507.02992 ($B$ image).

*Lanning 659*.—This strong UV-bright source (on the same survey plate as Lanning 652) was identified as the U Gem–type dwarf nova FS Aur. The dwarf nova is noted to have a range in $V$ magnitude from 14.4 to 16.2, with a period of 0.06 days (Downes 1986). The magnitude and color estimates from this work are $m_B = 15.5$ and $U-B = -0.9$. The times of observation for the source on this plate were JD 2,440,507.00914 (UV image) and JD 2,440,507.02992 ($B$ image).

*Lanning 663*.—This source is coincident with the previously identified DA white dwarf WD 0544+280 (Kirkpatrick & McGraw 1989). The source is exceptionally bright in the UV, with an estimate of $m_B = 20.0$ and $U-B = -1.2$. The verification of the source proved difficult, since the details, including a finding chart and positional information, were never published. The Kirkpatrick & McGraw reference only provided a summary of the survey program and some discussion. J. D. Kirkpatrick (2004, private communication) kindly provided a finding chart for the white dwarf. However, even this could not be verified. Ensuing discussion resulted in the discovery that the equinox implied by the CCD transit instrument (CTI) survey name CTI 054438.5 +280224 and reported as 1950 in the McCook & Sion catalog of white dwarfs was not 1950. It was instead 1987.5. Once the position was processed to J2000.0, the discovery finding chart was verified and the white dwarf was confirmed to be identical to the very blue source Lanning 663. The J2000.0 coordinates measured in this survey analysis are listed in Table 1.

J. D. Kirkpatrick also provided a copy of the spectrum of this source, obtained as part of the CTI survey, and has very kindly given his permission to include that spectrum in this work. The spectrum (Fig. 12) clearly exhibits the characteristics of a DA white dwarf with a strong blue continuum and the typical broad hydrogen absorption lines.

*Lanning 666*.—The U Gem–type variable UZ Ser was found to be coincident with the source Lanning 666. UZ Ser is noted to have a range in *V* magnitude from 11.9 to 16.0, with a period of 0.17 days (Downes 1986). The variable was estimated at $m_B = 16.5$ and $U{-}B = -0.3$ on the Sandage two-color plate. The times of observation for the source on this plate were JD 2,440,412.79201 (UV image) and JD 2,440,412.76667 (*B* image). The values of proper motion included in Table 1 suggest substantial motion for this source, with $\mu_{\rm R.A.} = 88$ mas yr$^{-1}$ and $\mu_{\rm decl.} = -46$ mas yr$^{-1}$. However, there also appears to be some confusion of sources in the USNO-B catalog, perhaps due to the different epochs of plates scanned. McCook & Sion (1999) list the proper motion of this source as ~253 mas yr$^{-1}$.

Several sources were found to be in regions containing a *ROSAT* X-ray source, when cross-referencing sources in SIMBAD. These are noted in Table 1. The 11 mag source Lanning 614 was found to be at the same position as that of 1RXS J051330.0+321353. The X-ray source 1RXS J052406.7 +293742 is located within about 20″ of the very strong source Lanning 627 ($U{-}B = -0.9$). Finally, Lanning 606, another very strong UV-bright source, with $m_B = 19.0$ and $U{-}B = -0.9$, was noted to be 1′.5 south of the X-ray source 1RXS J014206.4+592508. While the source Lanning 614 is virtually certain to be the optical counterpart, the remaining sources may be, but are not certain. Voges et al. (1999) stated that 90% of the *ROSAT* Bright Source Catalog sources were found within 25″ of the optical position when correlations were made using positions for Tycho catalog stars. The Tycho limiting magnitude is in the range of $B = 10.0$ to 11.0. Most of the sources noted here are much fainter, suggesting the positional accuracy could be sufficiently reduced as to allow the nearby *ROSAT* candidates to remain potential optical identifications with the UV-bright sources discussed above.

*Correction for LAN 213*.—Brian Skiff (2003, private communication) reported that the identification for Lanning 213 was likely incorrect on the published finding chart in Lanning & Meakes (1998). We have confirmed the object was indeed incorrectly marked. Additionally, the J2000.0 positions provided in the table were measured for the wrong star. The correct UV-bright source is the brighter star 20″ to the north. The correct J2000.0 positions and star identification have been updated on the Web site devoted to this survey. The correct J2000.0 coordinates are R.A. = $01^{\rm h}05^{\rm m}30^{\rm s}.8$, decl. = $+59°10'34''.9$.

Information related to this survey, including published papers, finding charts, updated tables, etc., can be viewed on the survey Web site.[1]

We would like to thank Dr. Allan Sandage for the opportunity to pursue the examination of his two-color survey. We extend a special thanks to Dr. J. Davy Kirkpatrick for kindly providing a finding chart to verify the source Lanning 663 as the previously identified white dwarf WD 0544+280, resolving the published positional errors, and for allowing us to present his unpublished spectrum of the white dwarf in this work. We would also like to thank Brian Skiff for his diligence in pointing out the misidentification of the source Lanning 213. The assistance of Stephen Levine of the US-NOFS in batch processing the UV-bright source list to obtain proper motion data from the USNO-B catalog is most appreciated. Finding charts were obtained using the Guide Star Astrometric Support Program developed at the Space Telescope Science Institute. The original photographic survey was supported in part by NASA under grant NGR 09-140-009. This research project was supported by funding from the STScI, which is operated by the Association of Universities for Research in Astronomy, Inc., under NASA contract NAS 5-26555 and by NASA ADP contract PO S-92513-Z. This research has made use of the USNOFS Image and Catalogue Archive, operated by the United States Naval Observatory, Flagstaff Station.[2] We have also made use of the SIMBAD database, operated at CDS, Strasbourg, France, for the literature search and collection of source identification information.

[1] See http://www.stsci.edu/~lanning/index.html.

[2] See http://www.nofs.navy.mil/data/fchpix.

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