

THE ATLAS AND CATALOGUE OF INTERACTING GALAXIES

B.A. Vorontsov-Velyaminov

(Moscow 1959)



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[as translated by N.A. Sharp]

PART 1: 355 SYSTEMS

The Catalogue includes galaxies which are interacting in our sense of the word, or suspected of being so. For this definition and the preliminary results of the study, see Astronomical Circular No. 192, 1958 and Sov. Astron. J., 35, 858, 1958. The overwhelming majority of the systems were found by the author on the Palomar Observatory Sky Survey (POSS). Some systems were known earlier, but it was not always noted how they are interacting. With some noted exceptions the pictures presented are 17x enlargements from the POSS, reproduced with the kind permission of the Palomar Observatory. The scale is 4 arcsec/mm. Cases having different scales are indicated. Reproduced also, usually as an extra, are pictures from other sources; in particular are photographs obtained by G.A. Manova and M.V. Savel'yeva at the Crimean Station of the Sternberg State Astronomical Institute (GAISh) using the meniscus telescope ($D = 50 \text{ cm}$, $F = 200 \text{ cm}$).

The numbers on the photographs correspond to the Catalogue numbers, arranged in the same order in the tables and in the pictures. For the tabulation we tried to select those systems which exhibit the same type of interaction. North is indicated by a long arrow. East is to the left; but it was not always possible to arrange for North to be up. Some suspected systems may turn out to be solitary galaxies, mainly peculiar or chaotic types. More often they may be found under the heading of merged systems or galaxy nests. The predominant cause of such mistakes is over-exposure images on the copies of the POSS. Statistically the number of these types of errors is compensated for the loss of truly interacting systems not discovered on the POSS for exactly the same reasons. It is also hard to draw a hard line between the existence of outlying condensations or fragments found near S and I galaxies, and truly independent dwarf galaxies.

Coordinates were derived from a superimposed grid, calculated for a gnomonic projection, and marked by all members of our Department. In most cases the coordinate errors do not exceed 2 (two) arcsec.

In determining coordinates and identifying galaxies with NGC names we were helped by F.A. Tsitsin, M.V. Savel'yeva and especially by A.A. Krasnogorskaya who also helped in the preparation of the entire Atlas and Catalogue. A large part of the photographic work for the compilation of the Atlas, and the production of negatives for reproduction was carried out by F.S. Trubinskii. Technical assistance for this work was provided by R.X. Lazarev. The author expresses his profound gratitude to all of them, and to the Director of GAISh, Prof. D.Ya. Martinov, and the head of the GAISh Photolaboratory O.D. Dokuchayev, for their cooperation in the publication of the Atlas and Catalogue.

In the printed version of the Catalogue (not reproduced here within LEVEL5) the columns are as follows:

Column [1] gives the running number for the object.

Column [2] gives the number of the Palomar Sky Survey (POSS) field containing the given object.

The first line refers to the object as a whole. The components of the object are identified by letters marked next to them on the photographs, and against the letters are the corresponding NGC or IC (with asterisk) numbers, or our temporary number on the given POSS from the Morphological Catalogue of Galaxies (MCG) being prepared by us (which will be complete approximately to 16 mag).

Column [3] gives the co-ordinates for the epoch 1950.0.

Column [4] contains the photographic magnitude:

Either our rough estimate, or the estimate of Holmberg [Ann. Obs. Lund, No. 6, 1937] given with a decimal place. If the Holmberg estimate did not exist, the estimate of [Shapley, H., and Ames, A., Harv. Ann., 88, No .2, 1932] is given in brackets (). The estimate from Zwicky [Erg. d. Exact. Naturwiss., 29, 344, 1956] is given in braces [].

The photoelectric measurements of [Humason, M., Mayall, H., and Sandage, A.R., A.J., 61, 97, 1956] are given between slash marks / /, and they are to be preferred.

Column [5] gives the dimensions of the inner bright part or core in units of 0.1 minutes of arc.

Column [6] gives the outer dimensions in units of 0.1 minutes of arc.

Column [7] contains the separation from component `a', or from the preceding component, if that number is in brackets.

Column [8] indicates the degree of isolation of the system on the scale:

- 1 - completely isolated
- 2 - fairly isolated
- 3 - in a sparse field of galaxies
- 4 - in a rich field of galaxies
- 5 - in a small compact group
- 6 - in a rich cluster

Column [9] gives the estimated type of the components where the symbol R is introduced for a ring galaxy. Here too we give the length of any tail (noted by **.). For the whole system we indicate a

descriptive type for the interaction by a combination of letters and symbols:

- spirals appear as S
- ellipticals and SO galaxies as E
- irregulars are given as I
- unclear types appear as G

Between letters a dash (-) indicates a connecting filament:

- (double dash) -- long filament
- (single dash) - short filament
- (equals sign) = double filament
- (arrow) -> filament appearing as a spiral arm
- (double-single) -- incomplete filament

A dash (-) after a letter indicates a tail.

A plus (+) shows contact between galaxies

A comma (,) indicates no contact.

A semicolon (;) indicates a distortion of form.

Often, especially in nests, one observes different forms of interaction simultaneously, but they are not all indicated.

Symbols in brackets () stand for cases of a common haze,

A dash (-) stands for a common atmosphere of stars.

GG, etc., indicates merged galaxies,

GGG indicates a ``nest", independently of whether or not there is fusion or contact of the galaxies.

G,G,G describes chains of galaxies

G-G-G indicates a chain, with spanning filaments.

Comprehending this descriptive classification is aided by consulting the photographs.

The Footnotes to the Catalogue give the spectral type, and the redshift in km/sec from [Humason, M., Mayall, H., and Sandage, A.R., A.J., 61, 97, 1956]; with or instead of them, the redshift from [Page, T., Ap. J, 116, 63, 1952] is given, followed by the spectral lines found in emission.

To correct for Galactic rotation, the speed of the Sun was taken to be 300 km/sec in [Humason, M., Mayall, H., and Sandage, A.R., A.J., 61, 97, 1956] and 250 km/sec in [Page, T., Ap. J., 116, 63, 1952]. In other sources the redshift is probably not corrected.

There are also comparisons with radio sources catalogues:

The Cambridge Catalogue [Ryle, et al., Mem. R. Astr. Soc., 67, 97, 1955], designated 2C, and with the Australian Catalogue [Mills, B., Slee, O., and Hill, E. Australian J. Phys., 2, No. 3 360, 1958], designated Mills, with their codes. Right after these entries we give the coordinate differences in RA and Dec between our objects and the radio sources. A coincidence is extremely rare.

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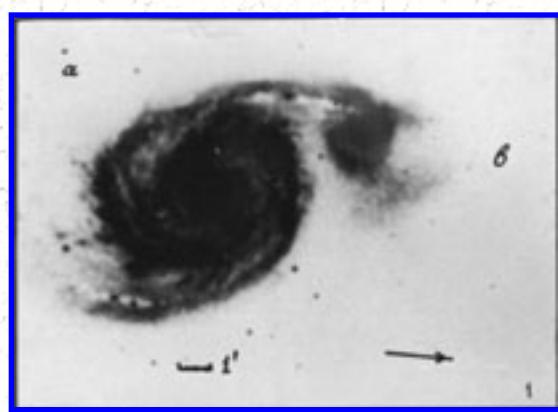
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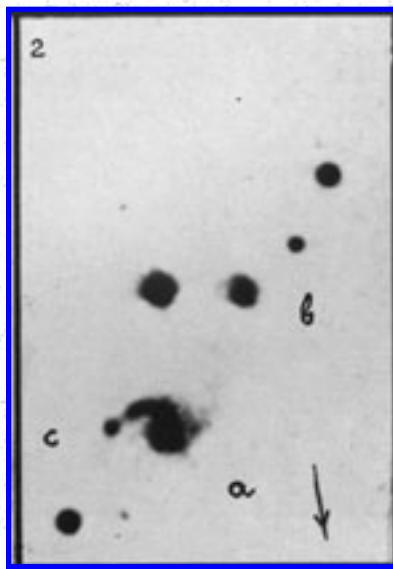
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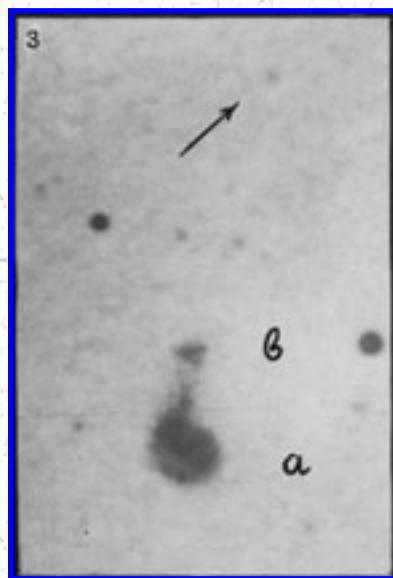
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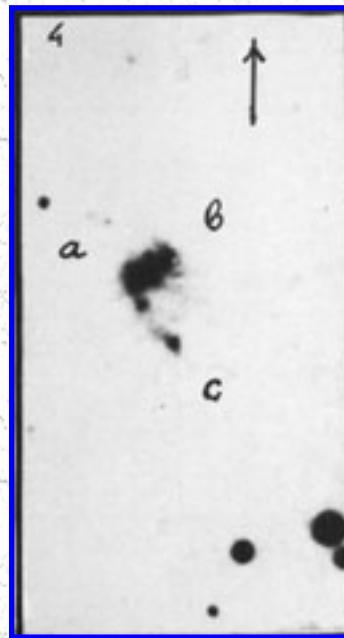
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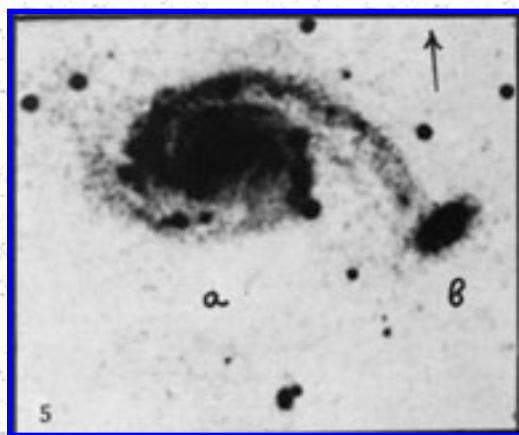
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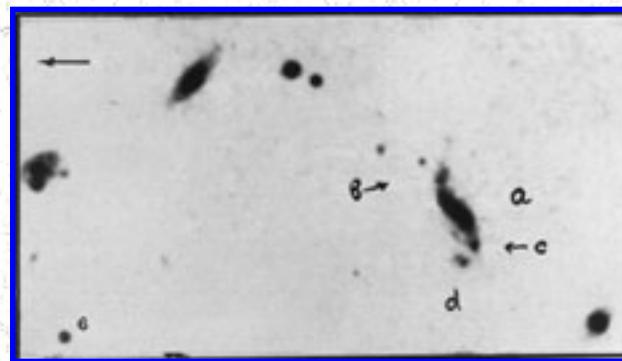
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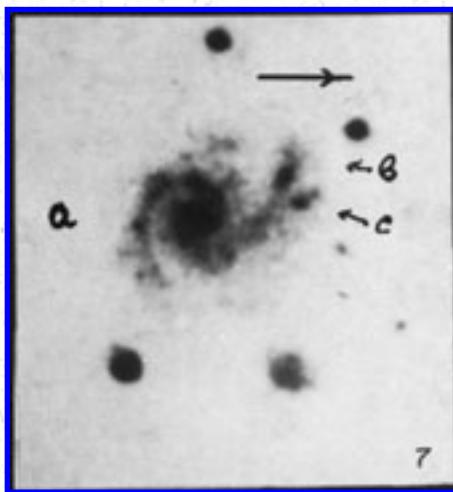
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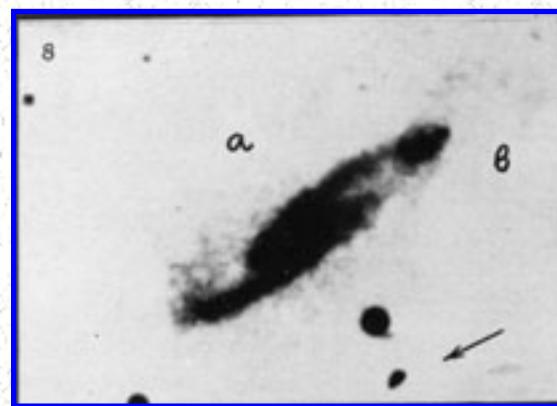
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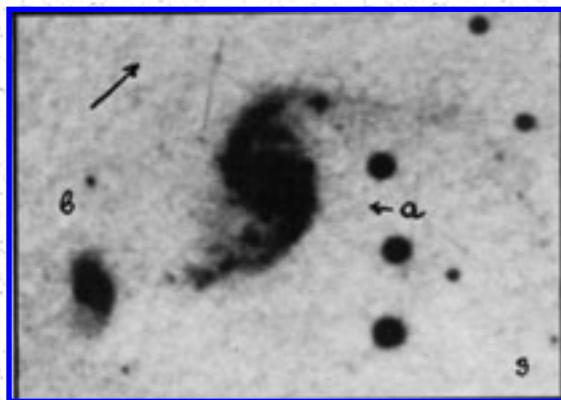
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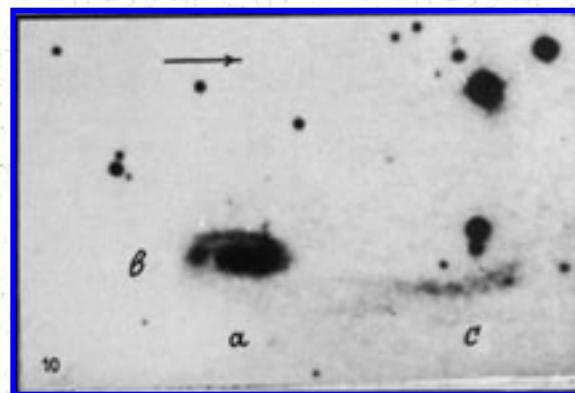
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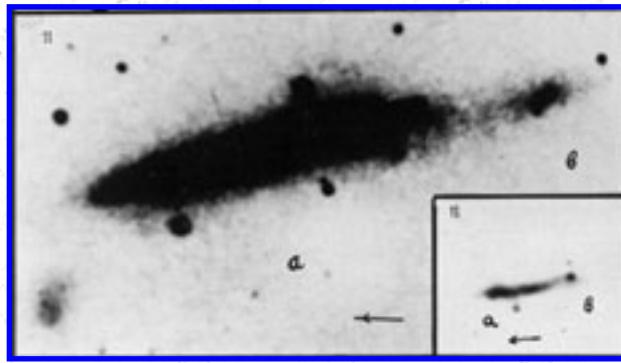
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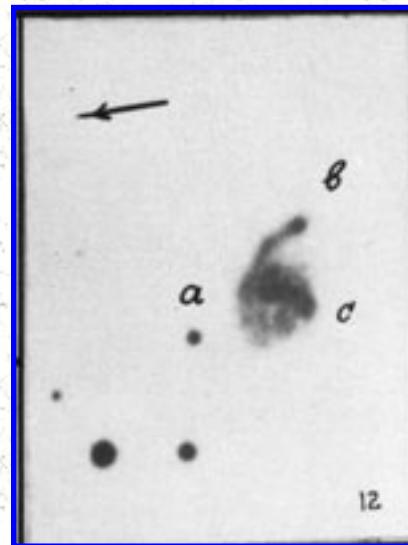
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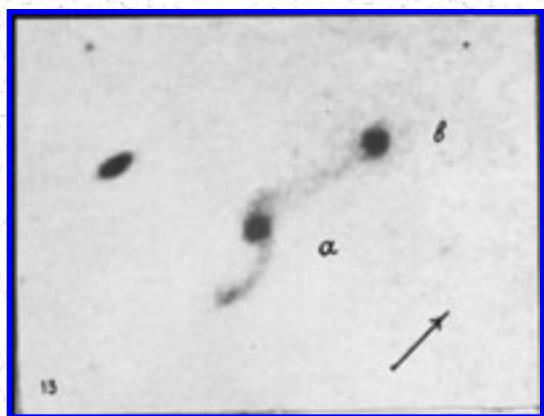
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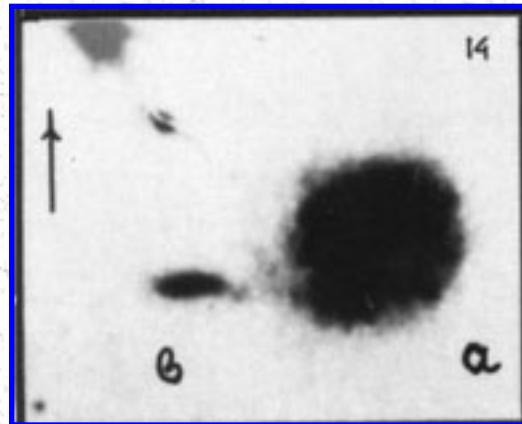
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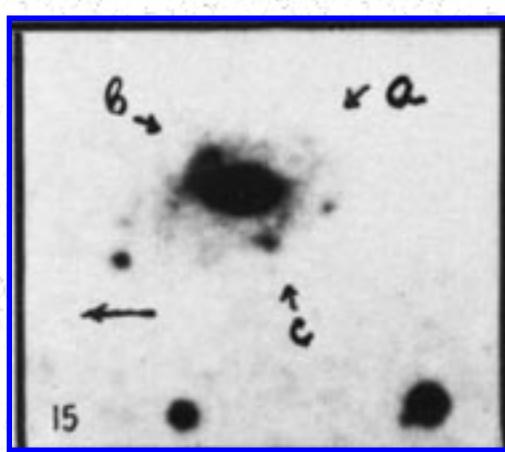
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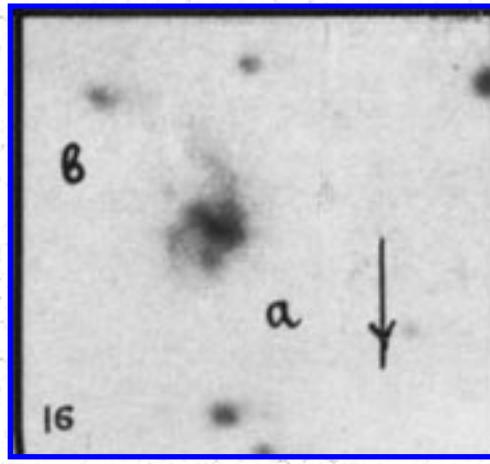
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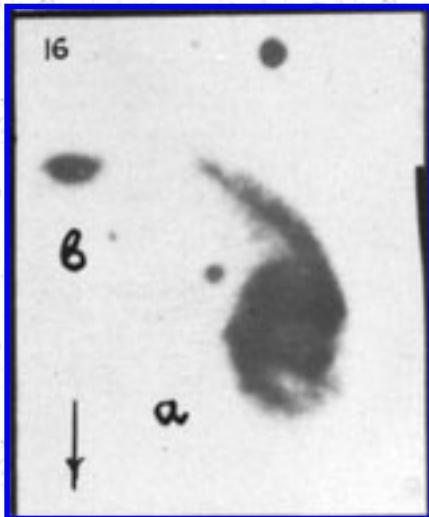
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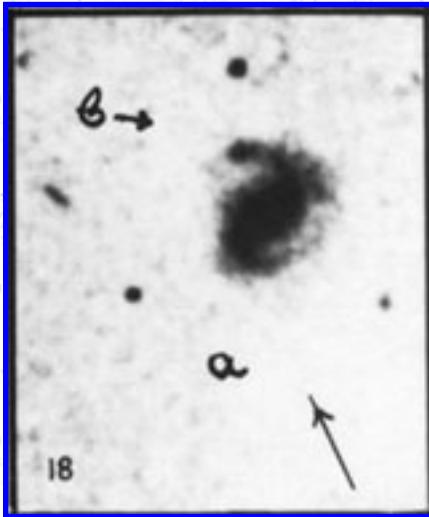
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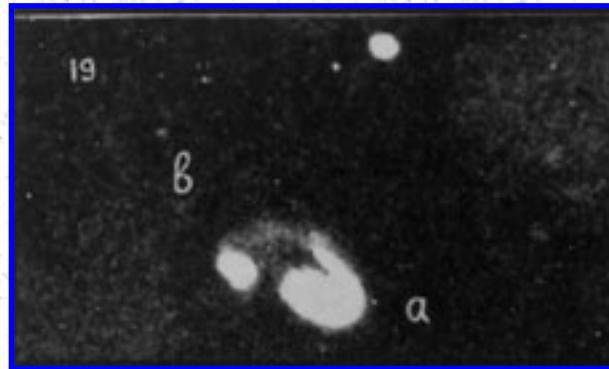
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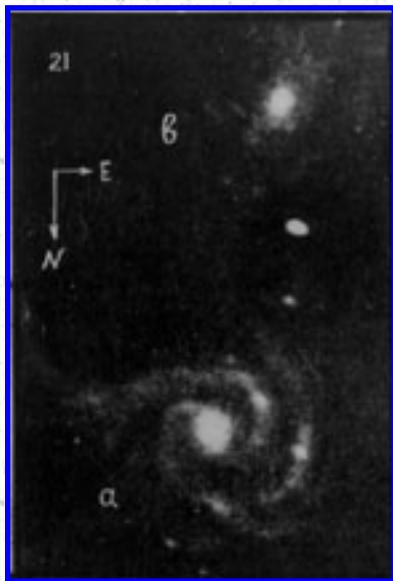
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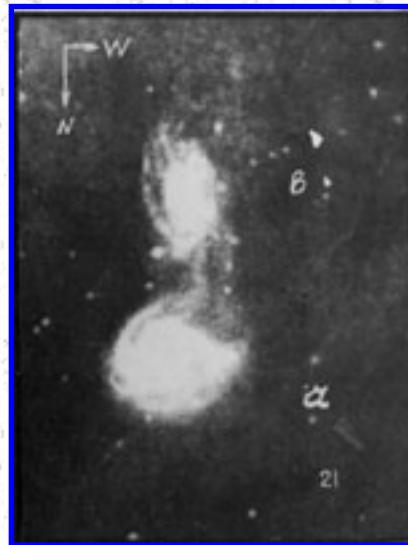
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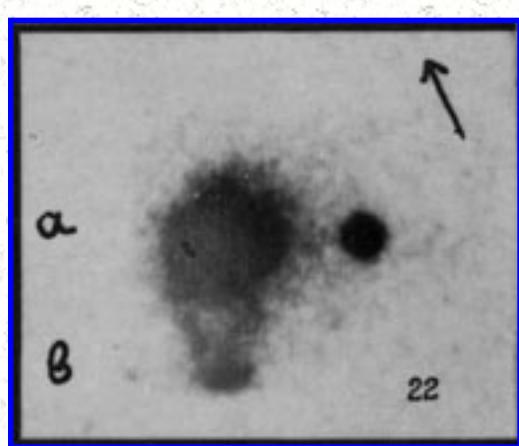
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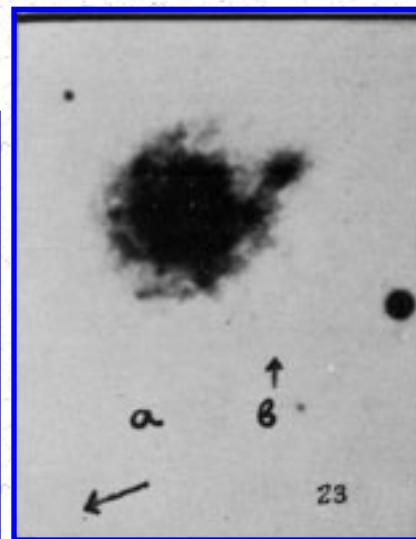
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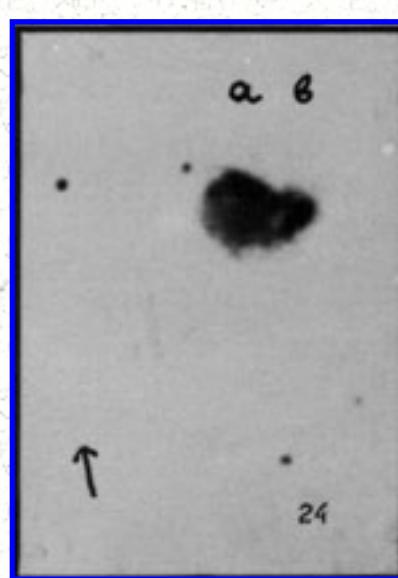
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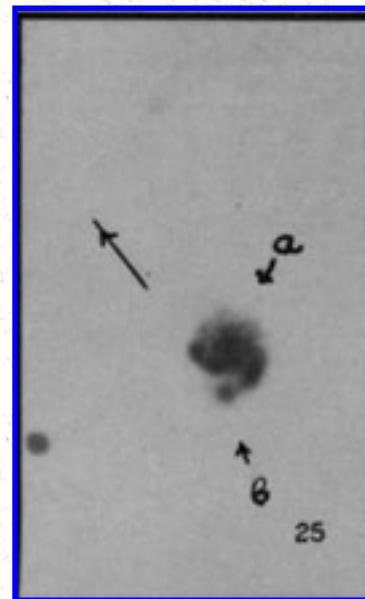
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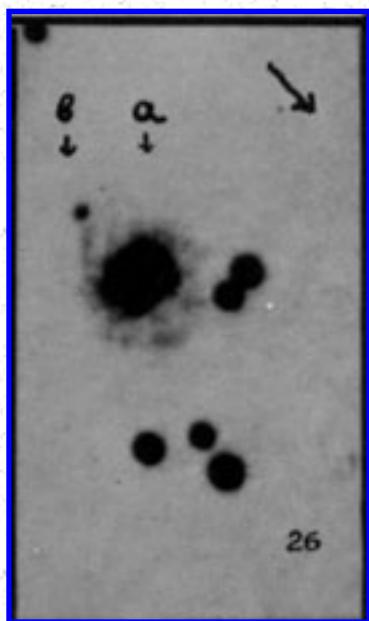
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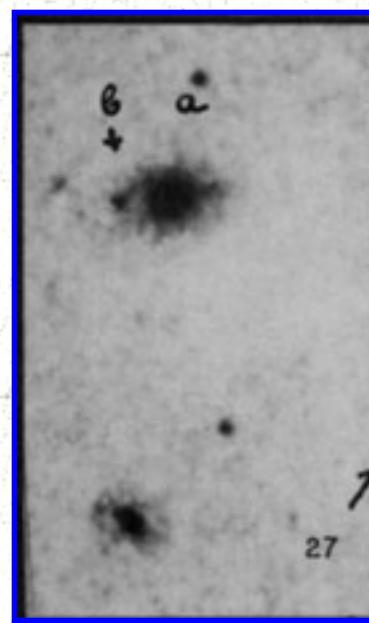
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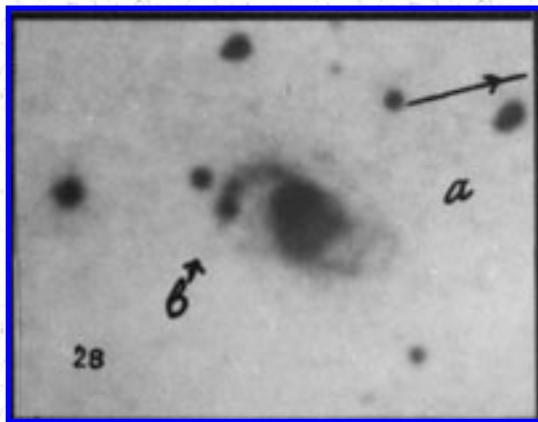
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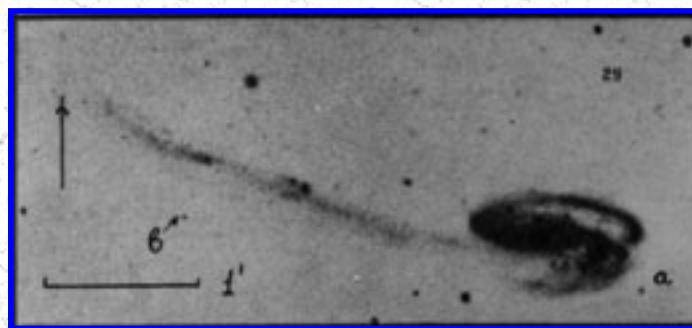
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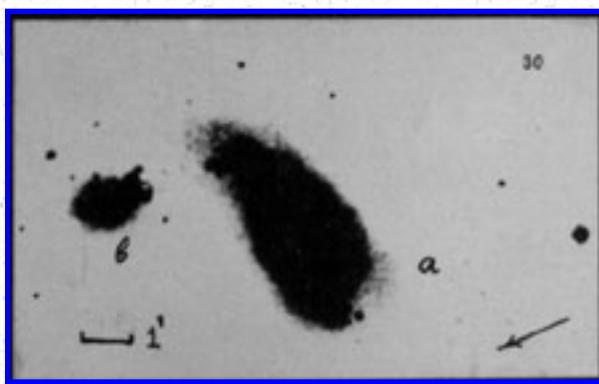
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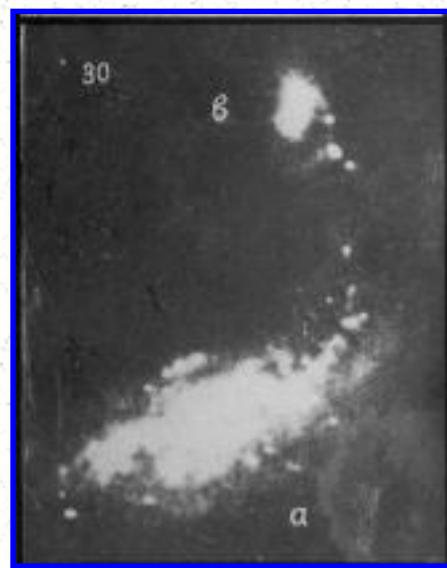
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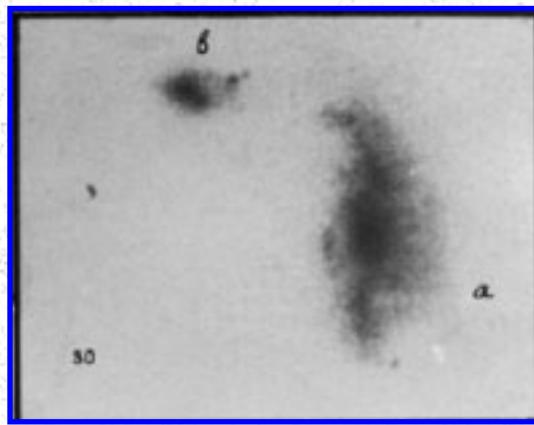
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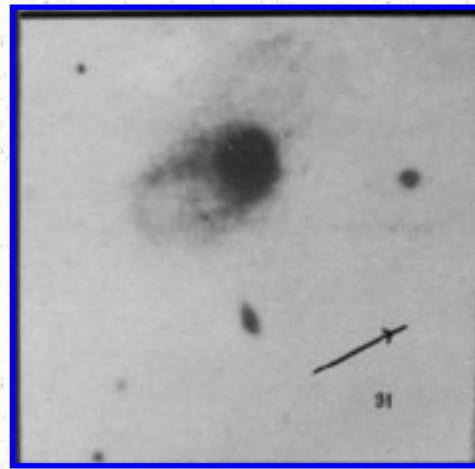
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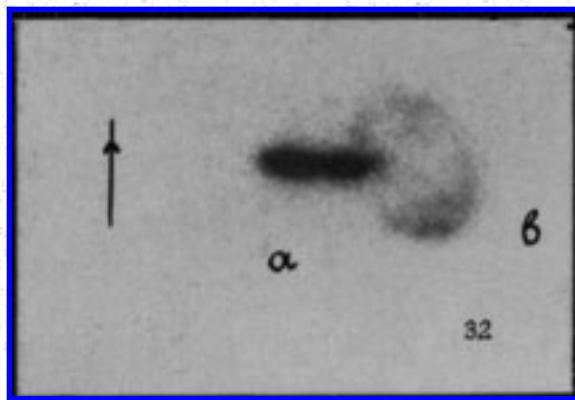
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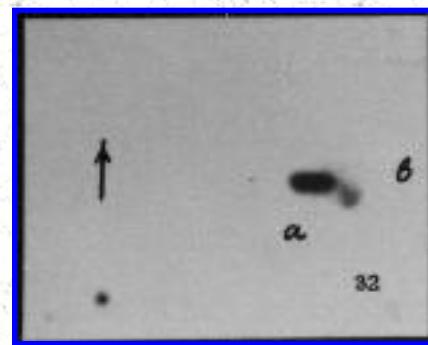
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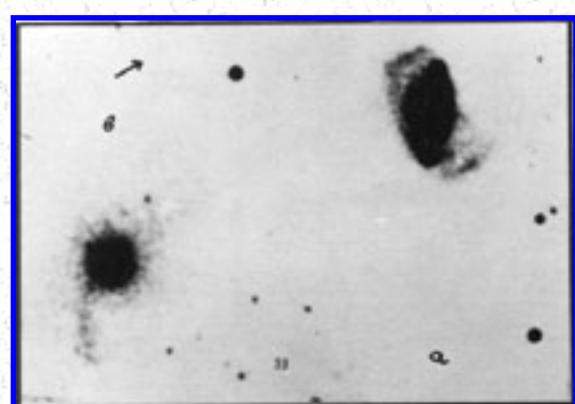
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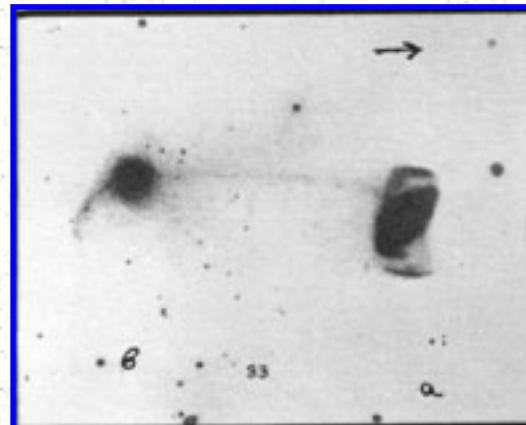
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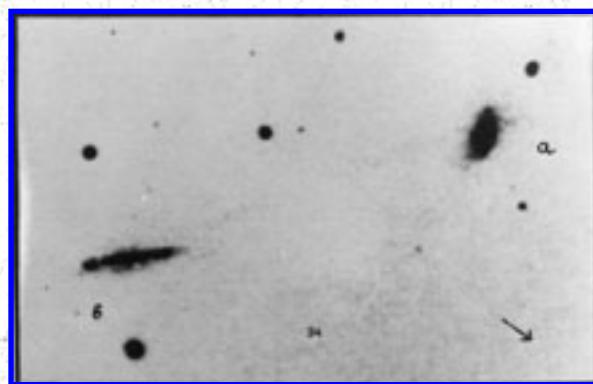
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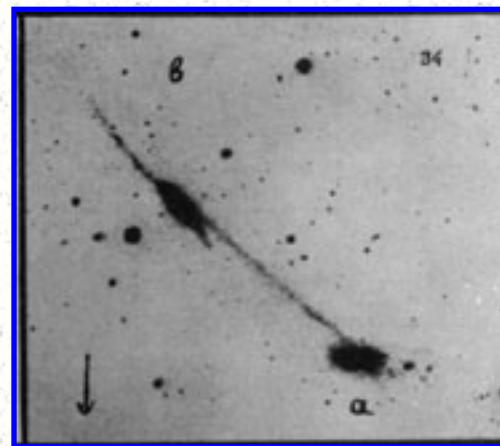
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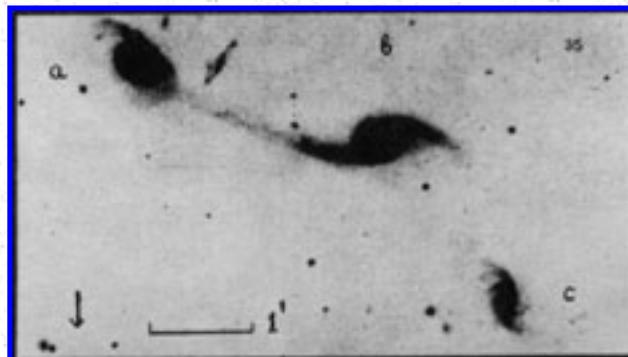
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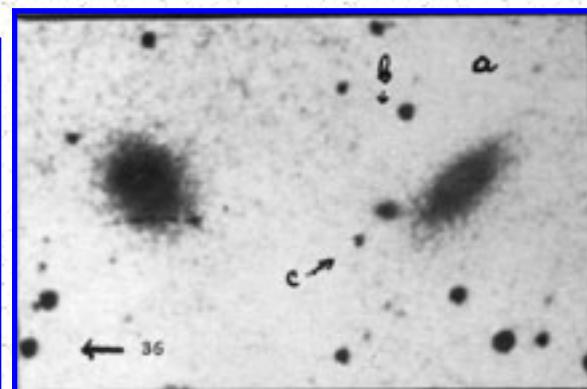
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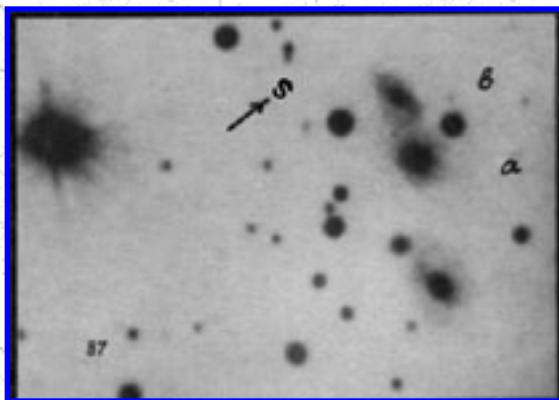
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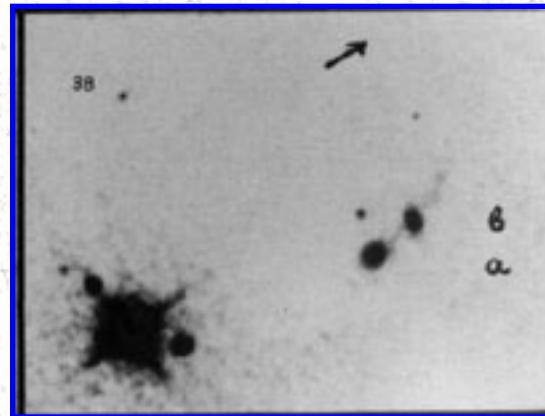
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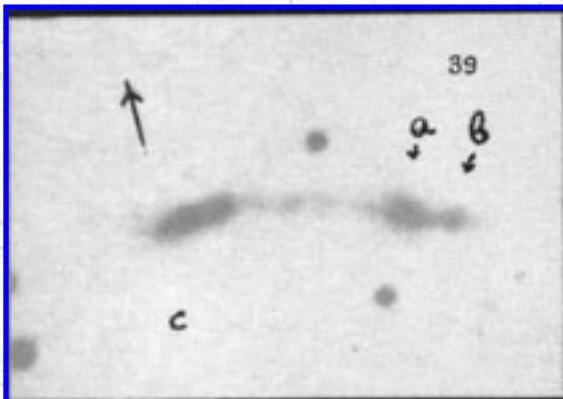
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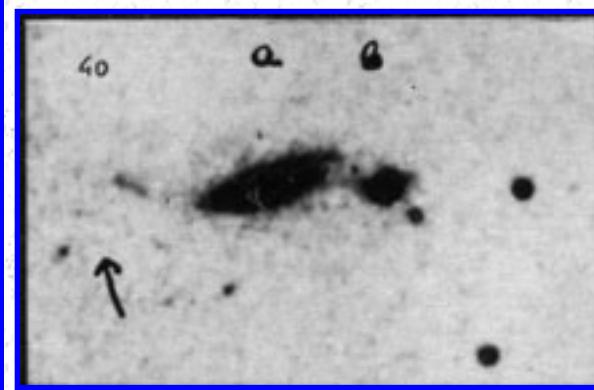
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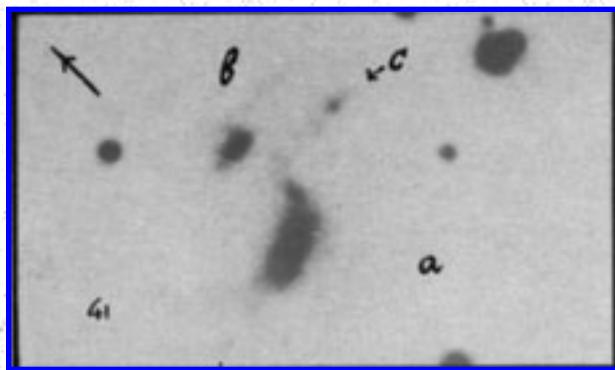
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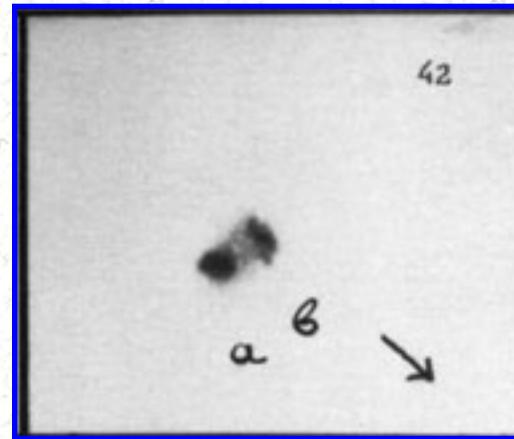
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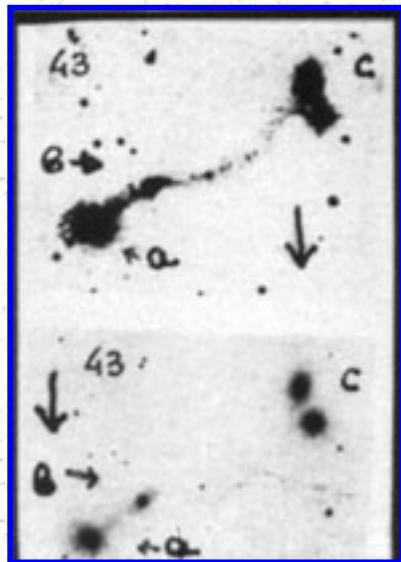
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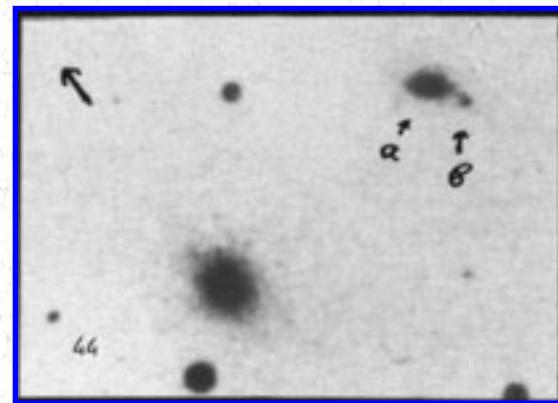
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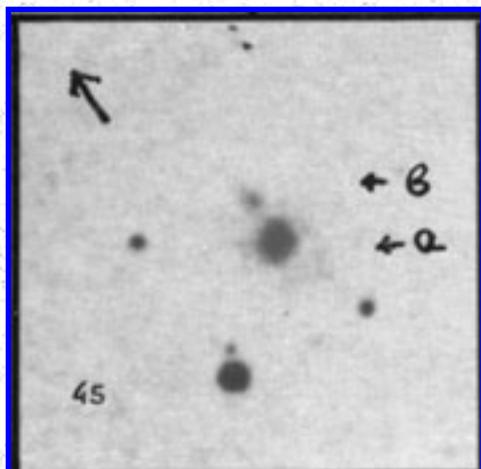
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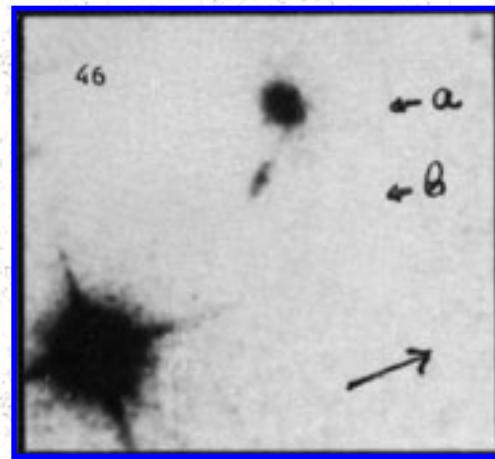
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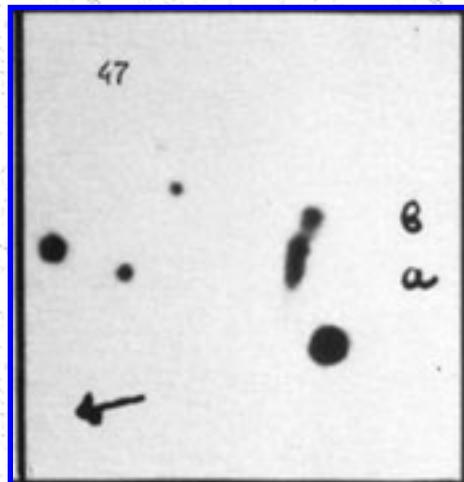
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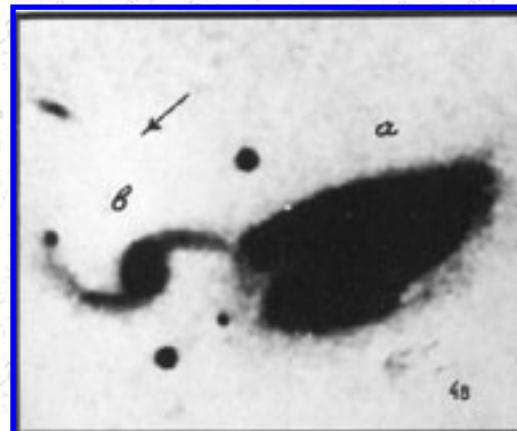
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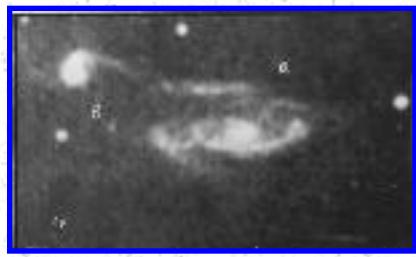
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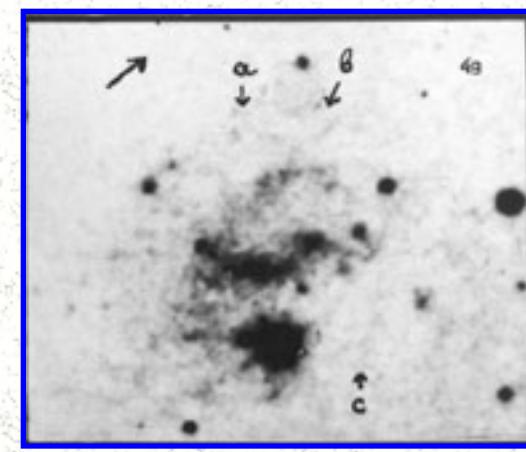
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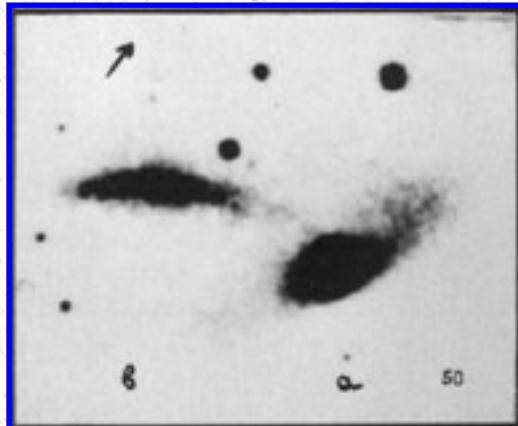
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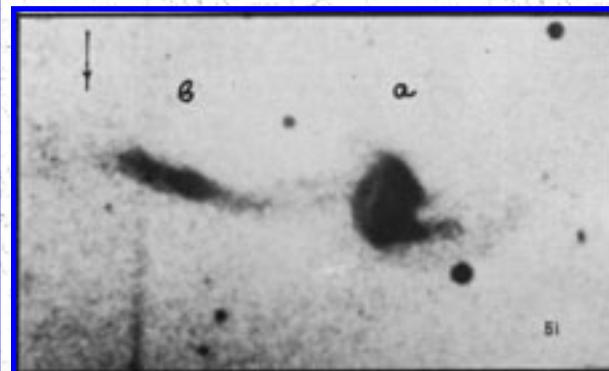
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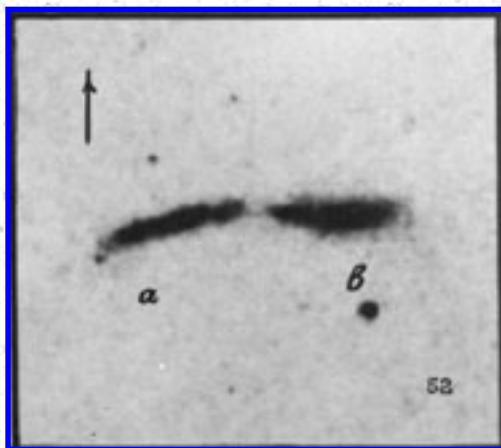
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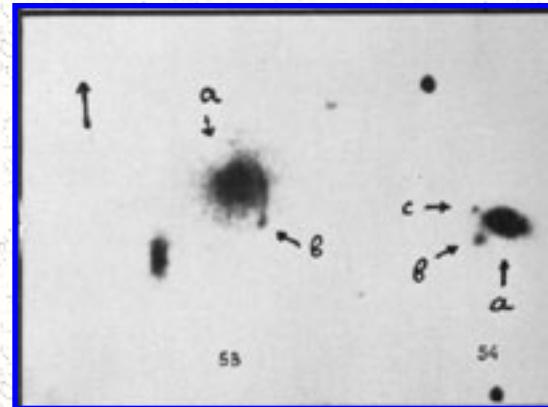
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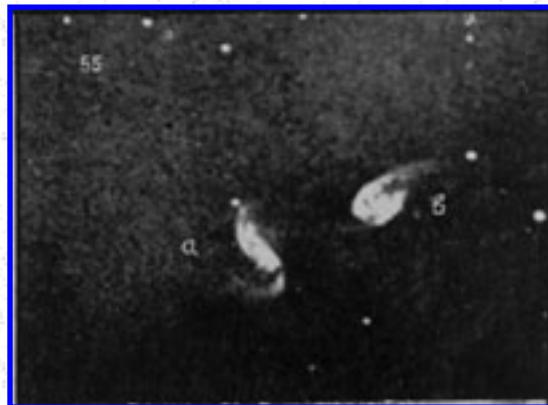
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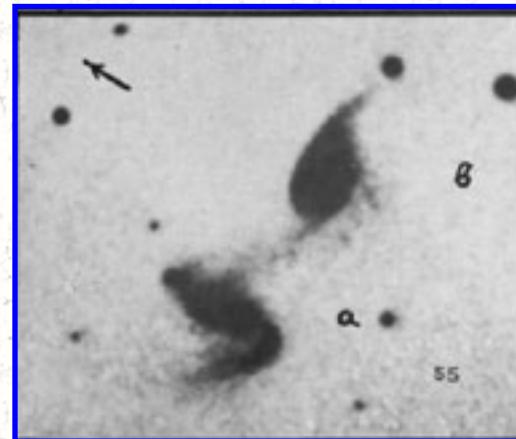
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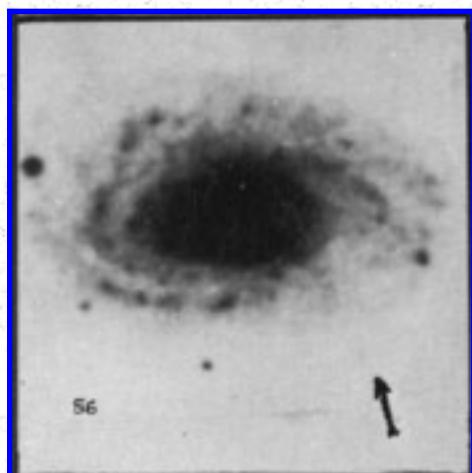
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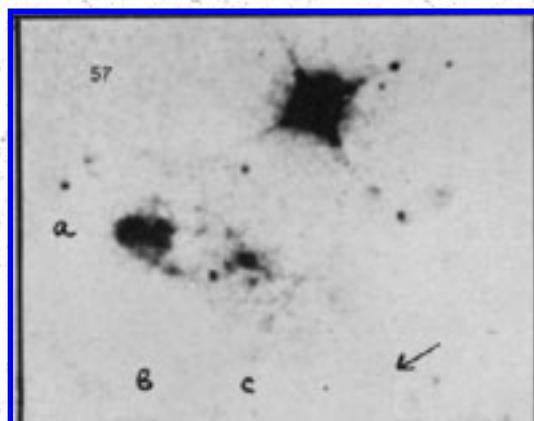
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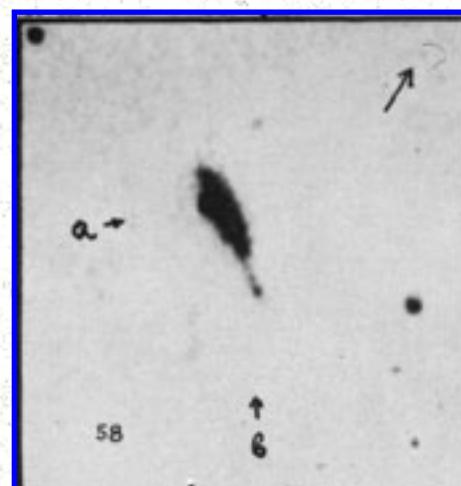
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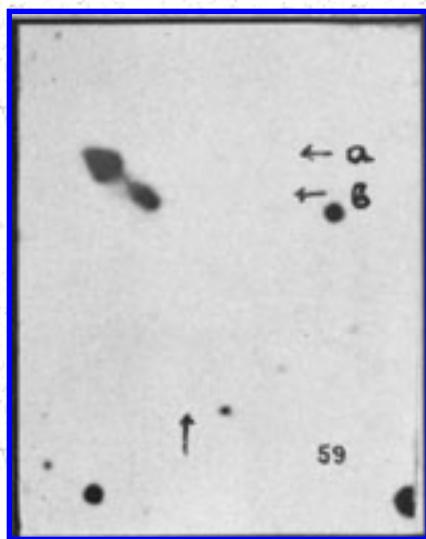
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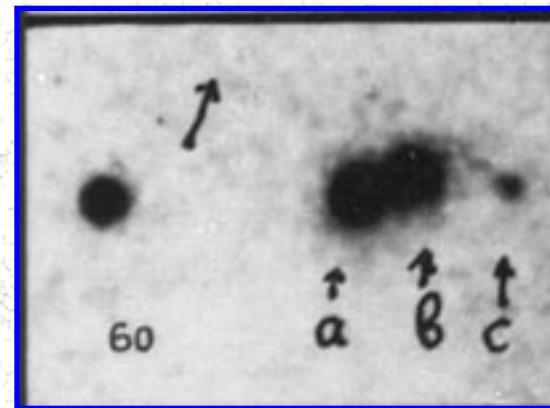
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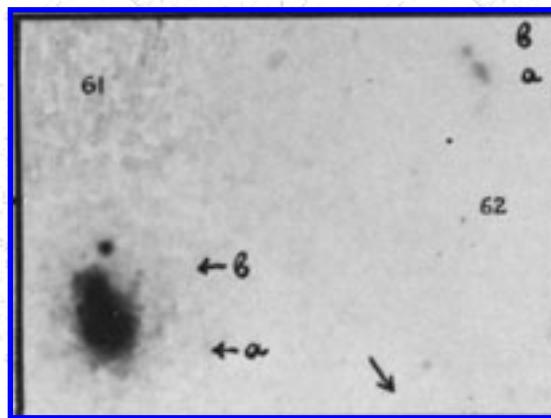
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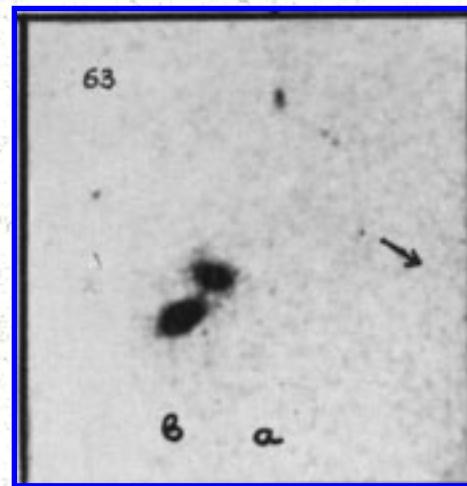
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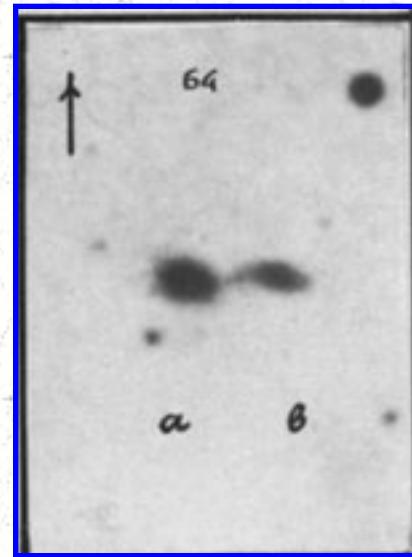
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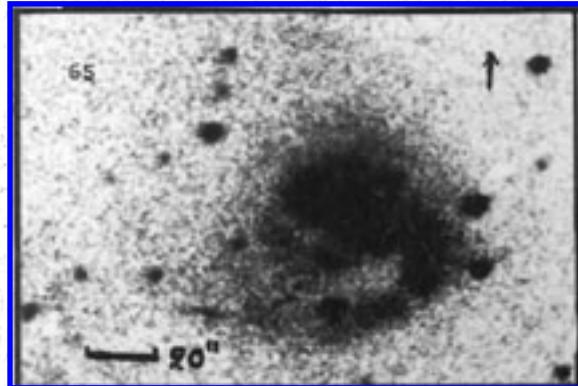
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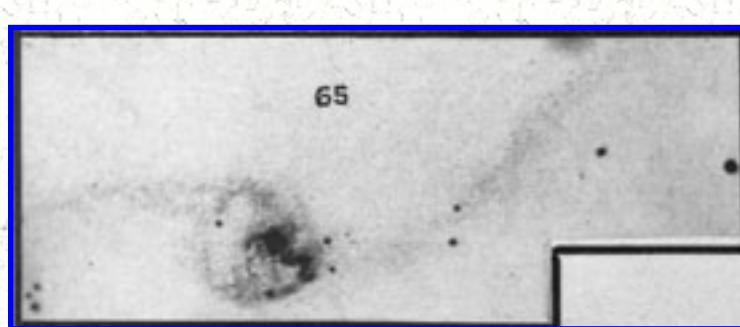
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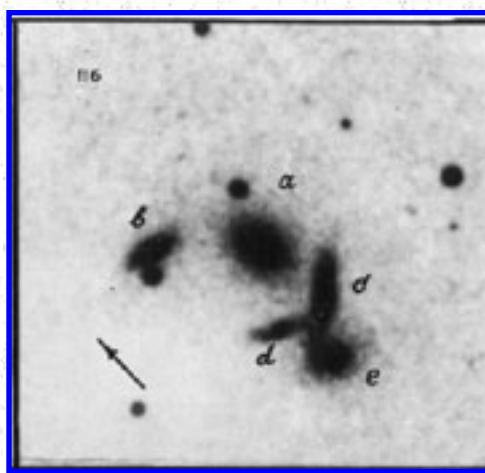
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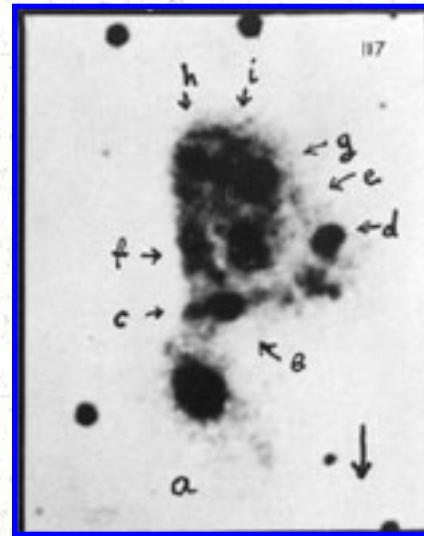
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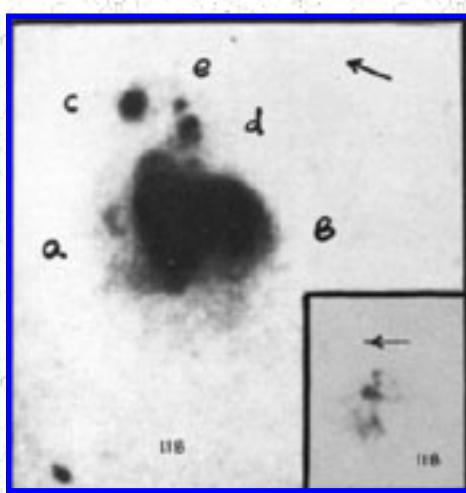
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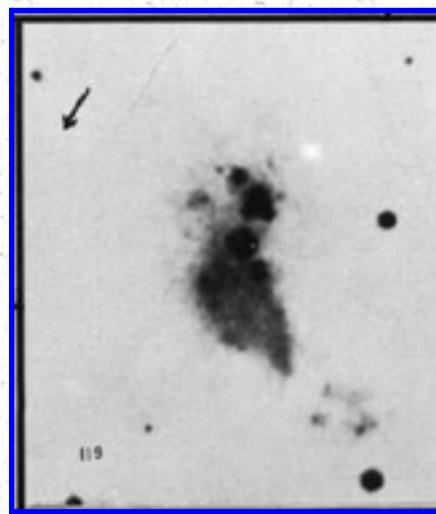
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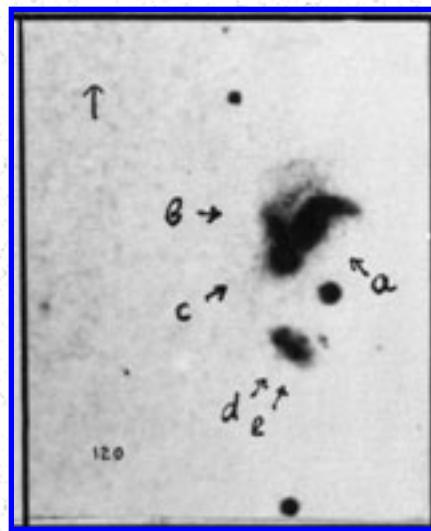
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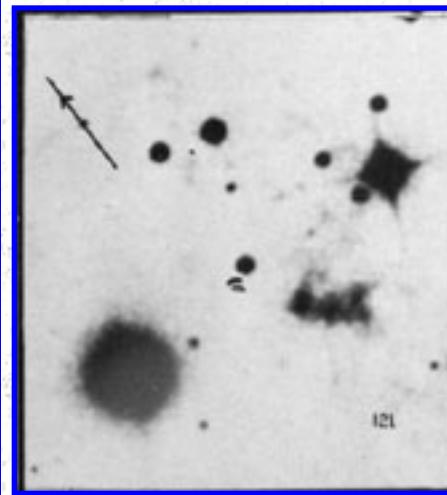
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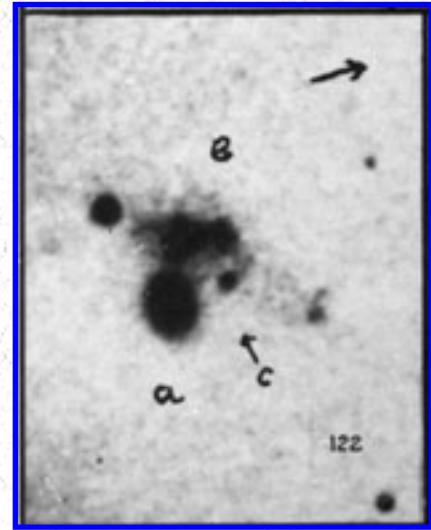
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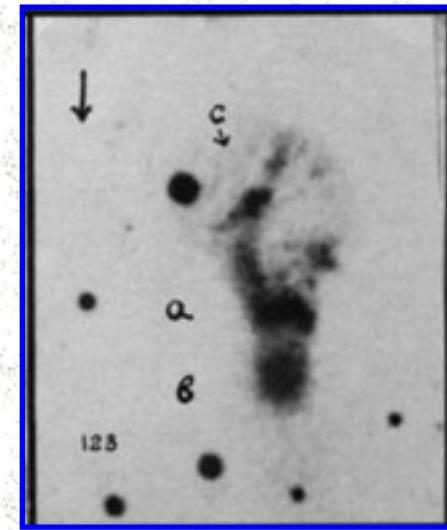
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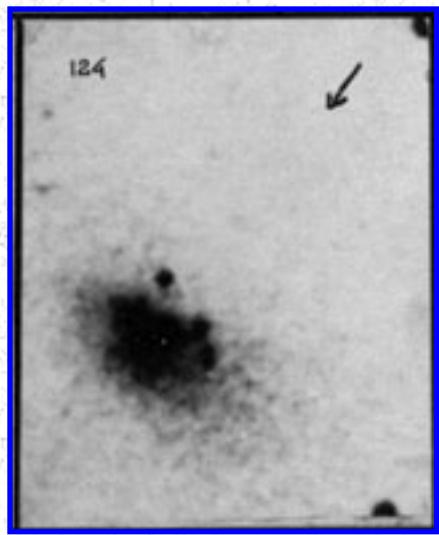
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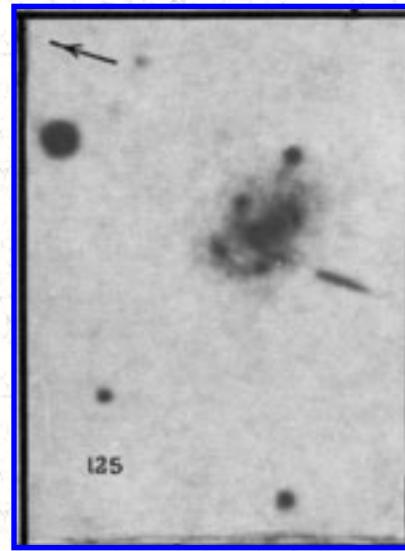
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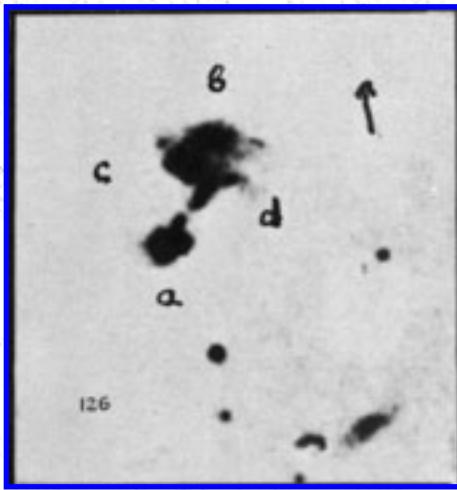
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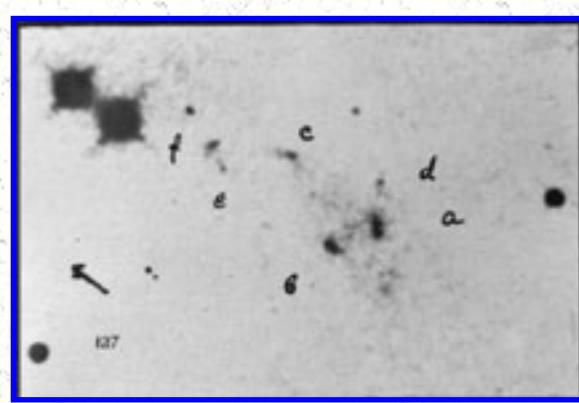
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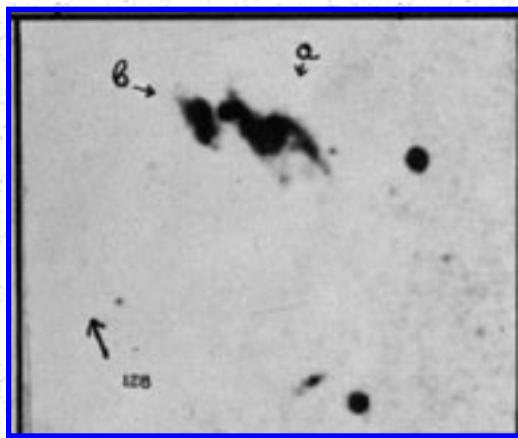
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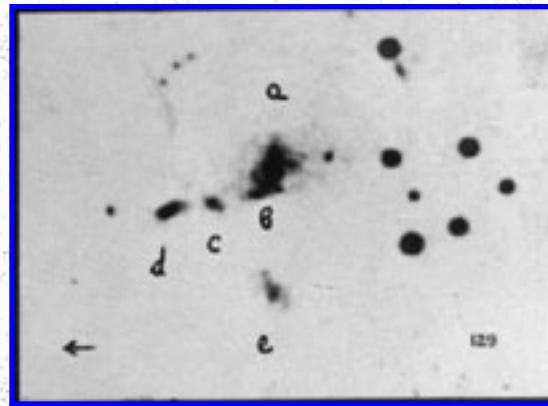
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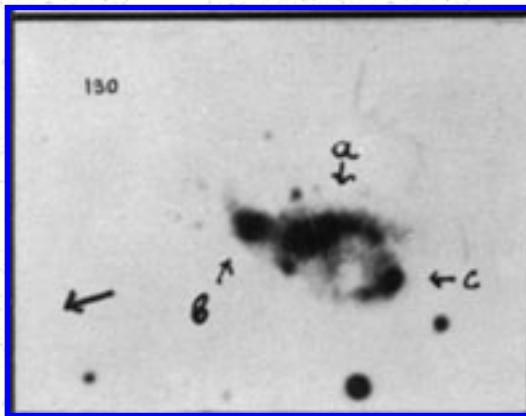
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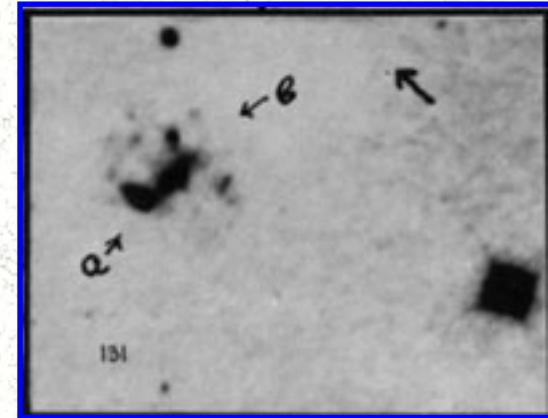
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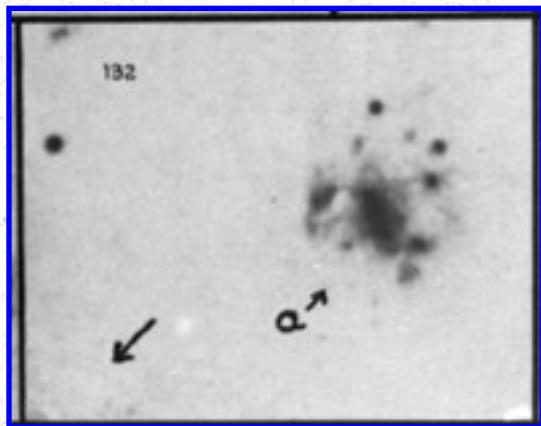
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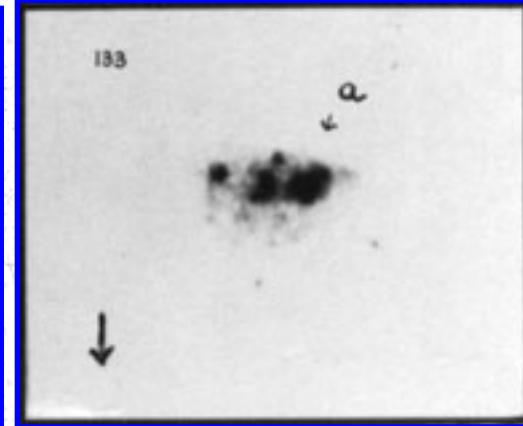
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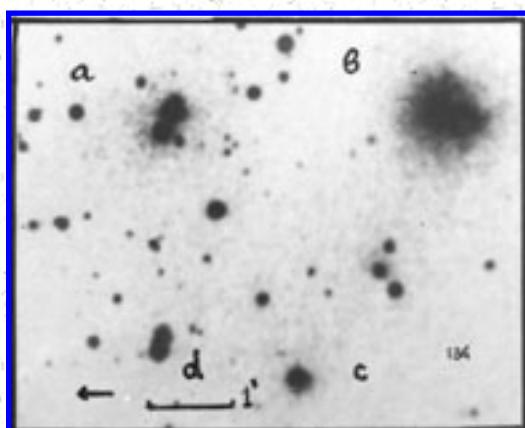
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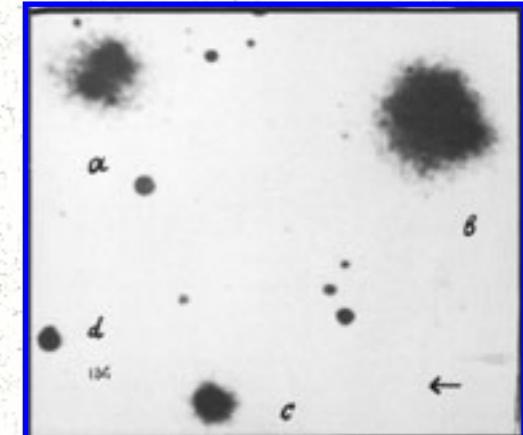
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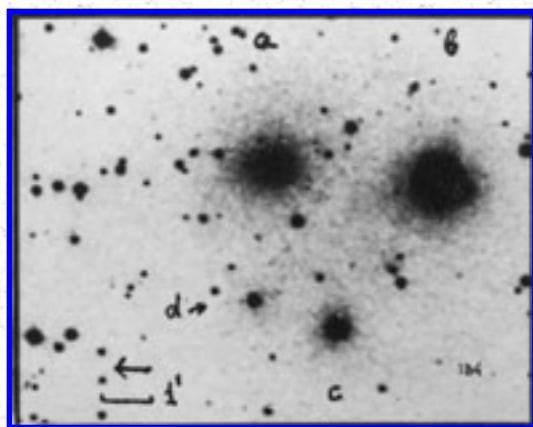
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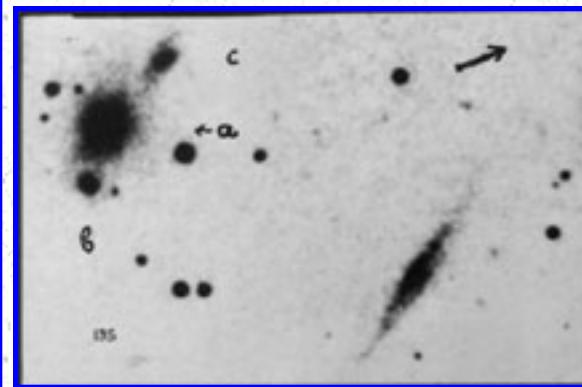
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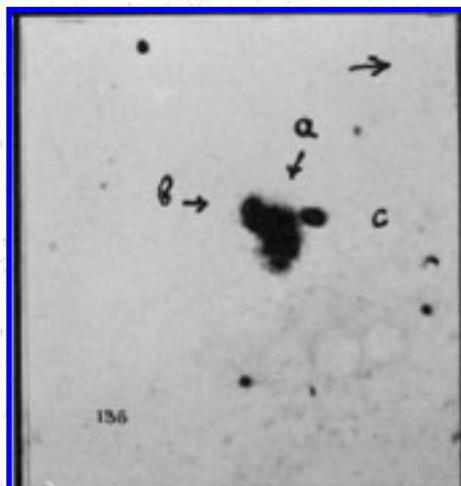
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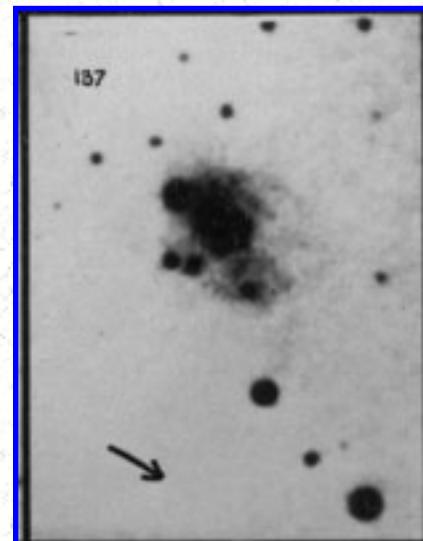
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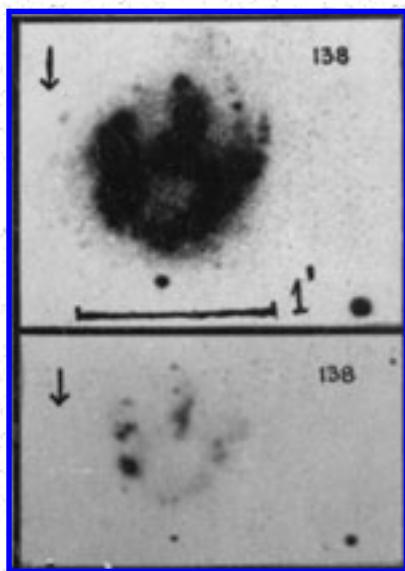
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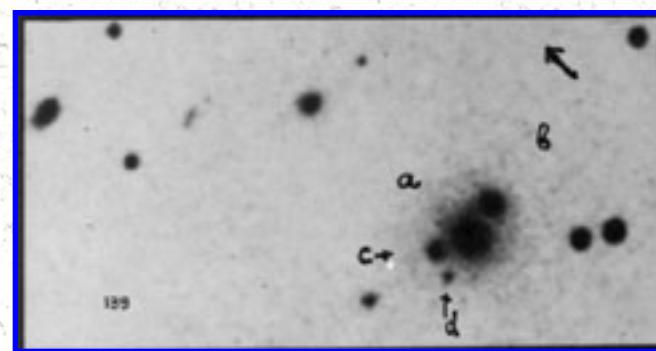
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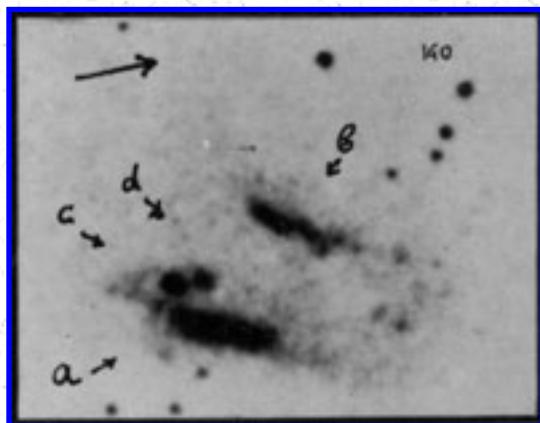
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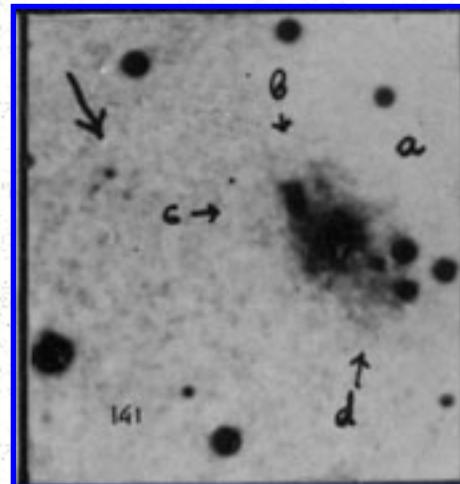
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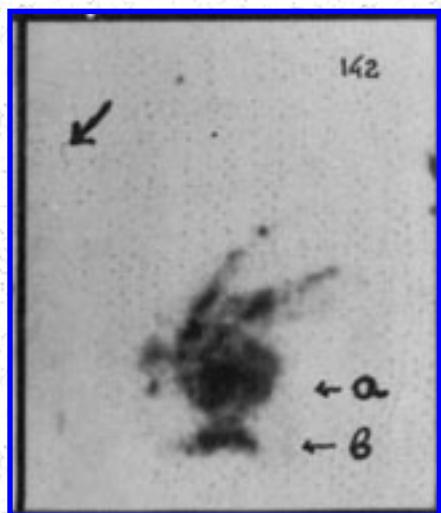
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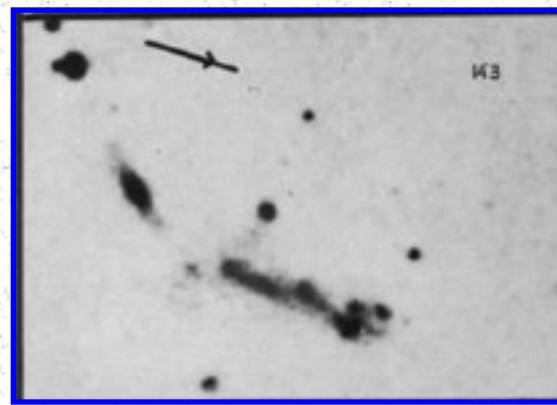
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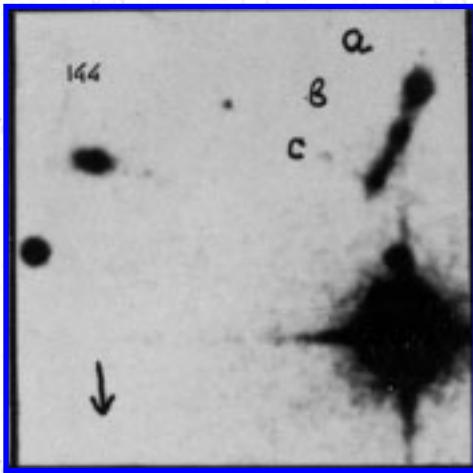
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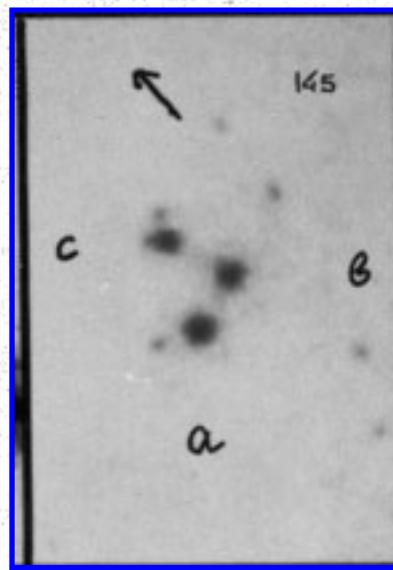
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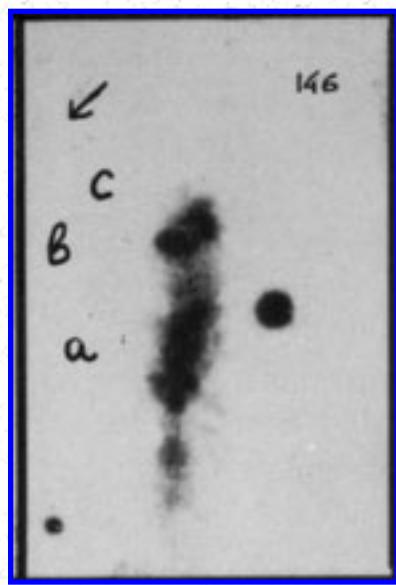
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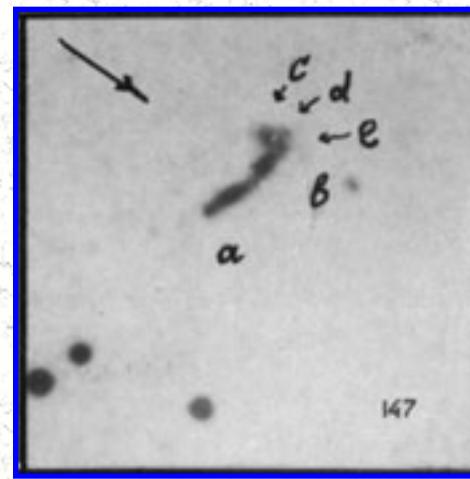
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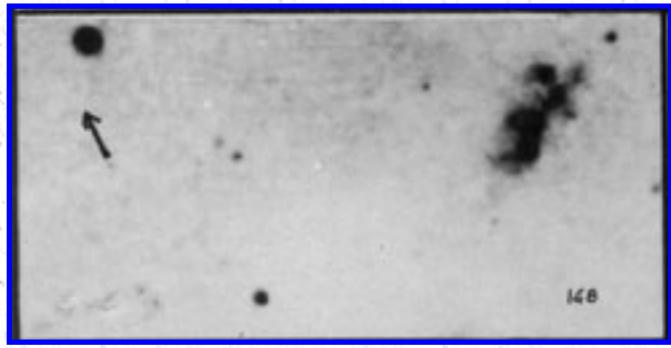
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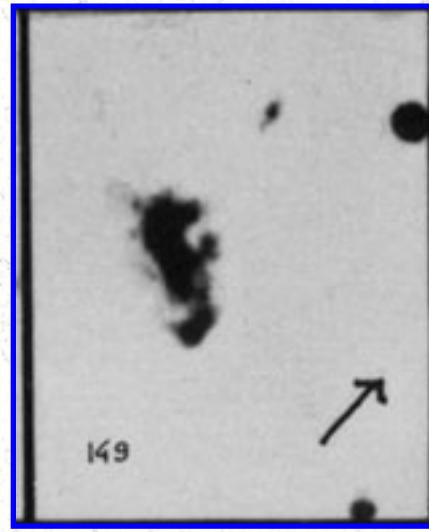
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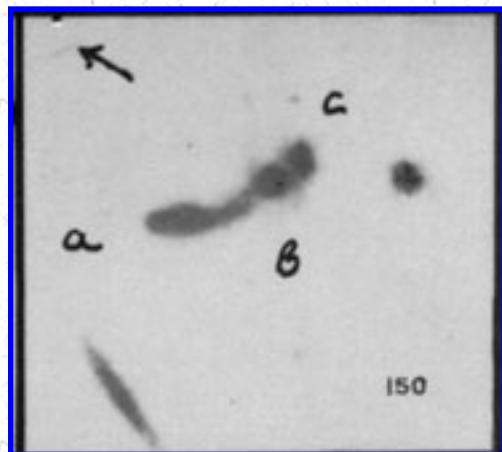
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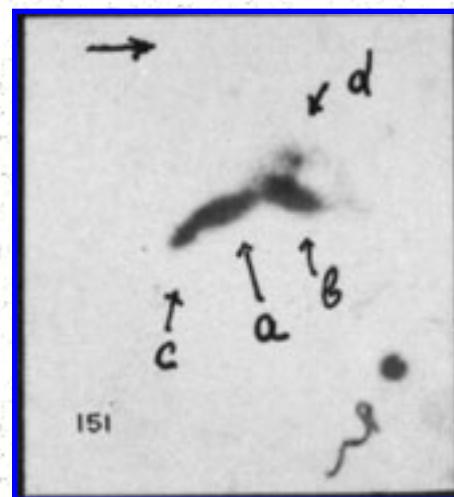
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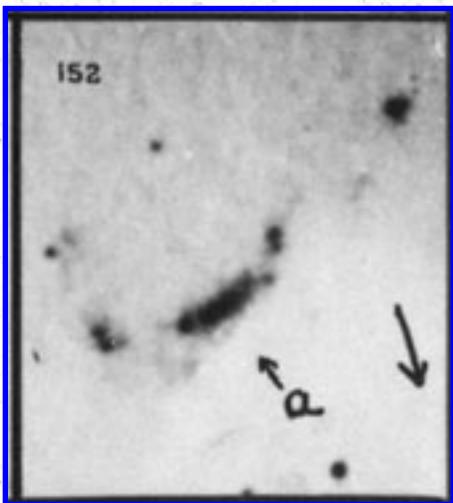
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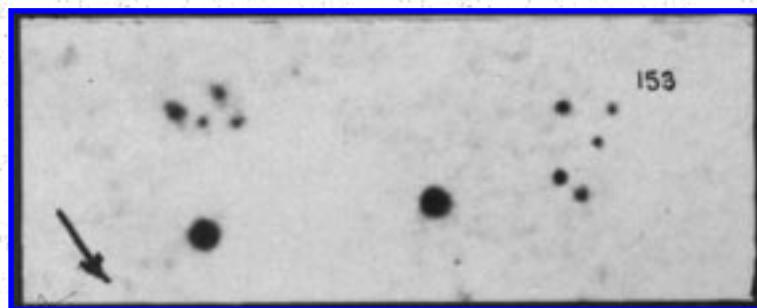
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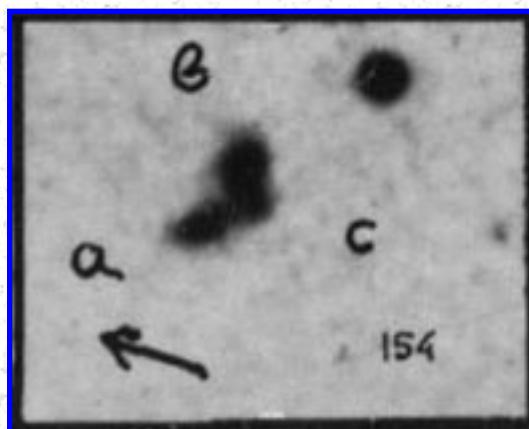
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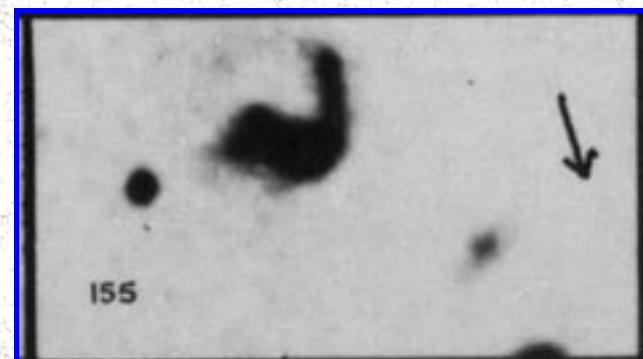
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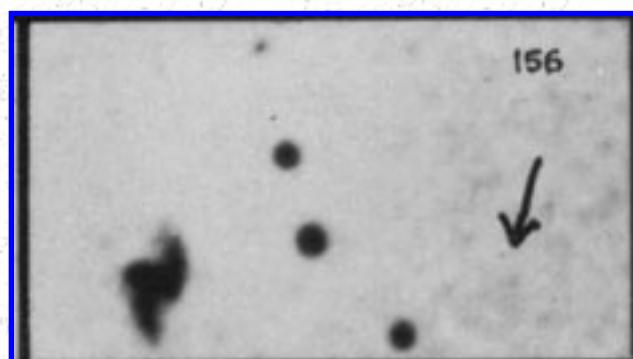
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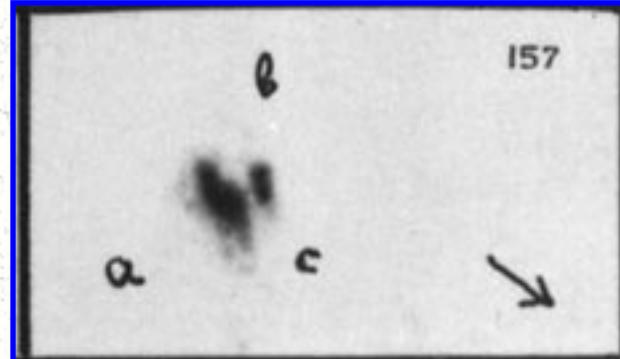
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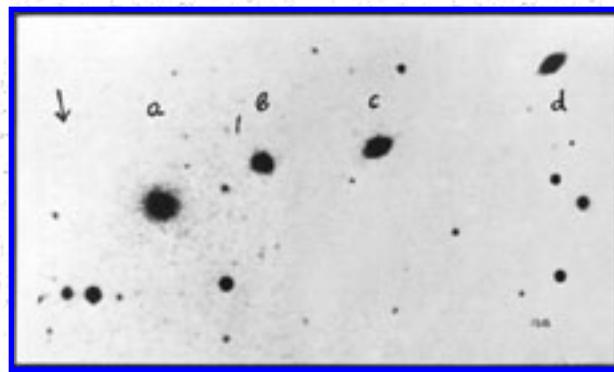
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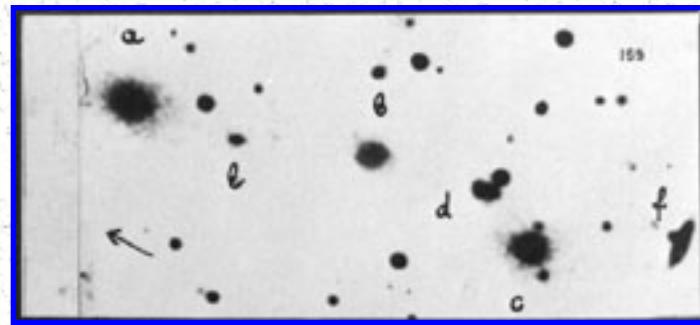
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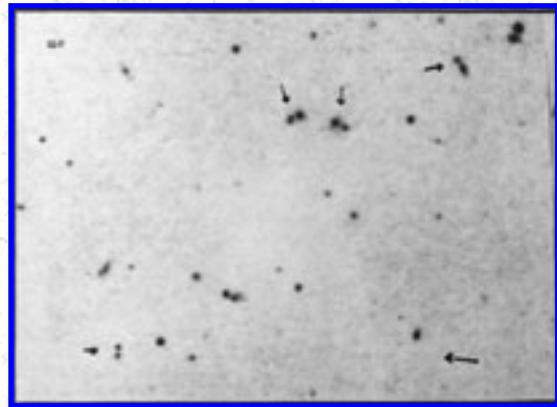
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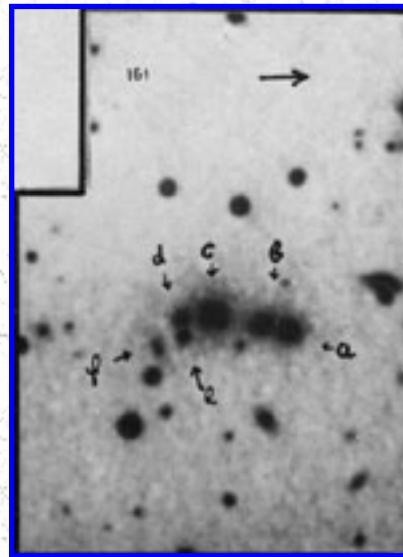
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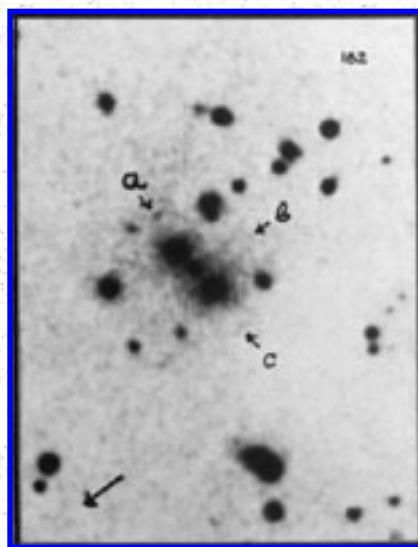
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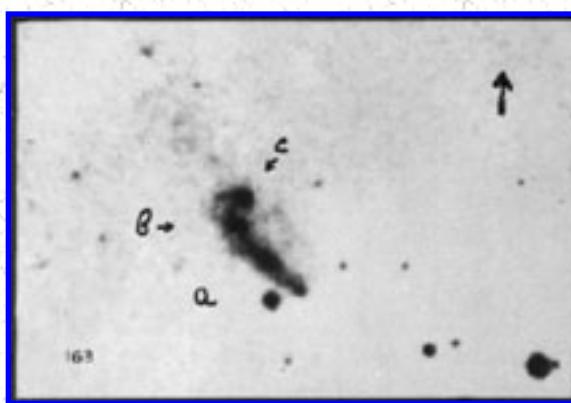
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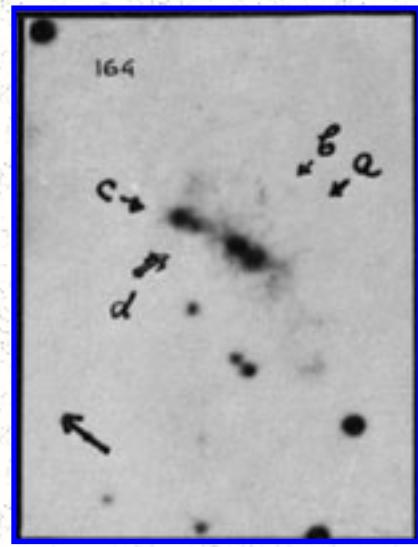
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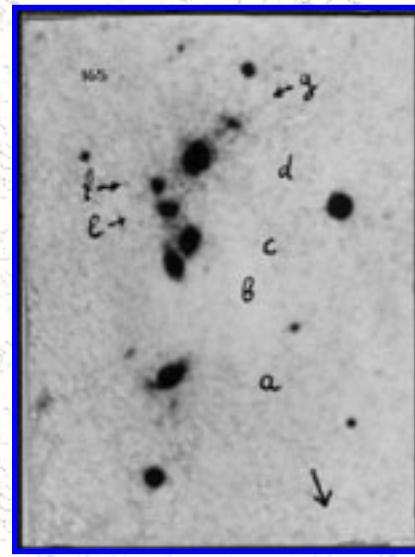
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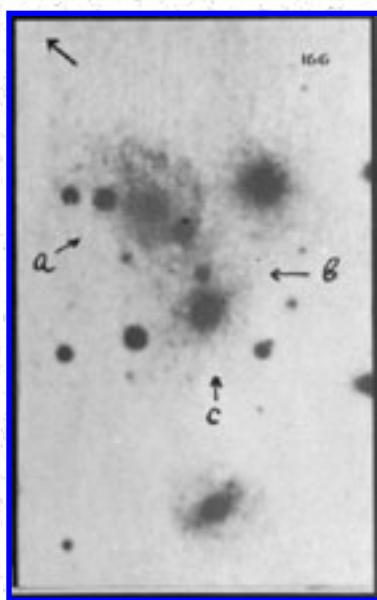
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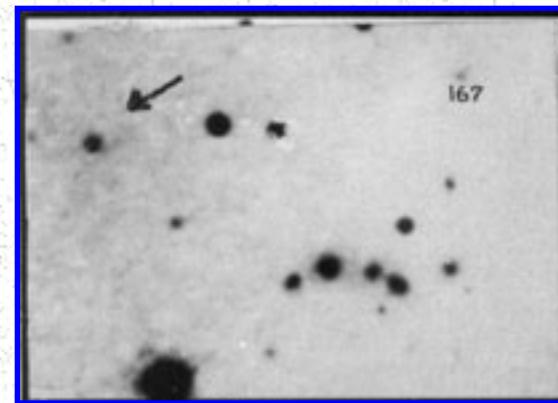
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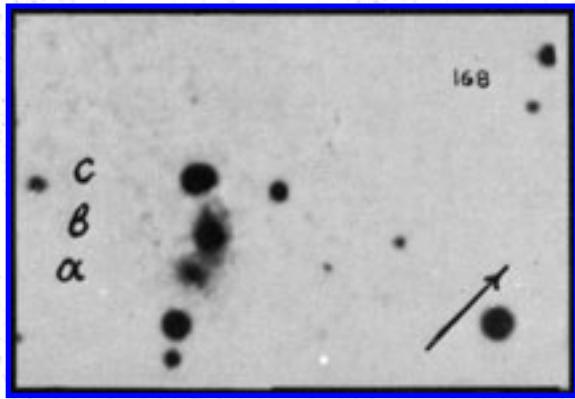
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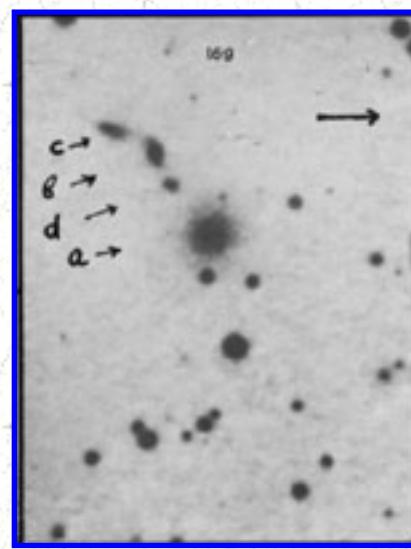
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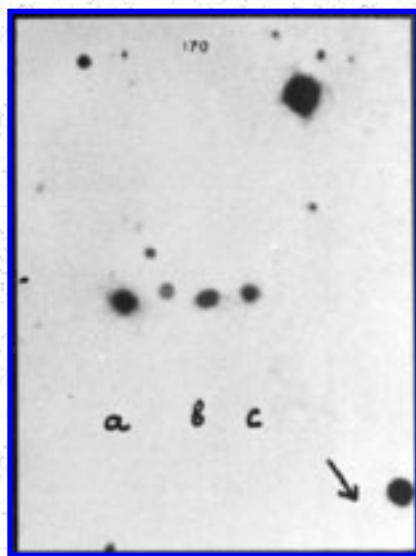
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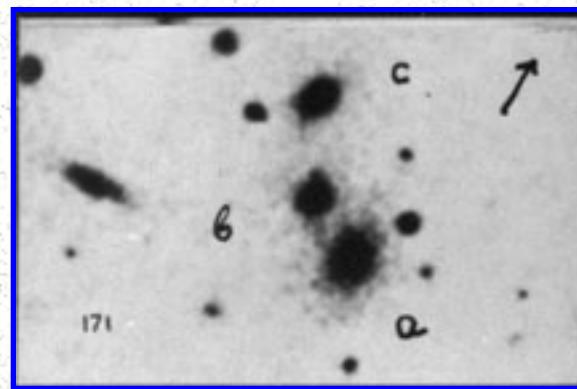
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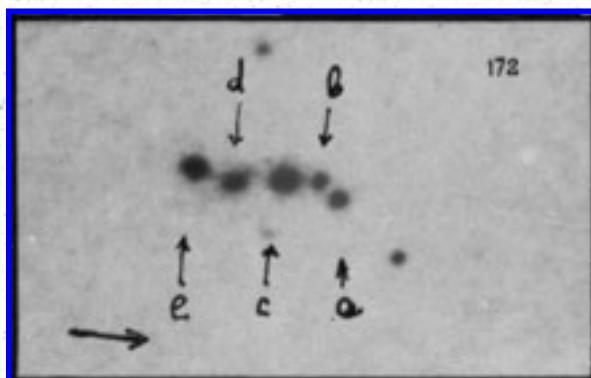
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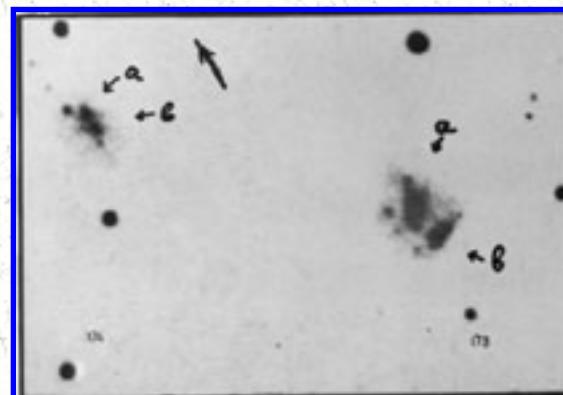
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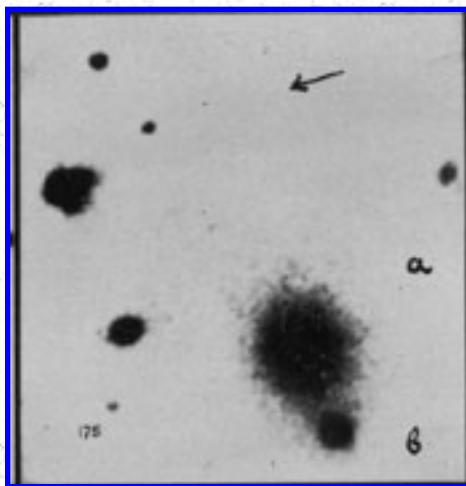
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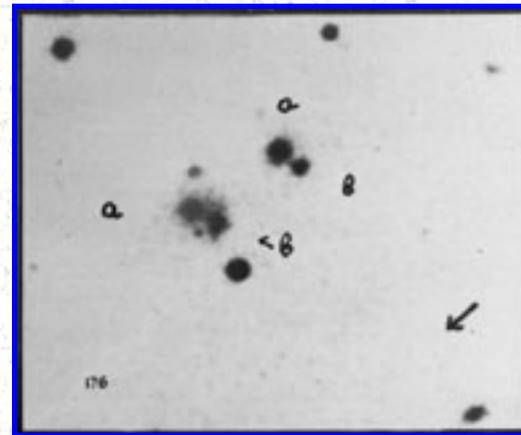
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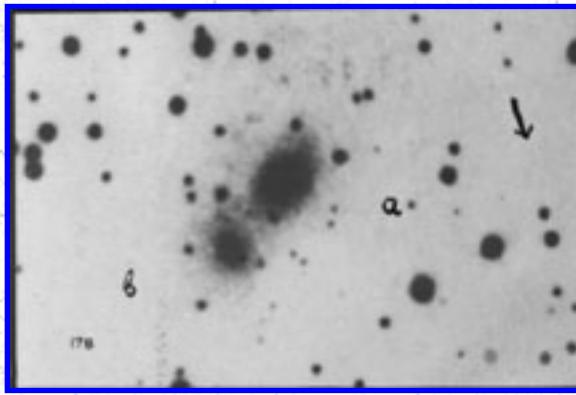
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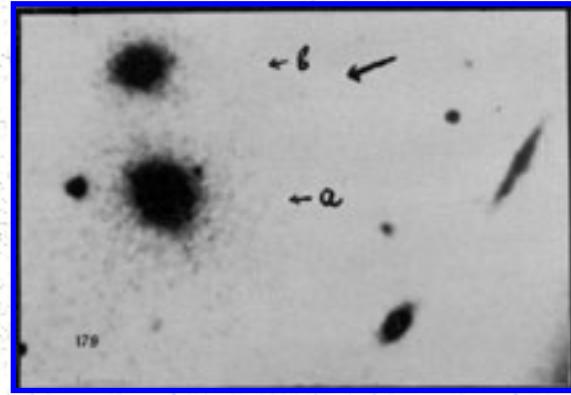
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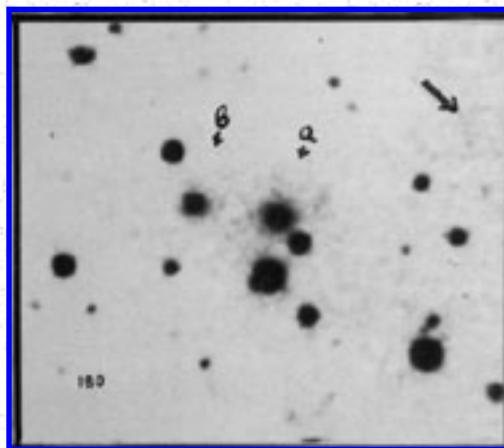
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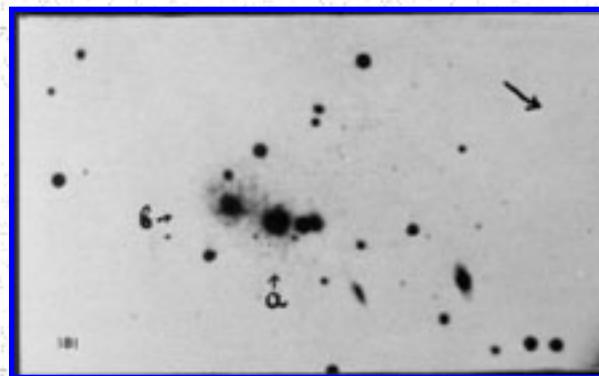
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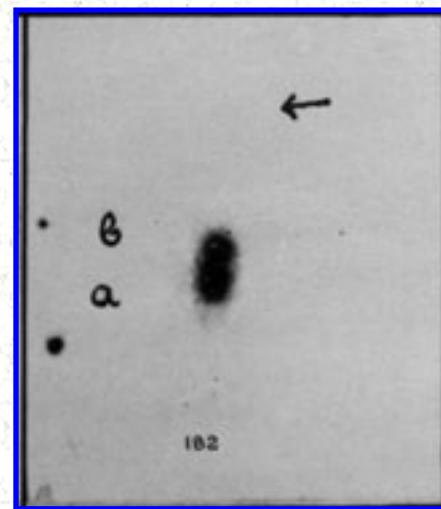
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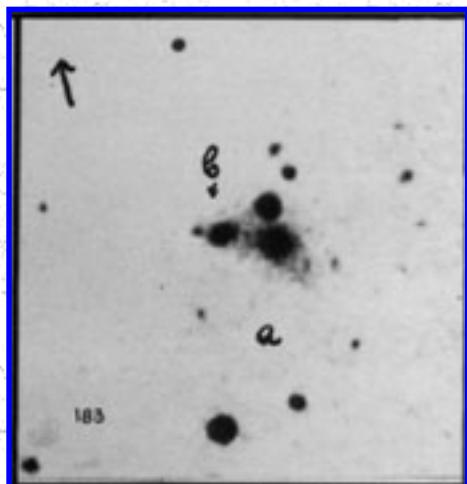
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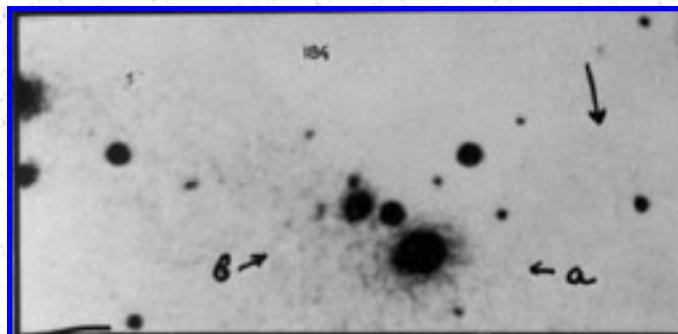
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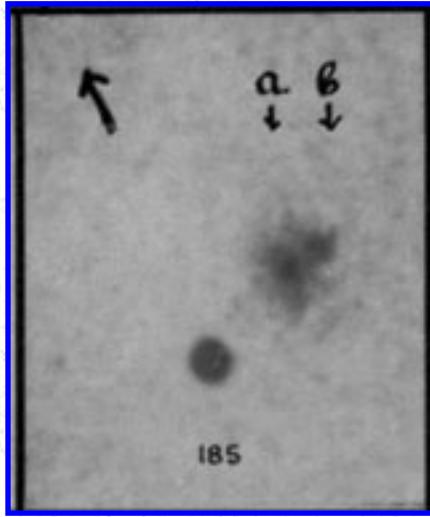
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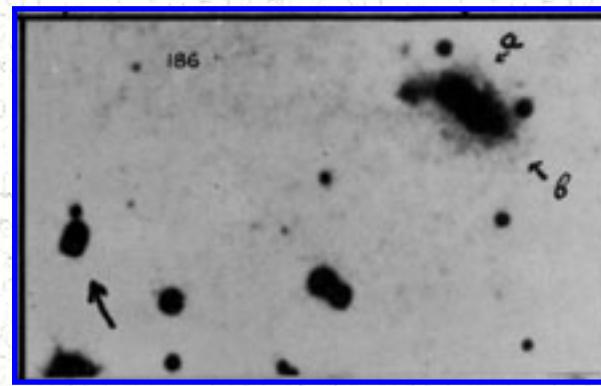
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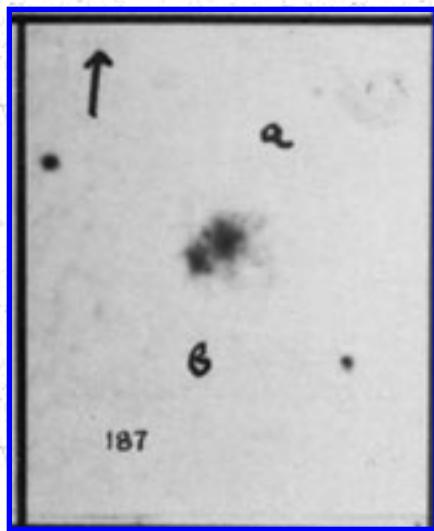
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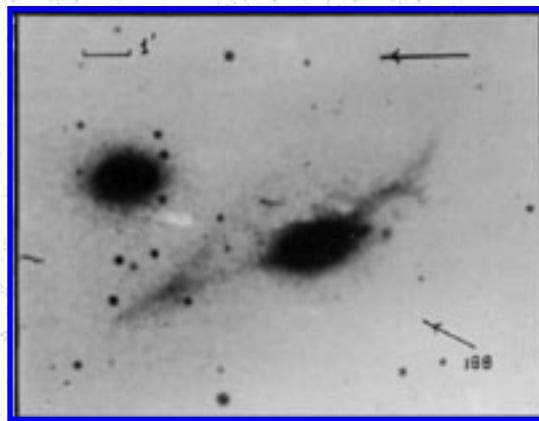
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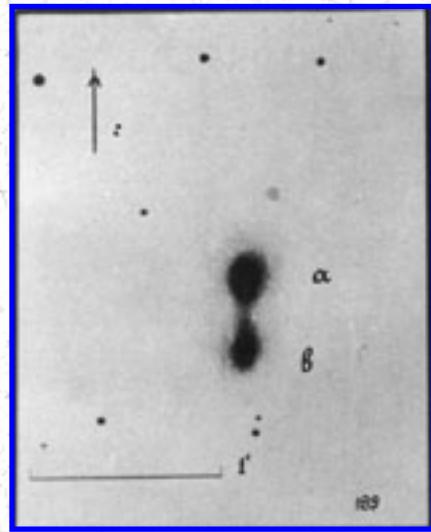
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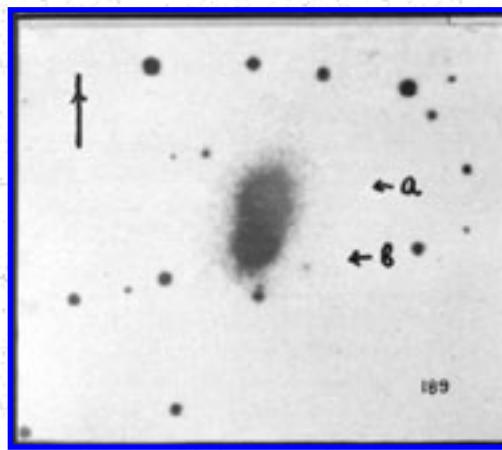
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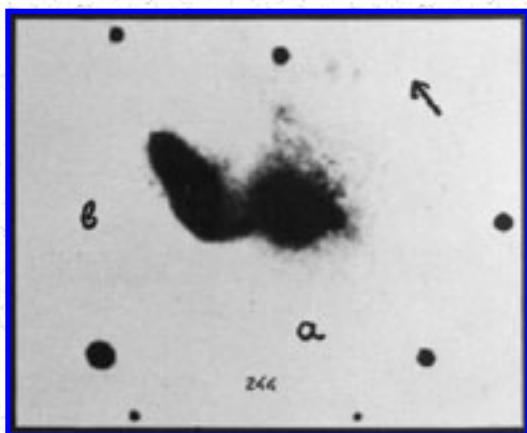
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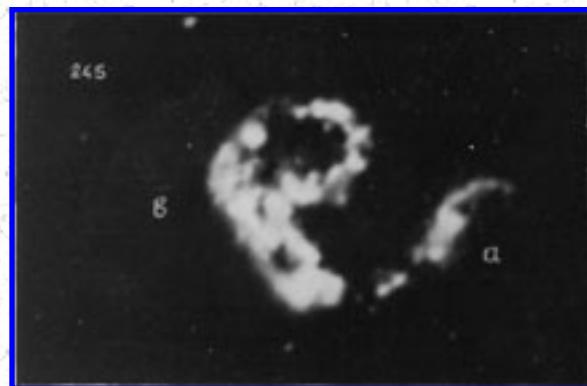
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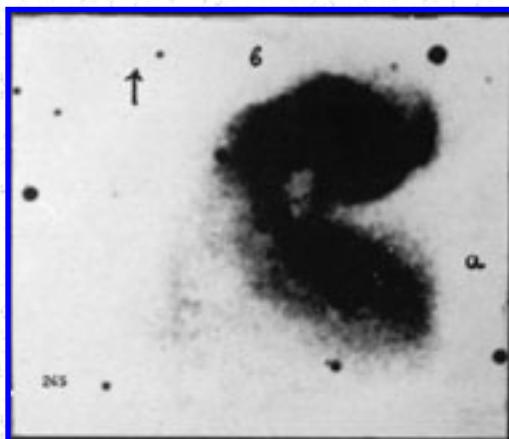
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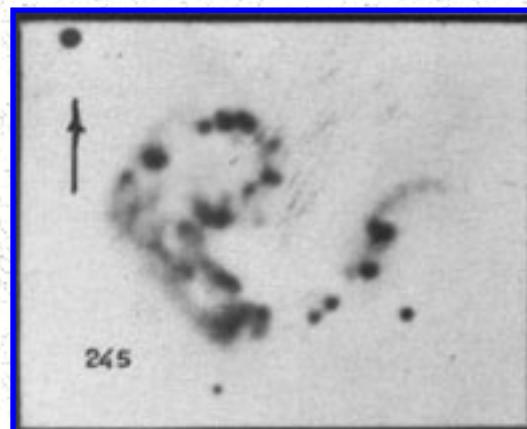
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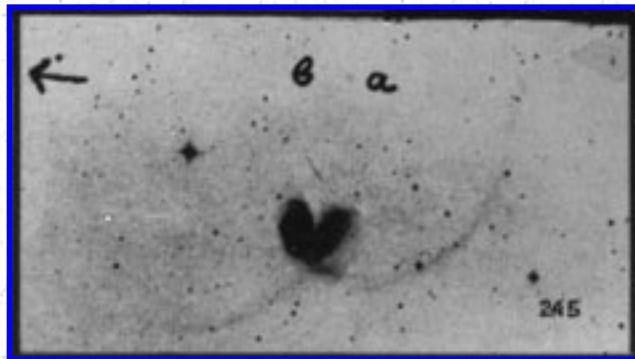
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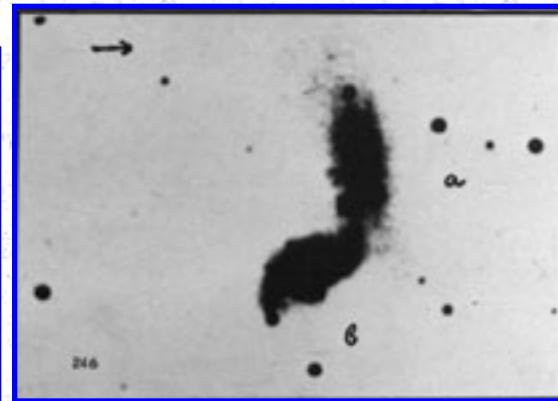
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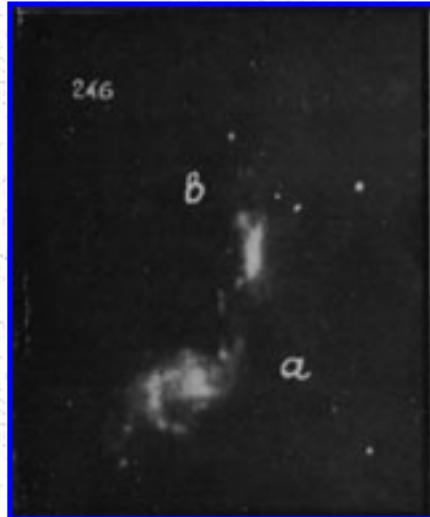
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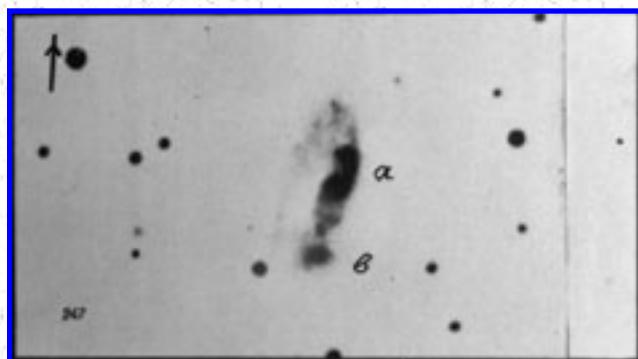
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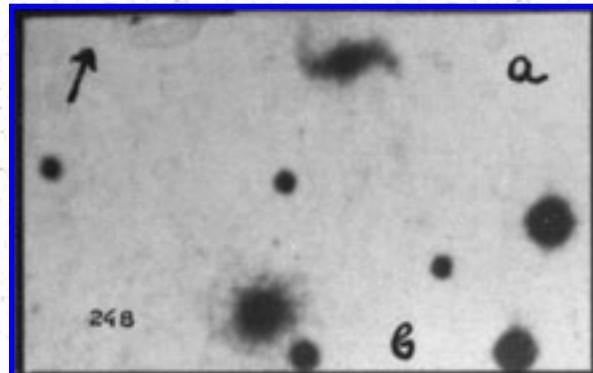
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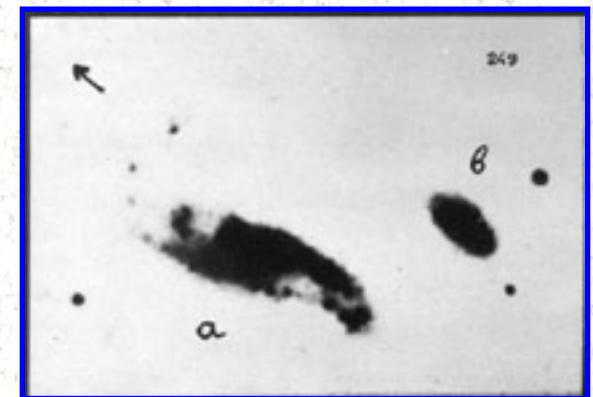
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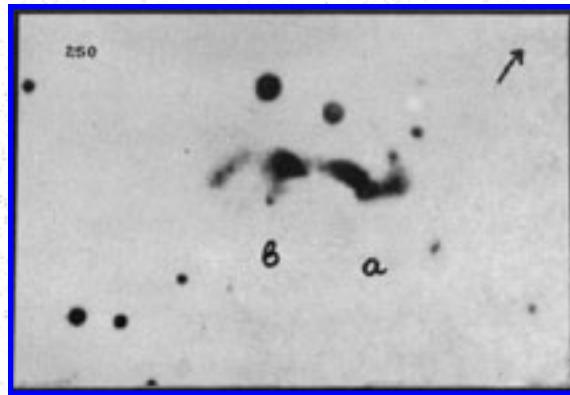
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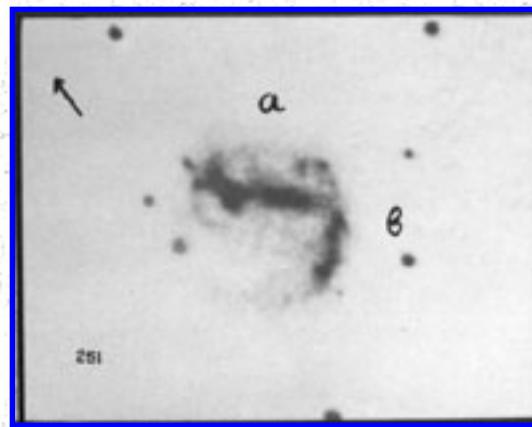
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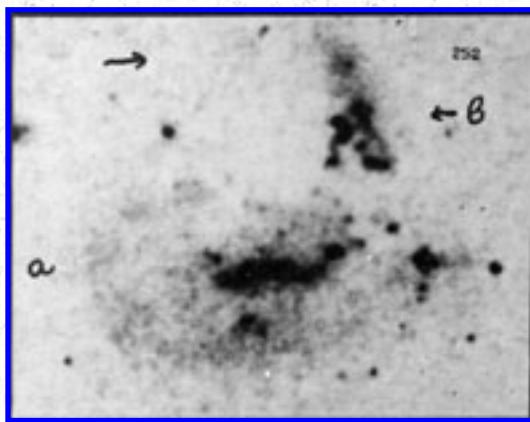
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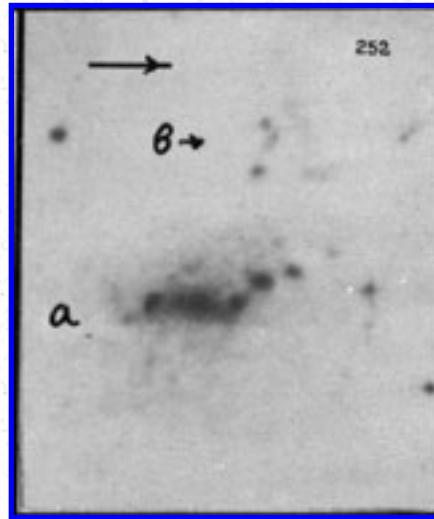
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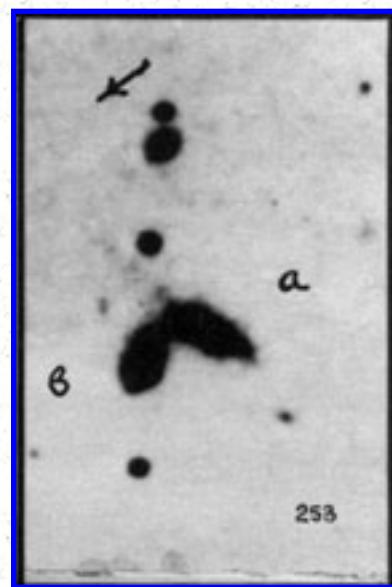
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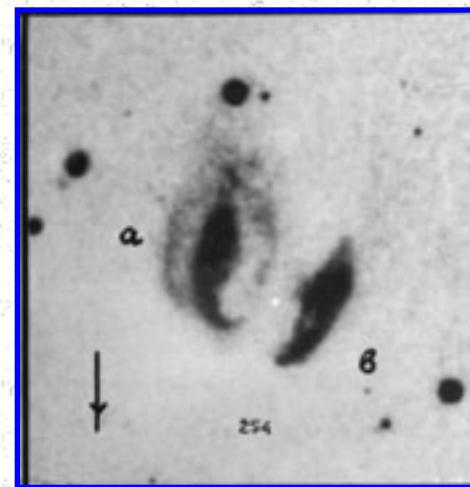
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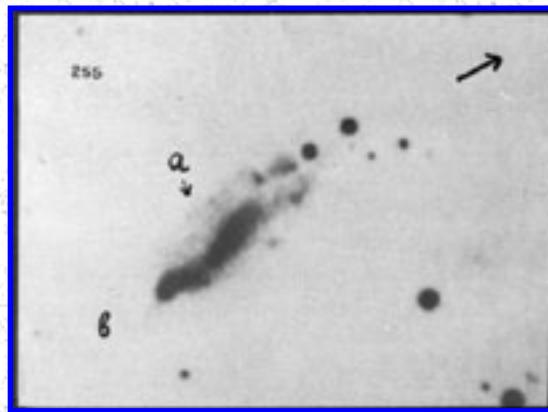
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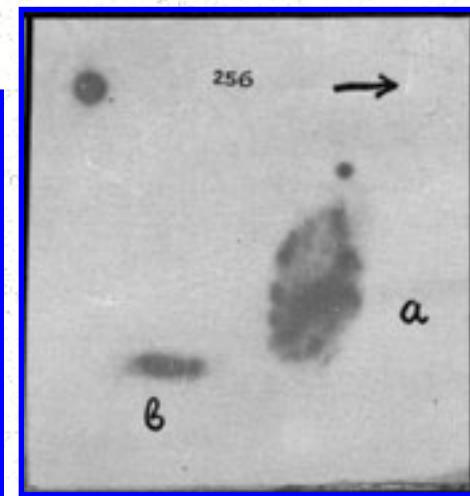
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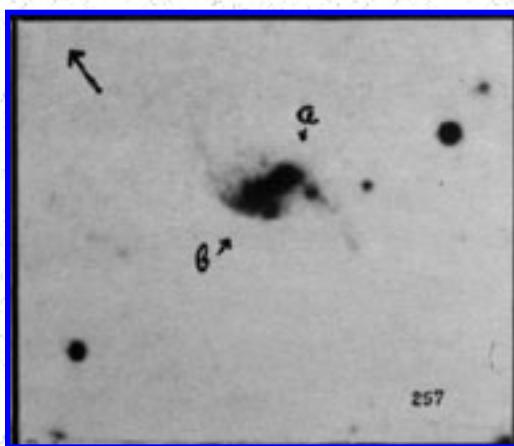
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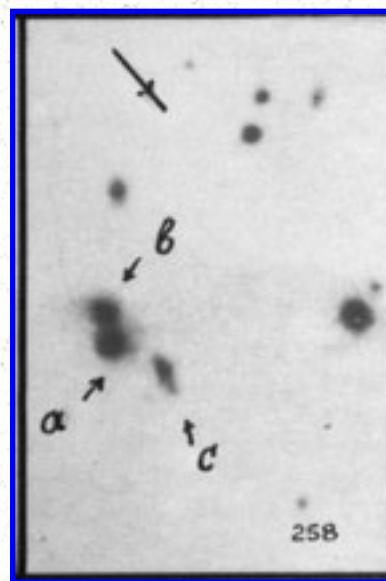
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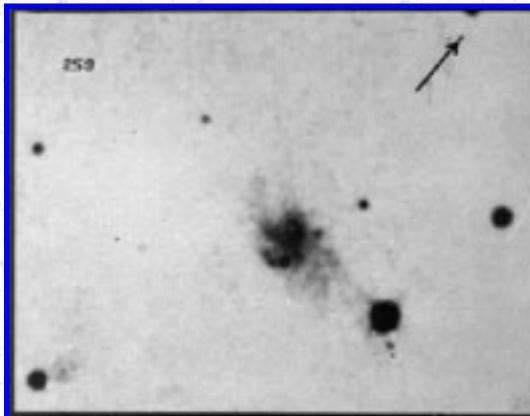
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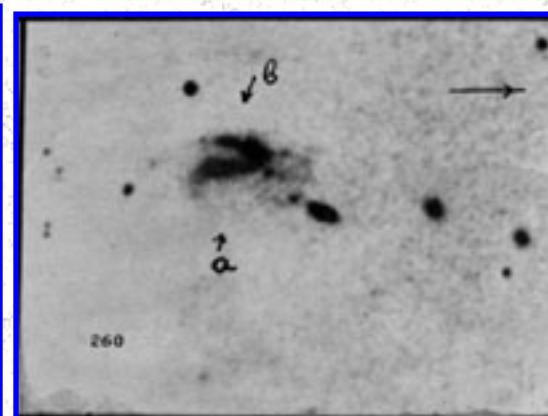
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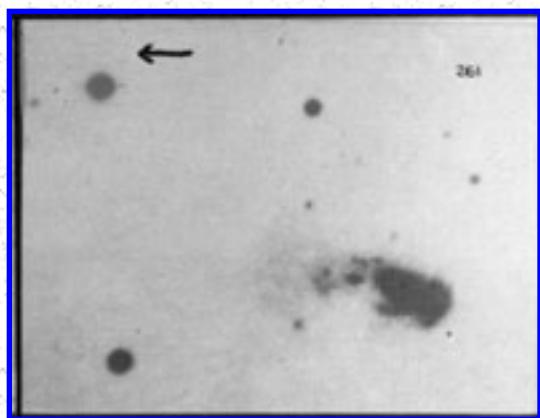
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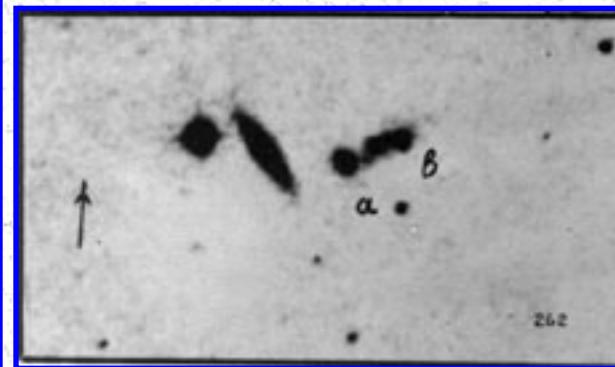
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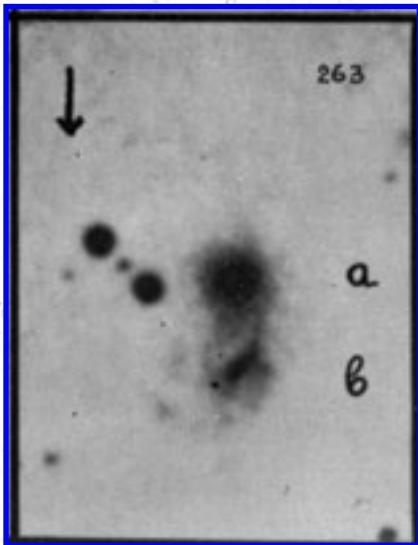
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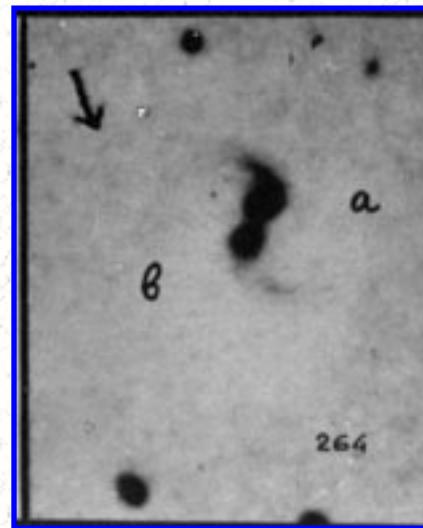
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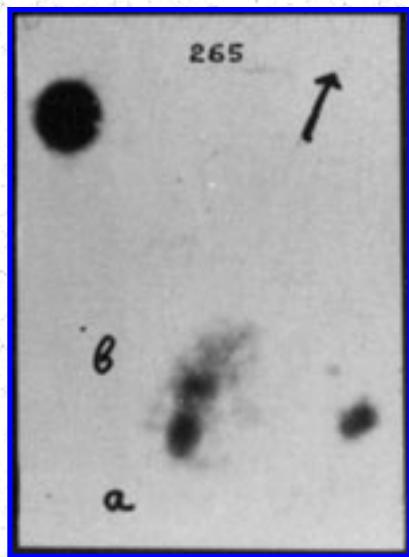
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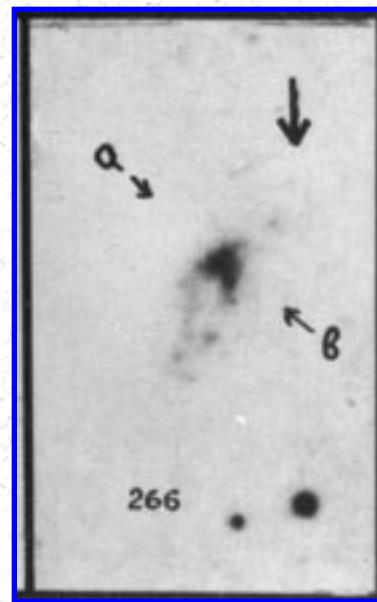
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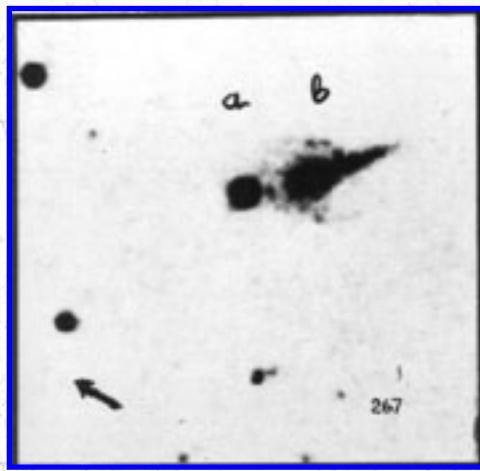
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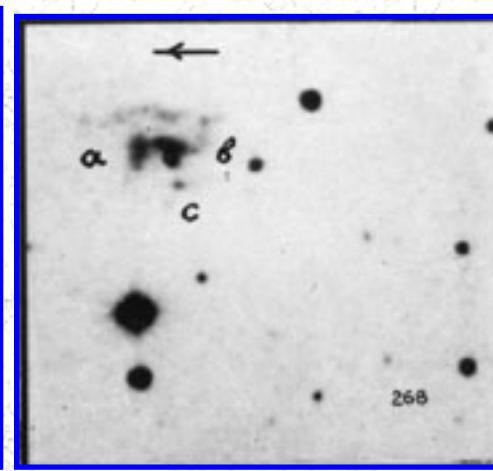
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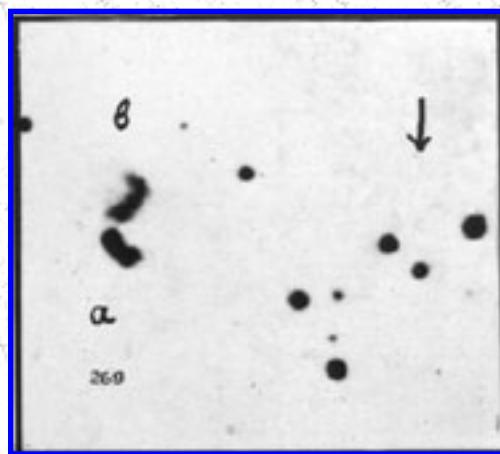
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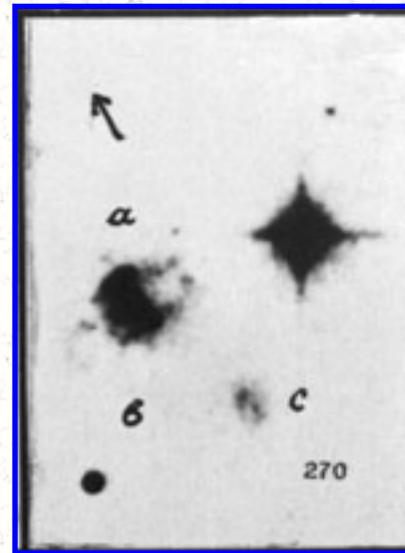
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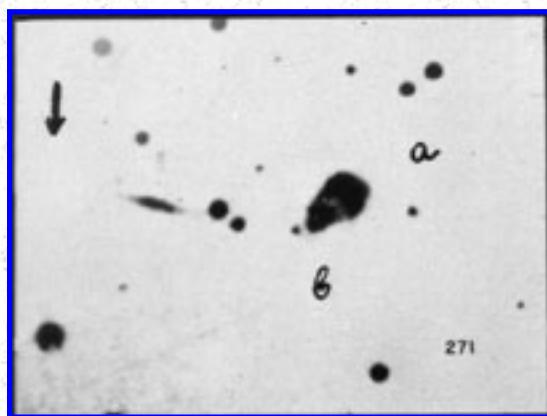
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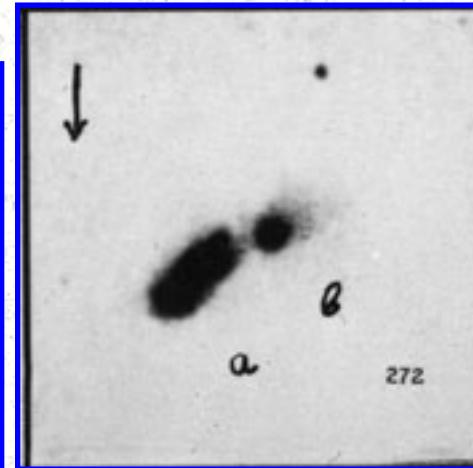
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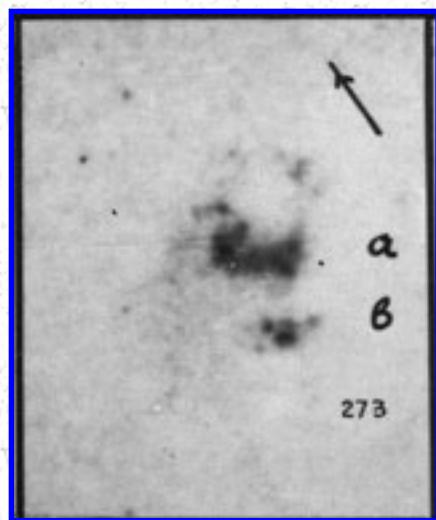
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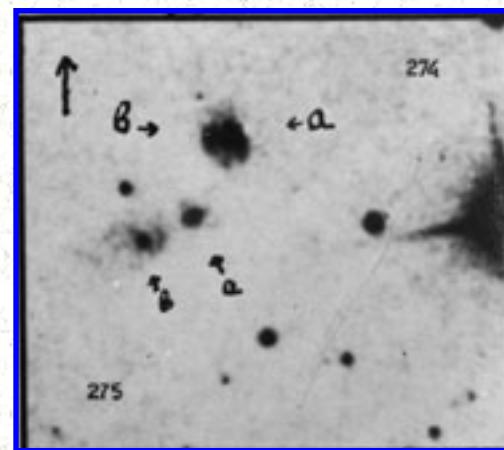
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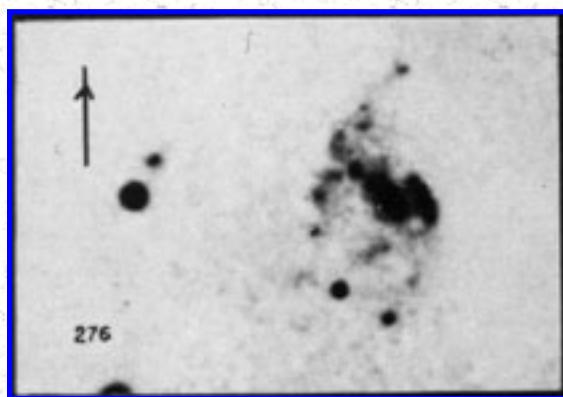
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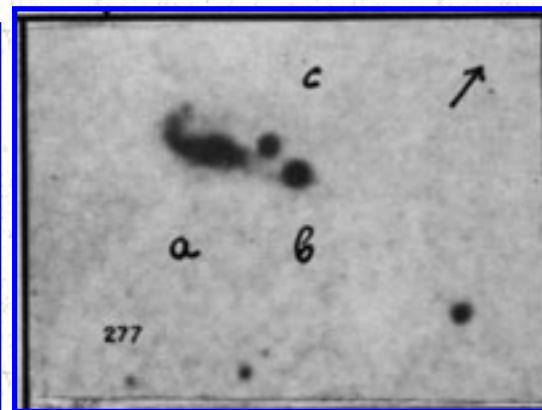
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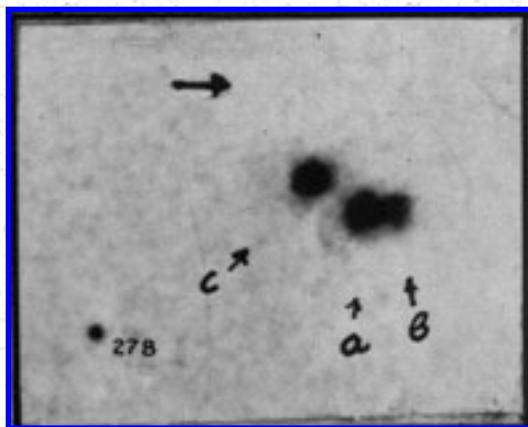
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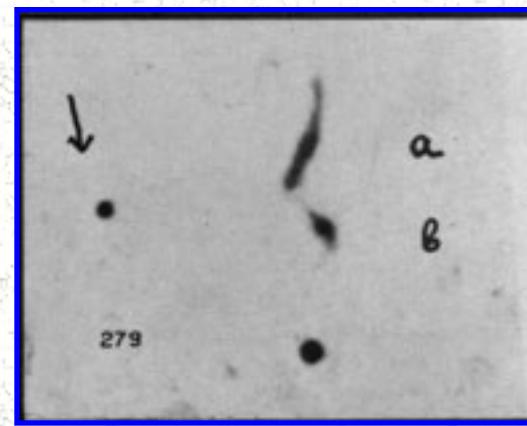
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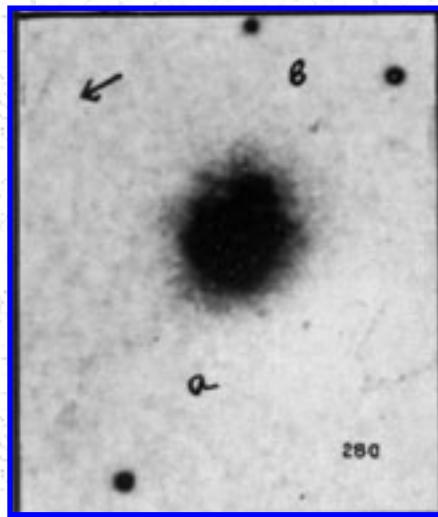
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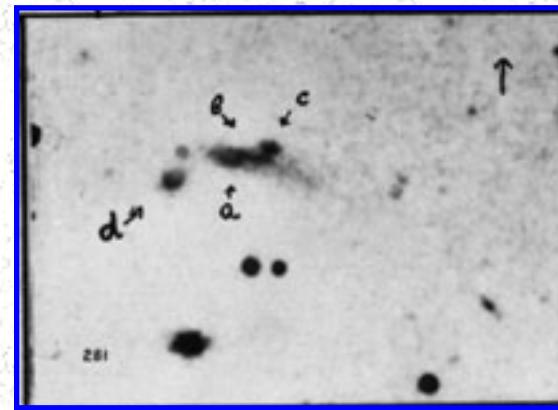
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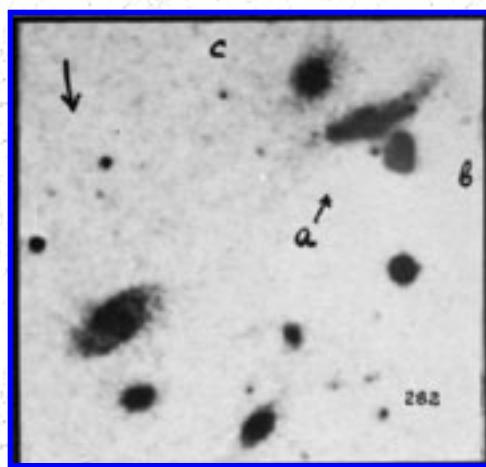
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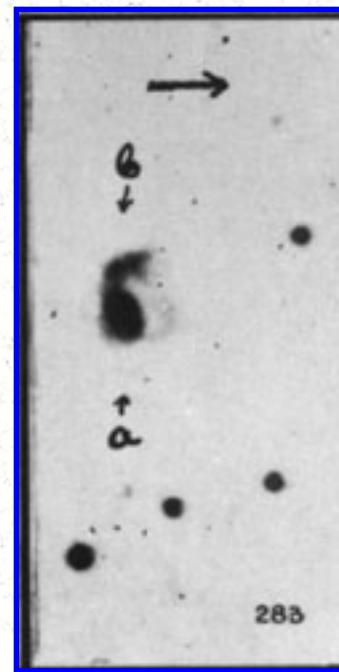
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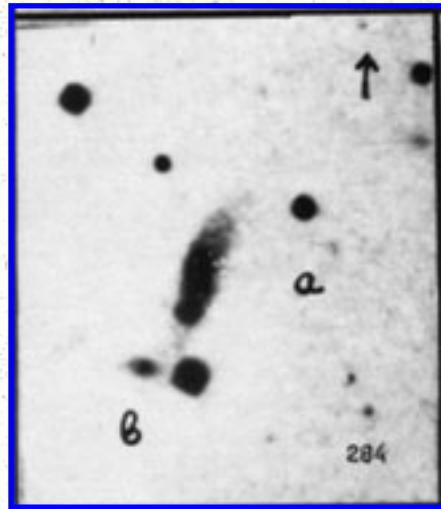
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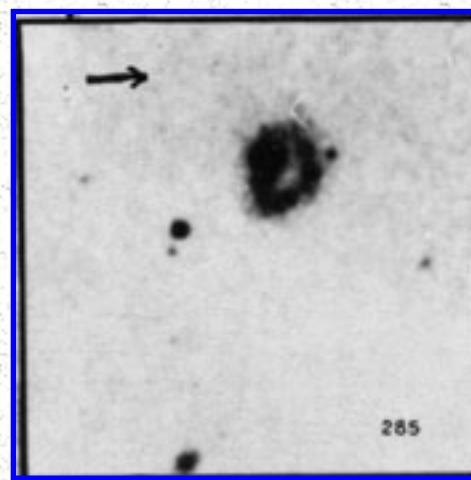
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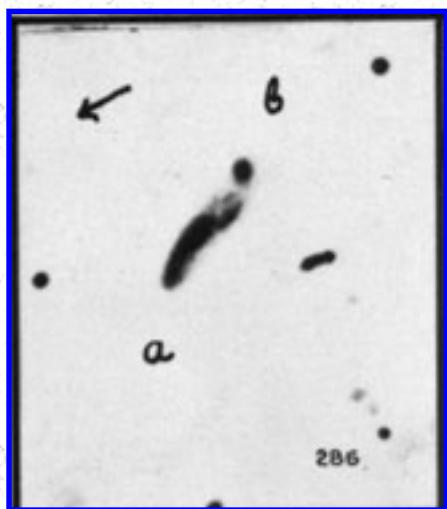
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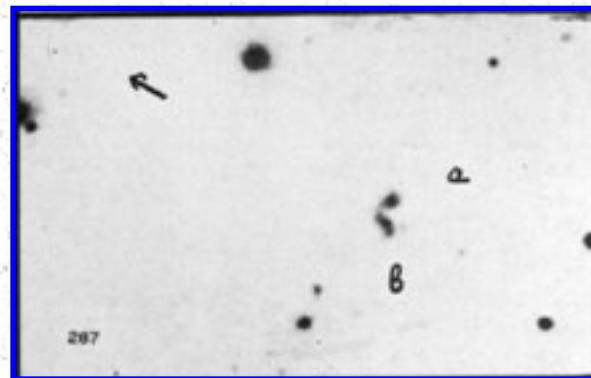
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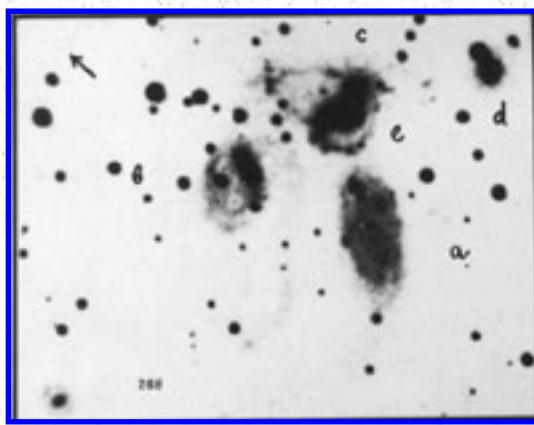
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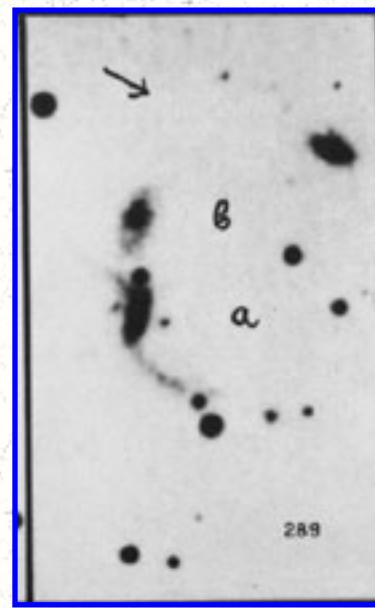
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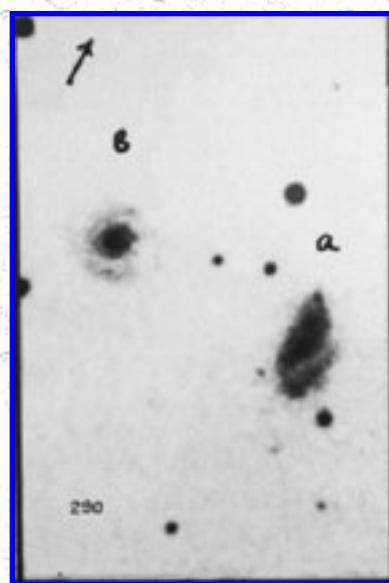
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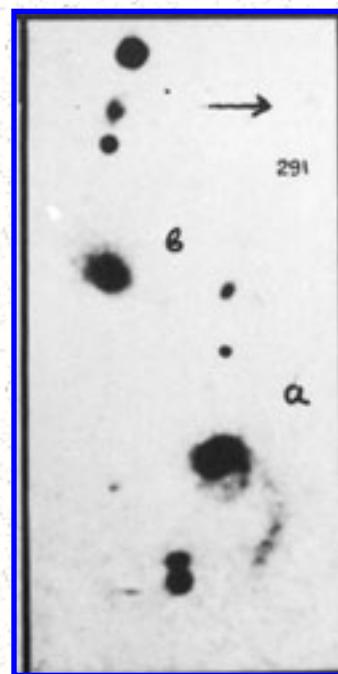
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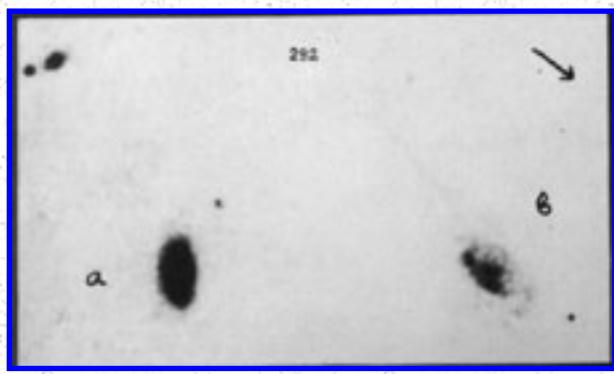
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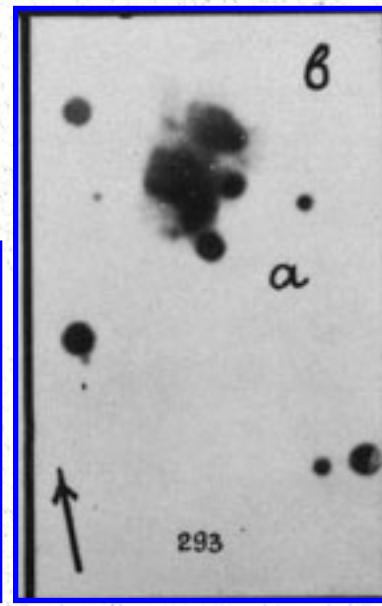
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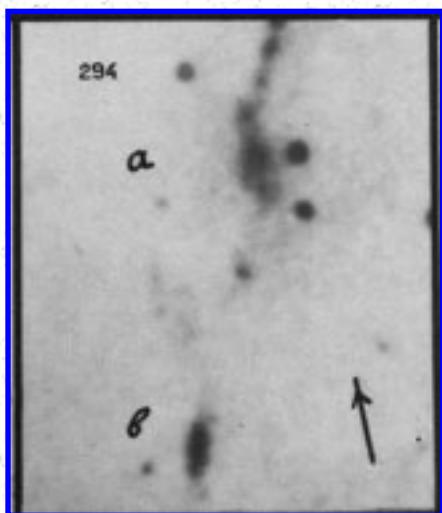
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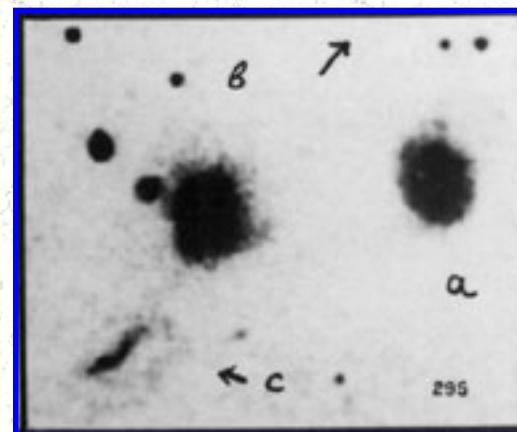
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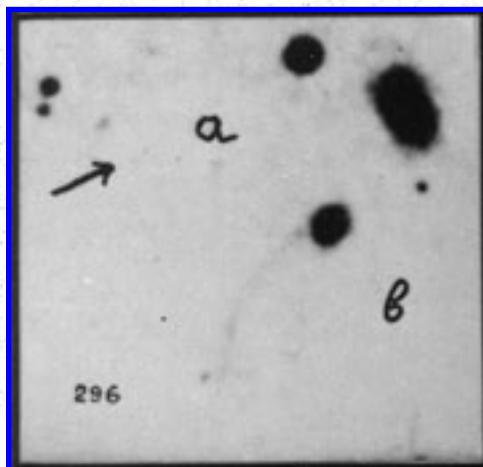
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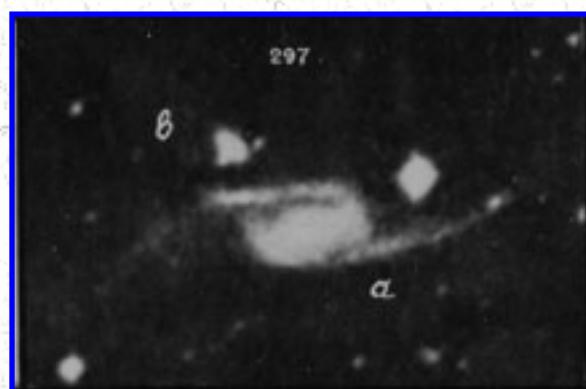
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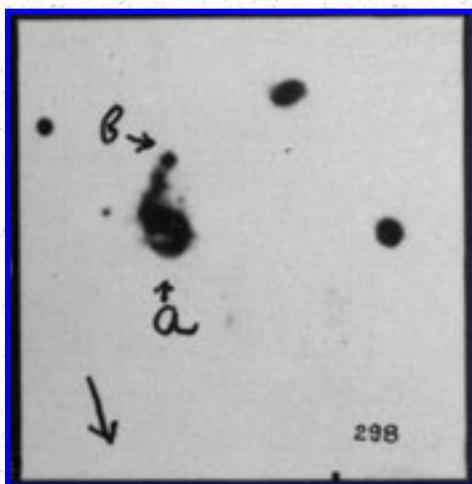
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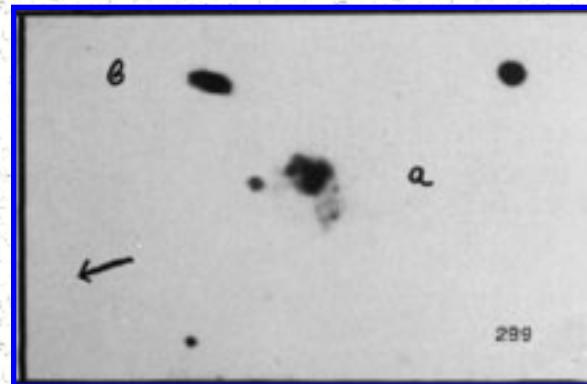
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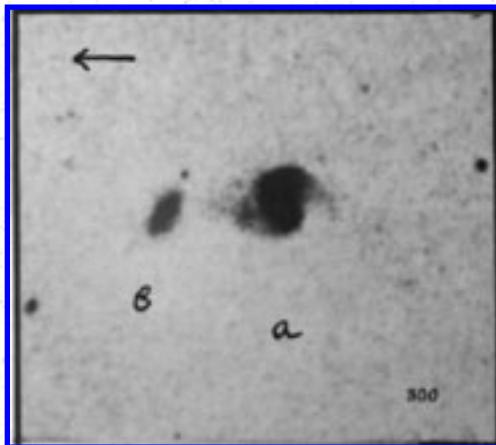
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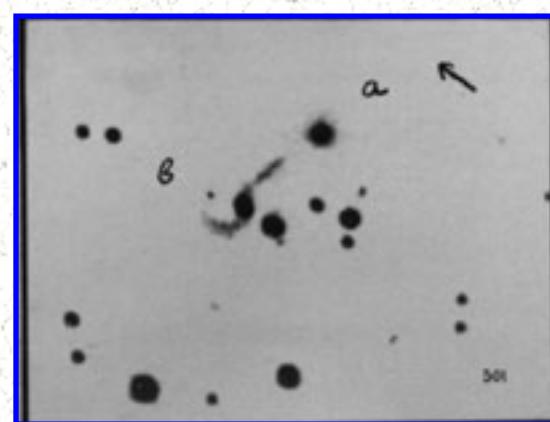
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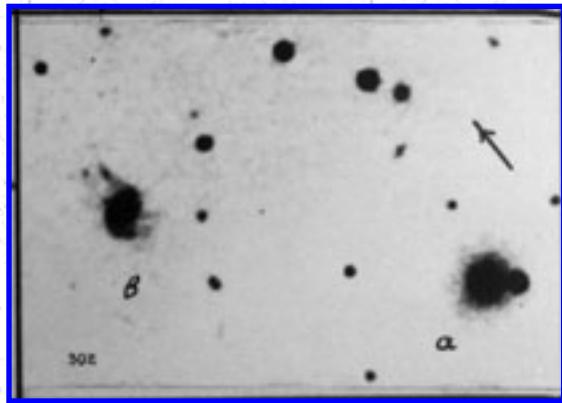
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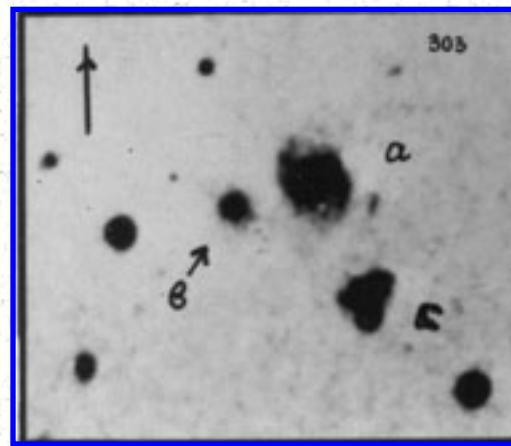
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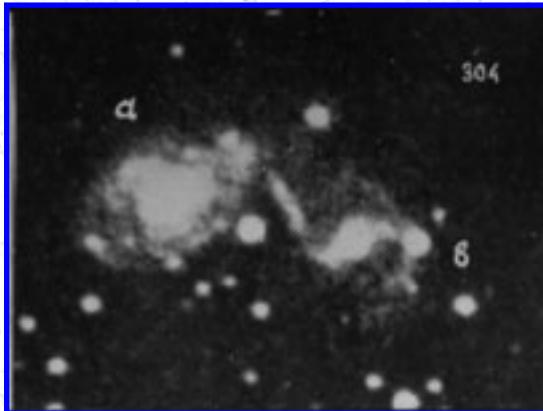
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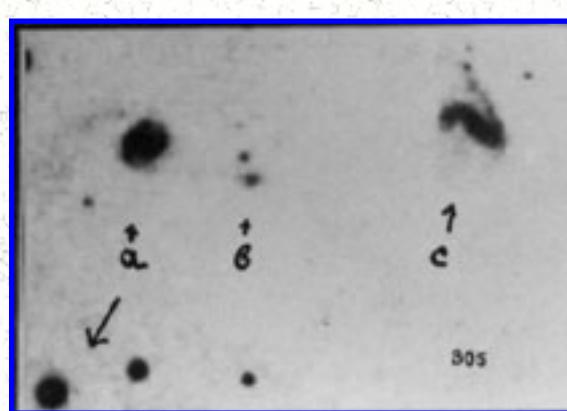
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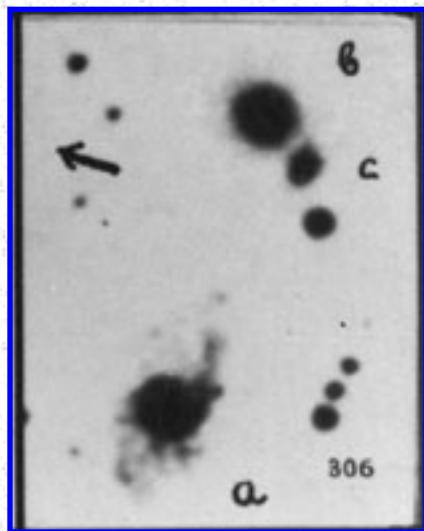
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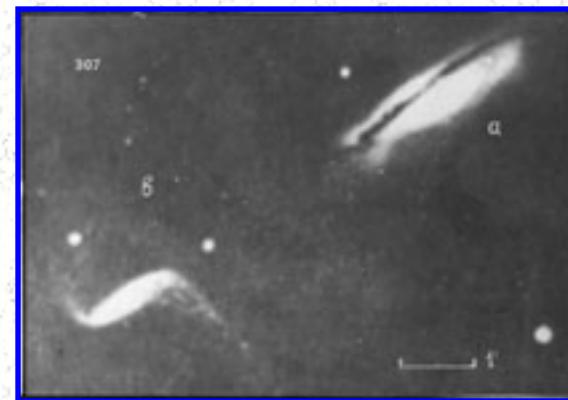
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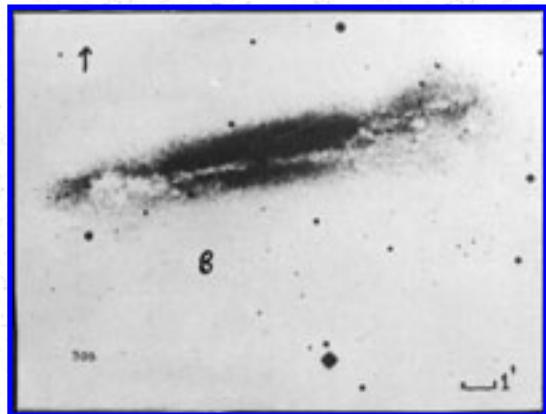
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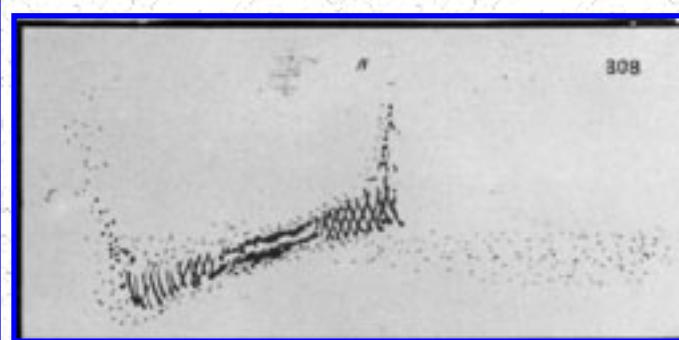
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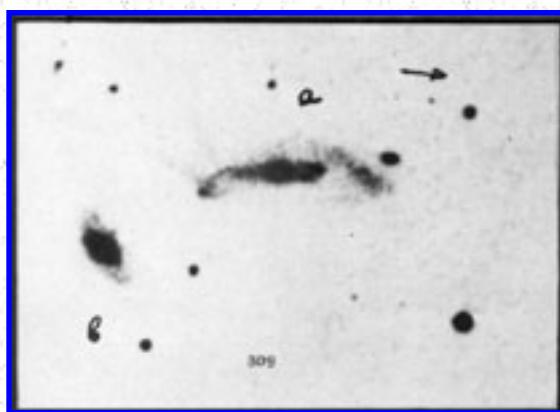
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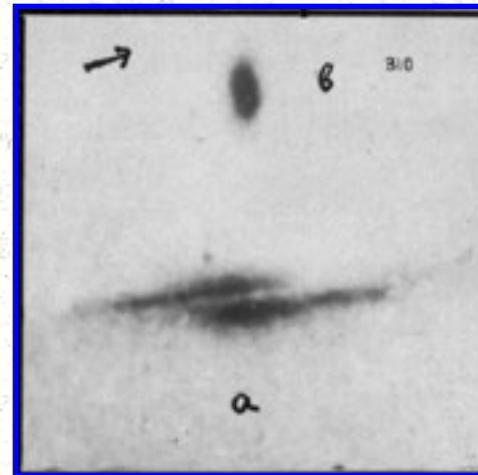
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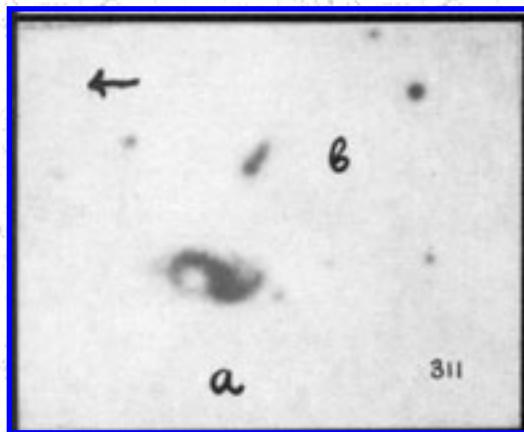
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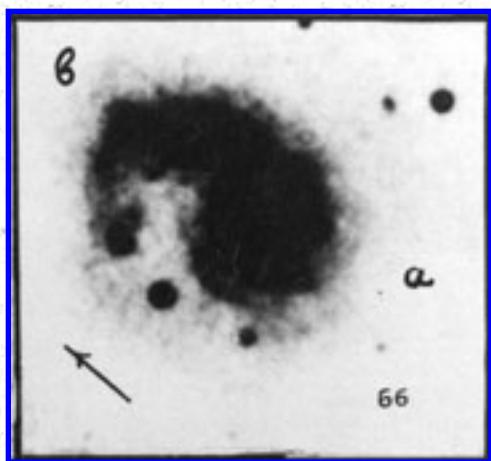
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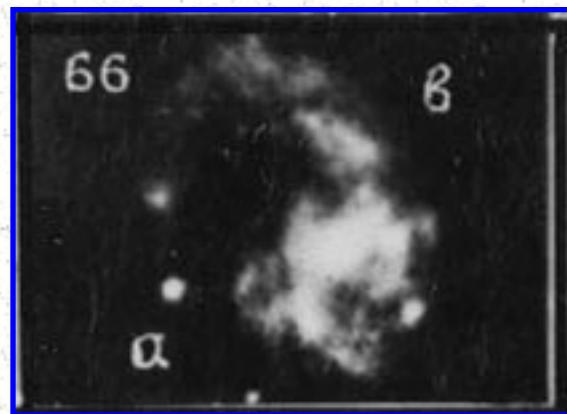
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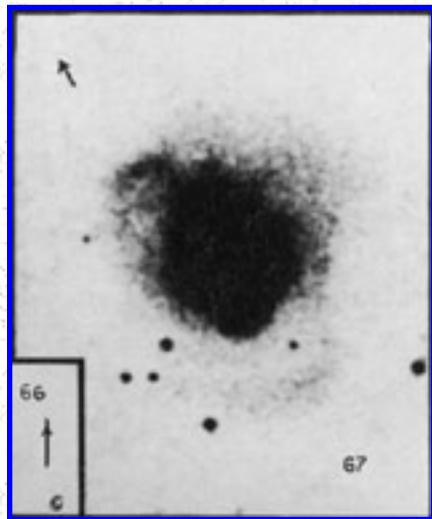
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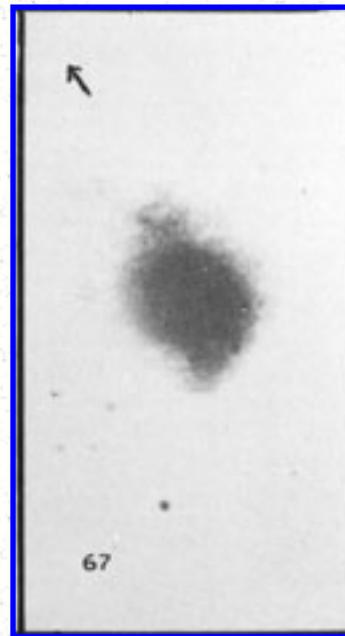
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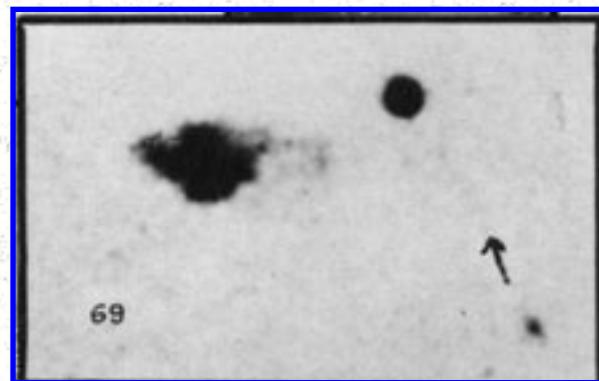
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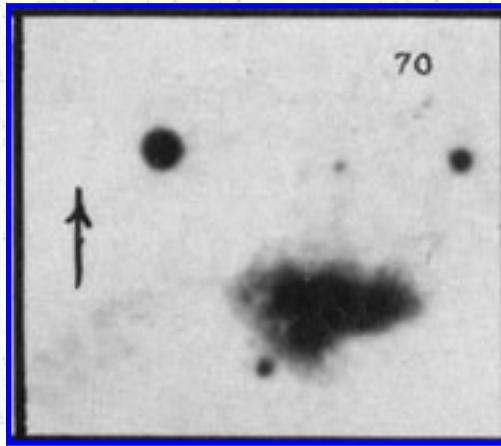
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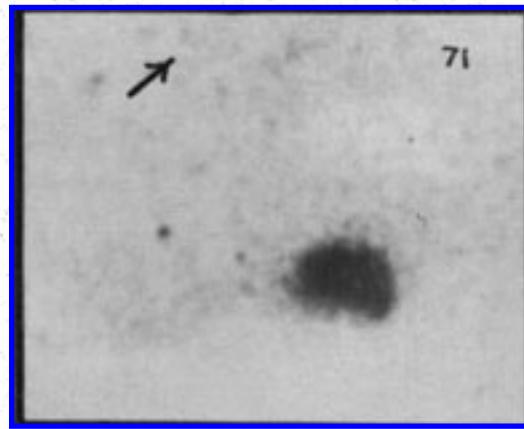
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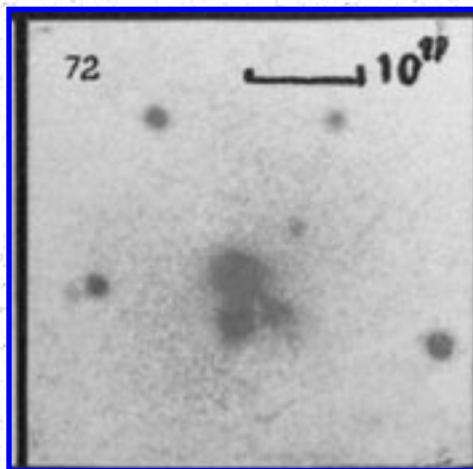
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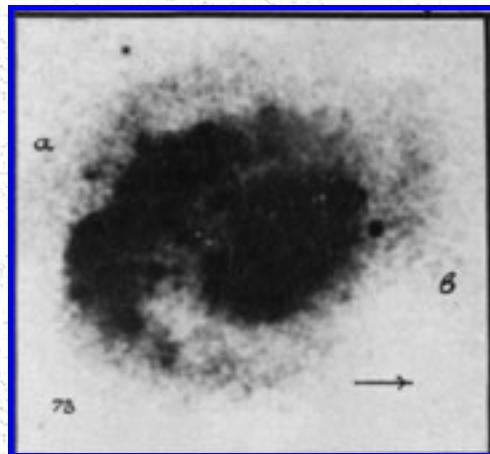
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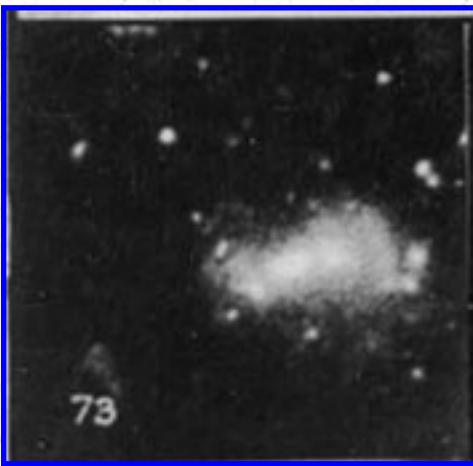
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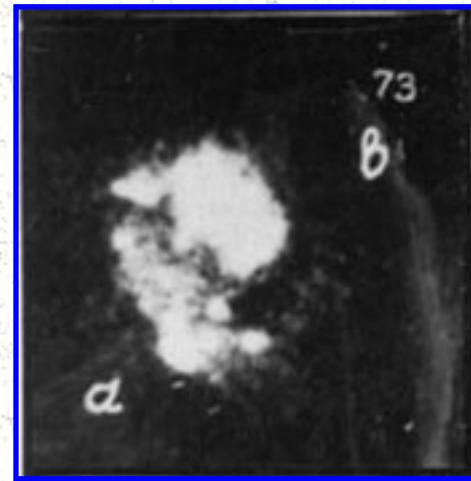
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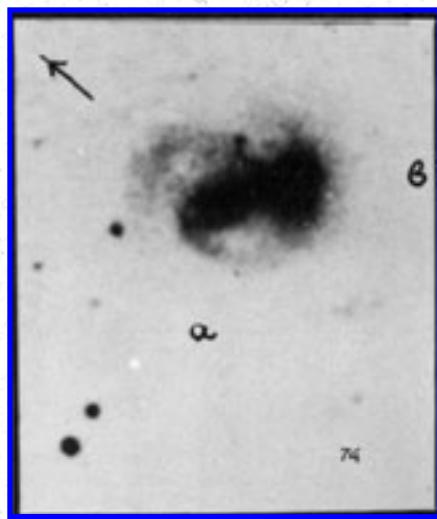
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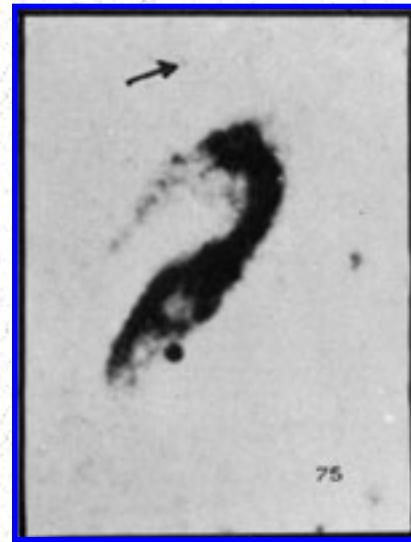
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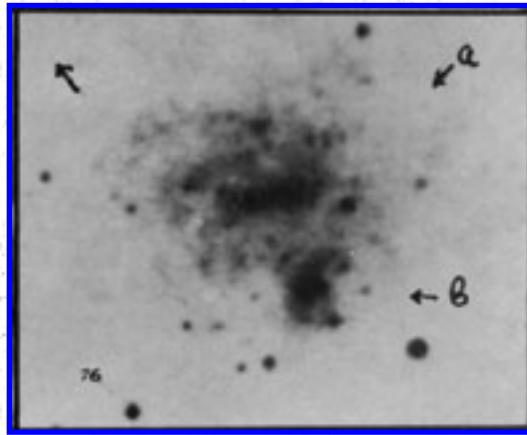
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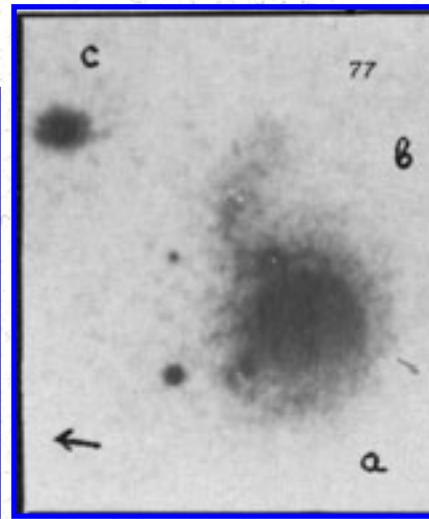
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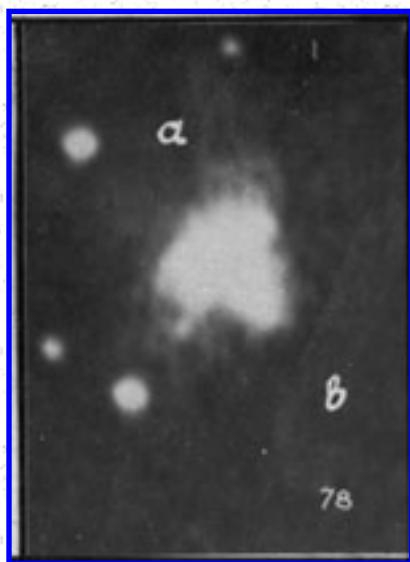
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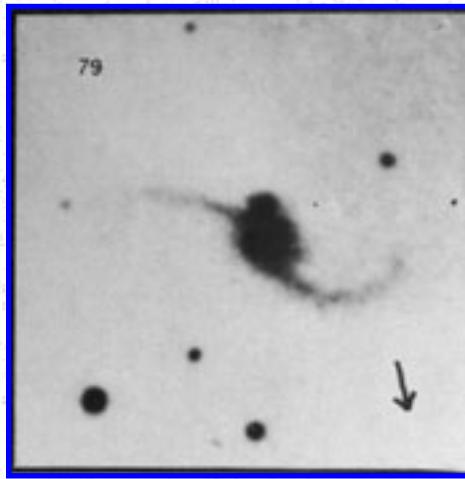
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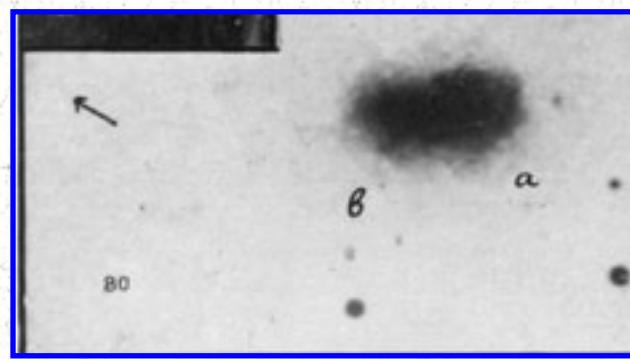
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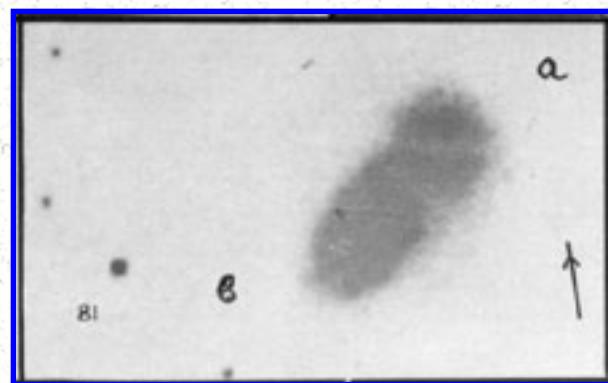
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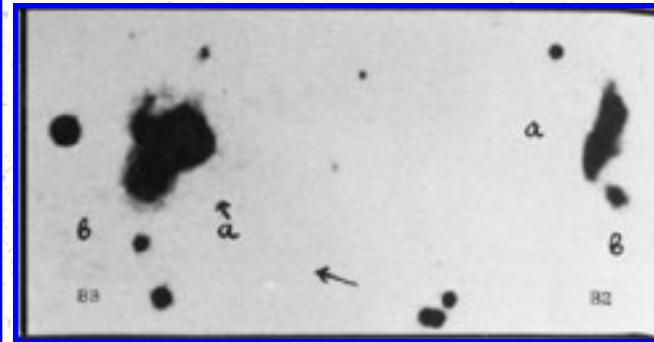
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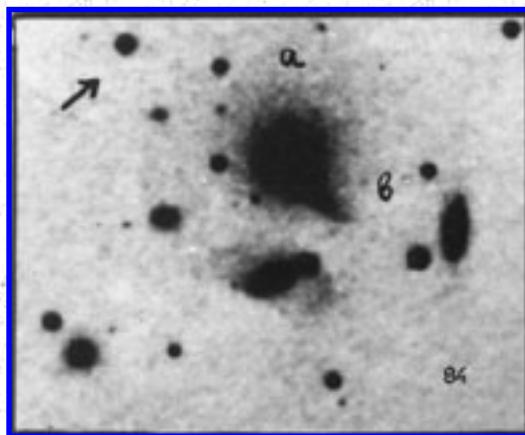
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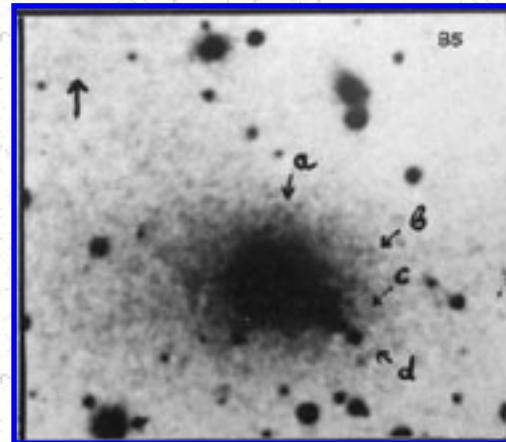
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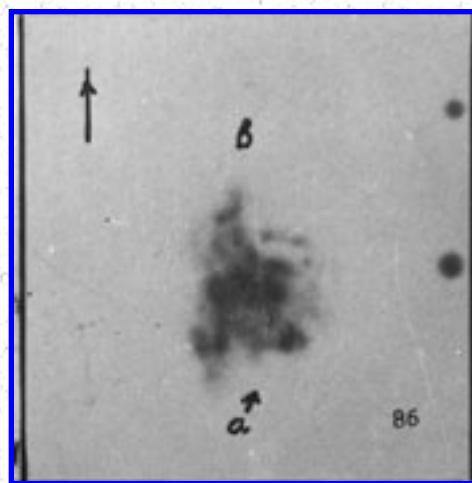
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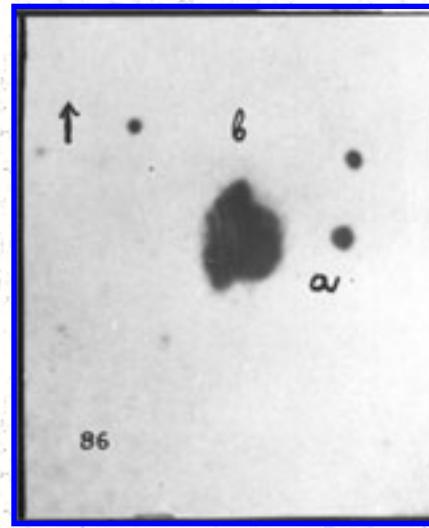
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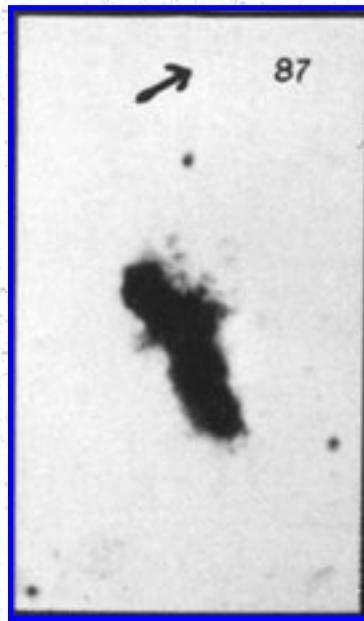
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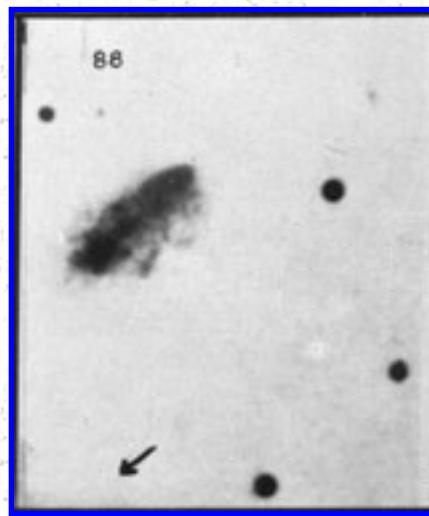
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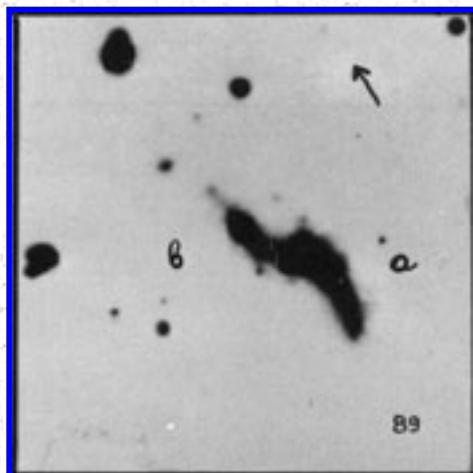
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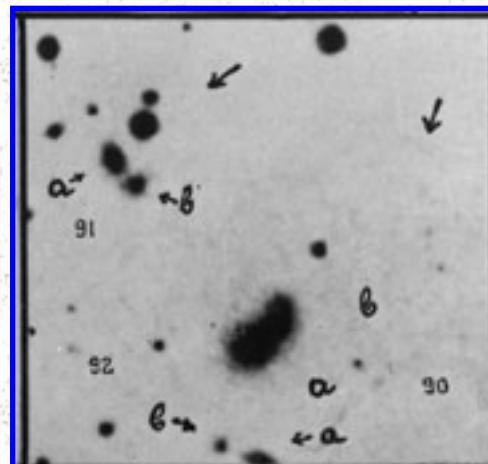
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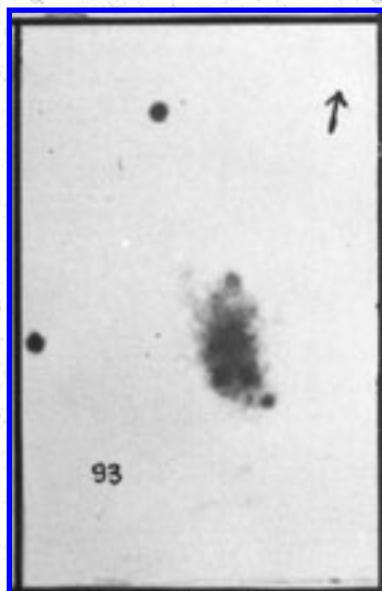
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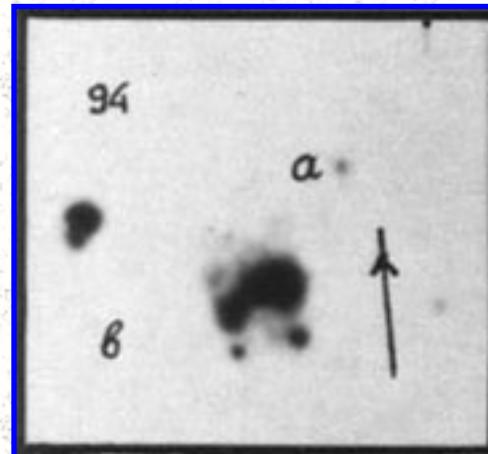
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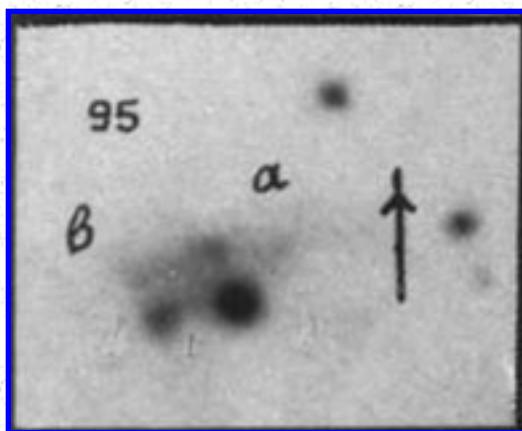
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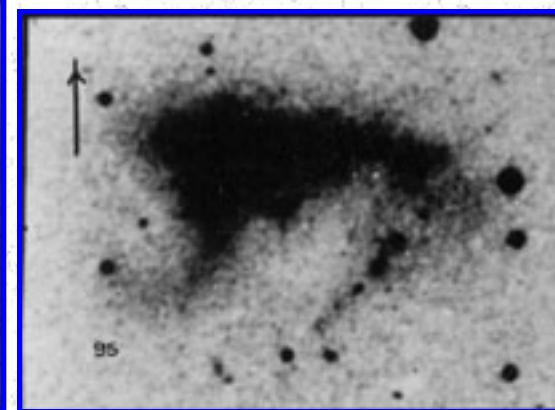
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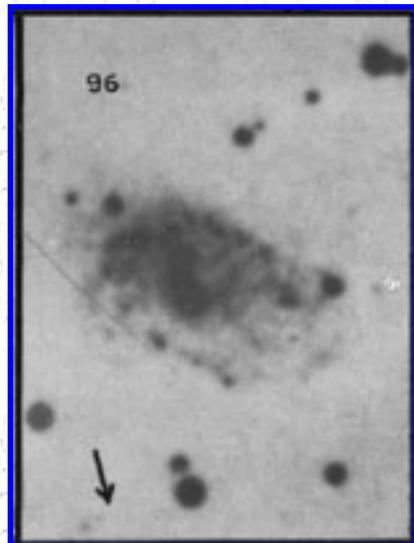
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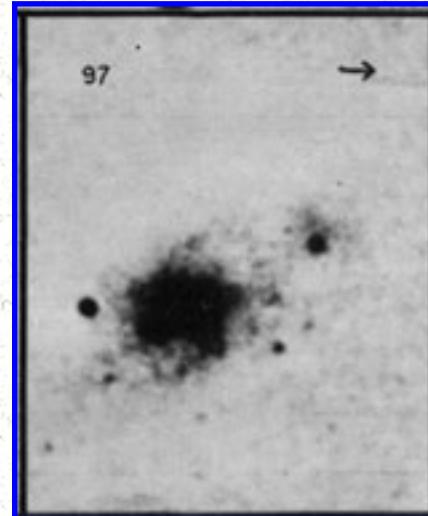
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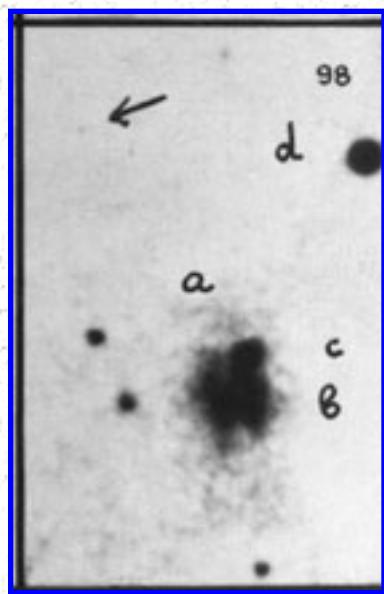
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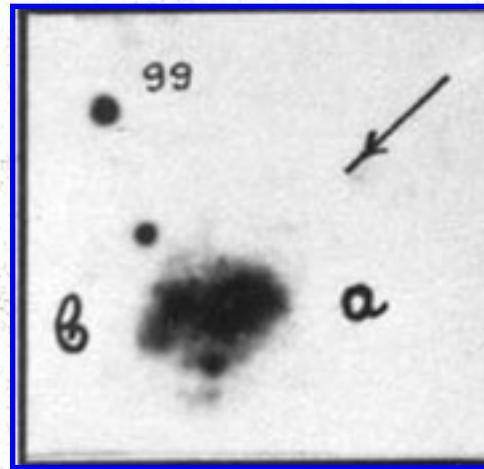
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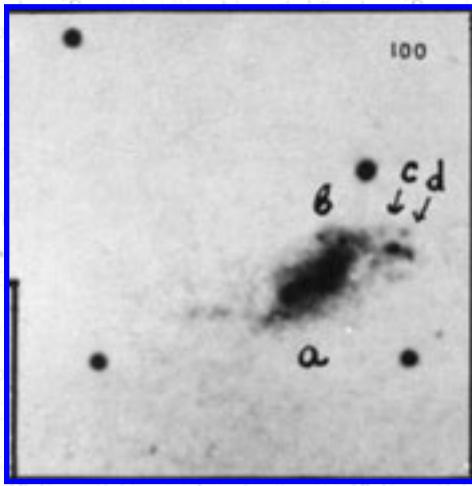
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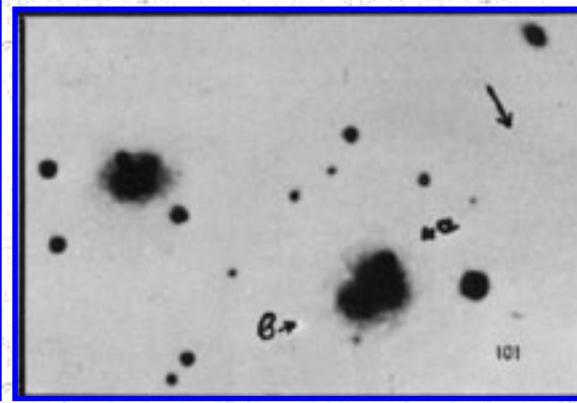
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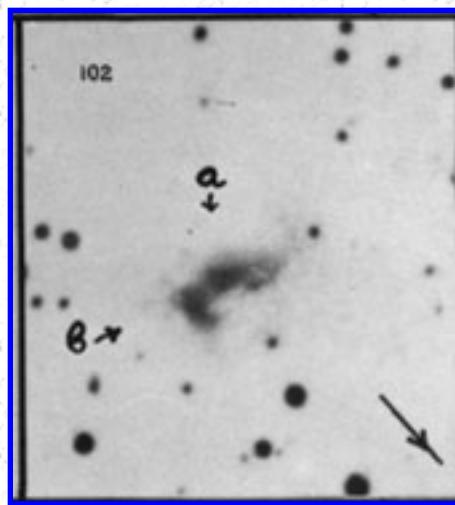
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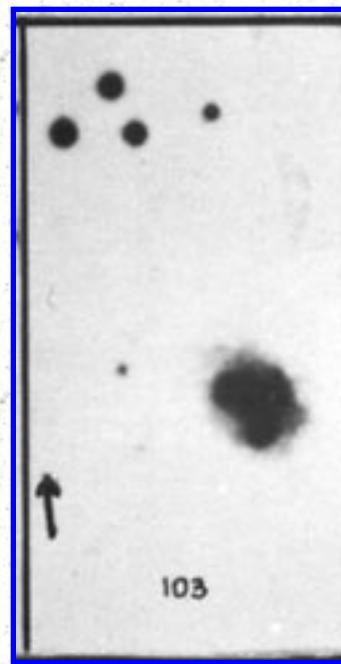
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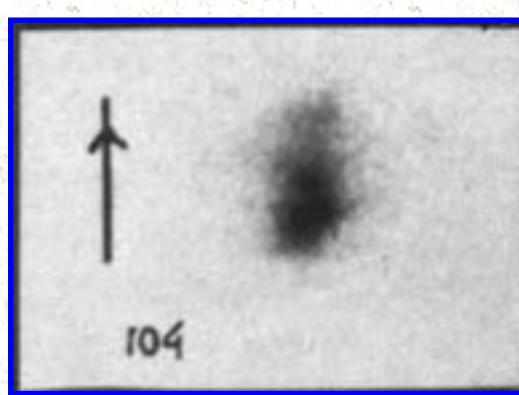
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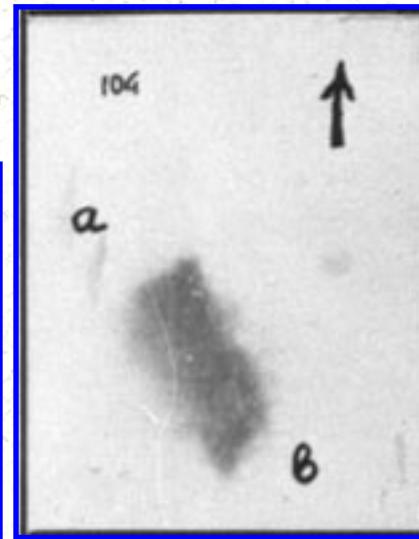
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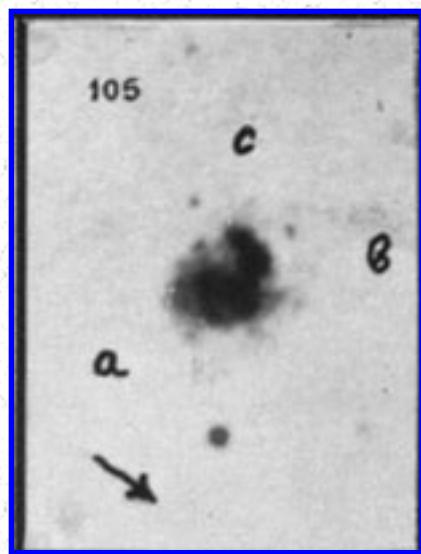
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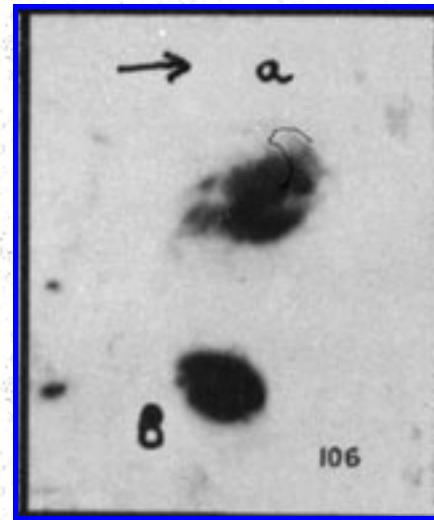
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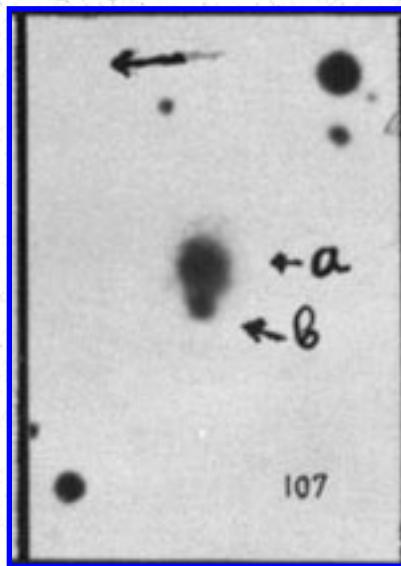
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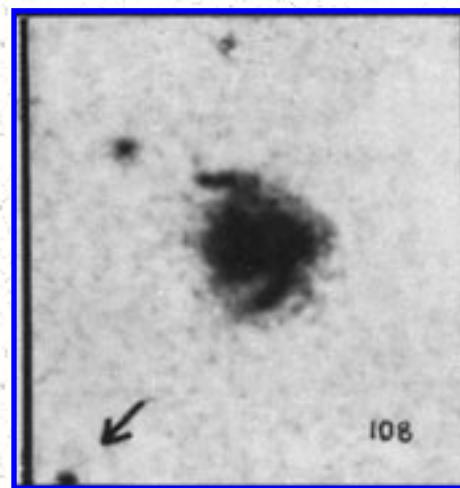
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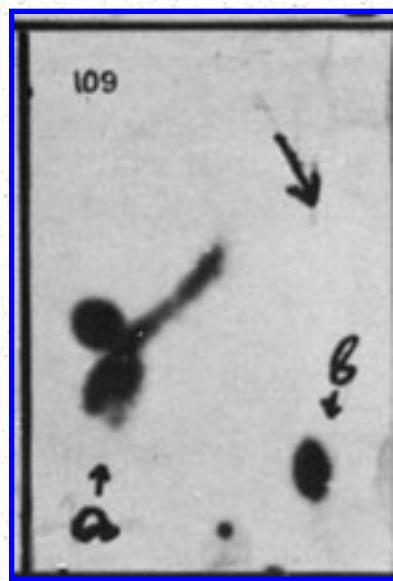
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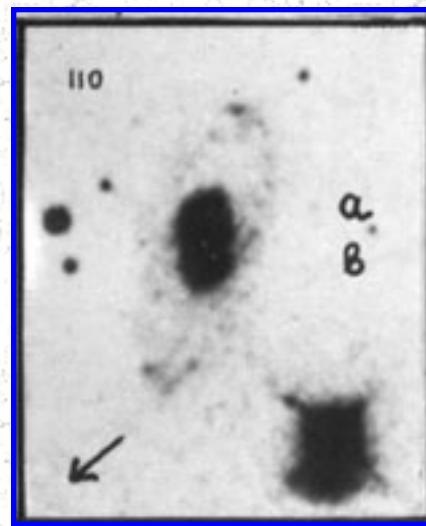
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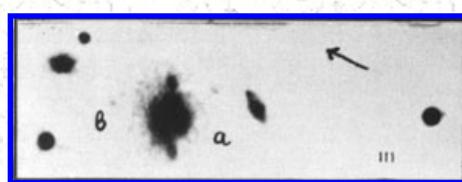
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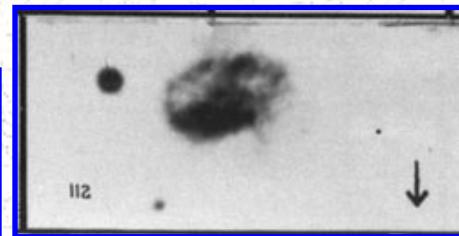
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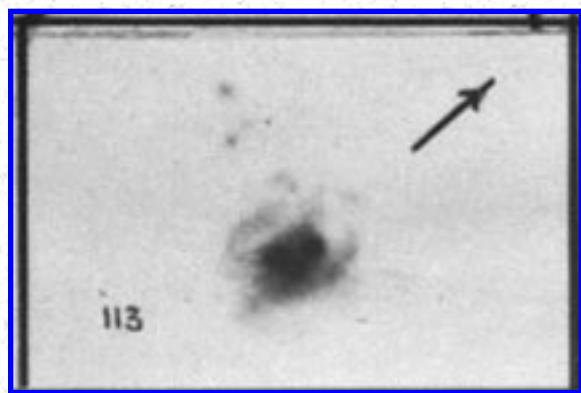
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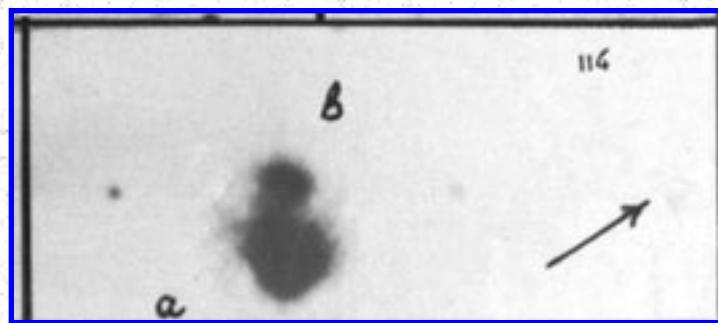
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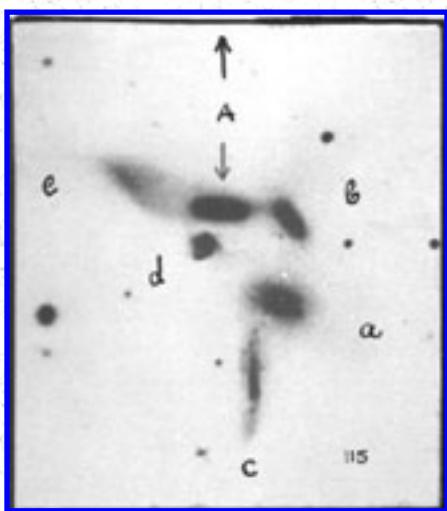
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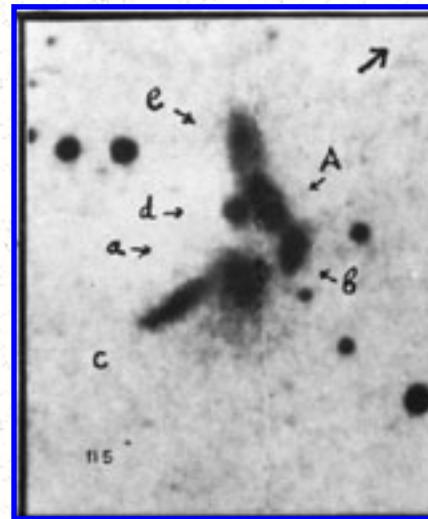
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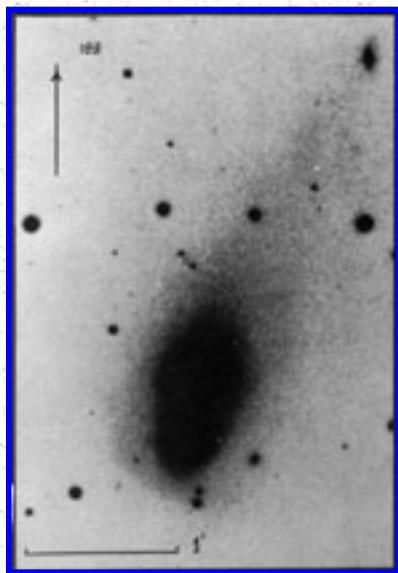
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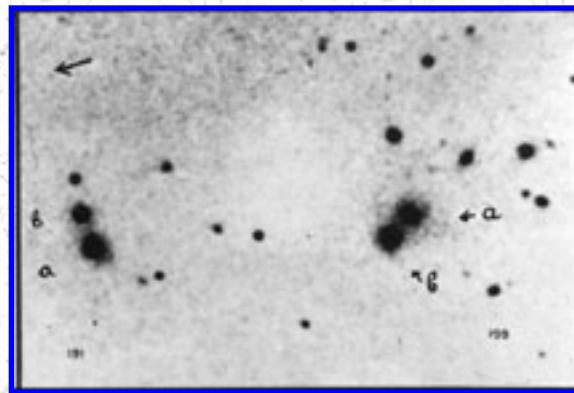
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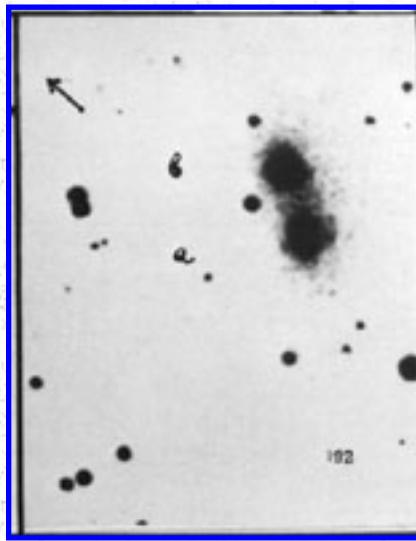
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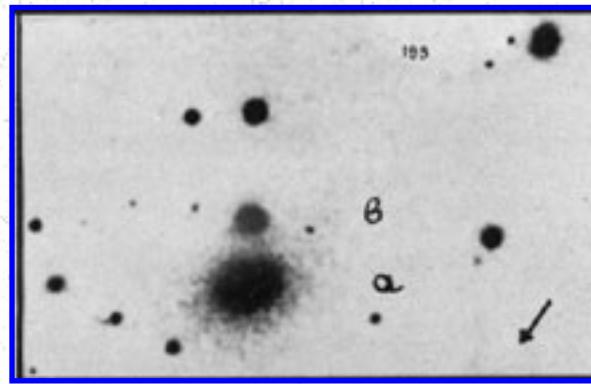
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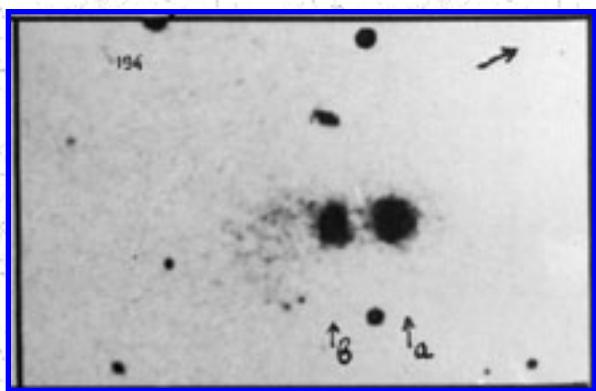
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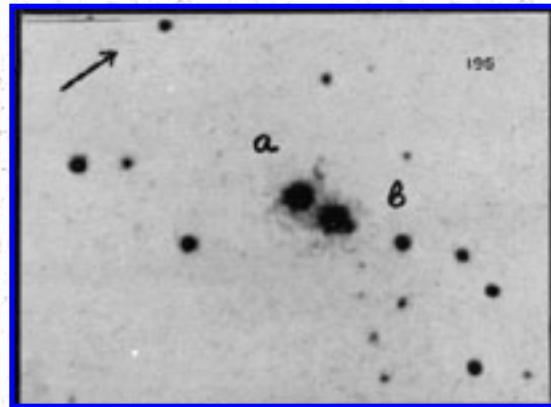
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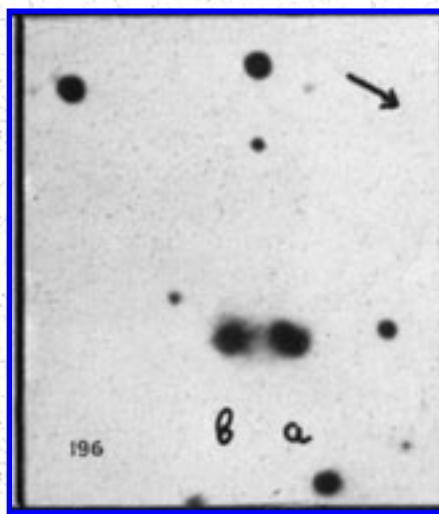
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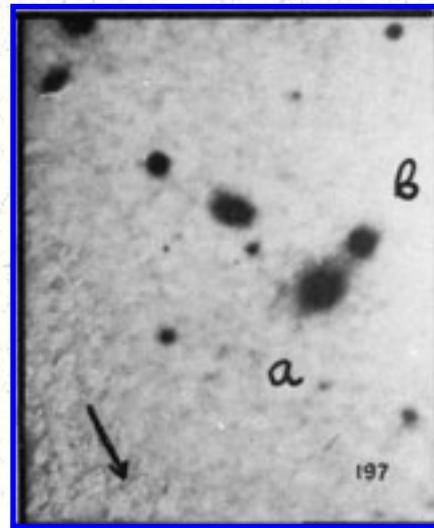
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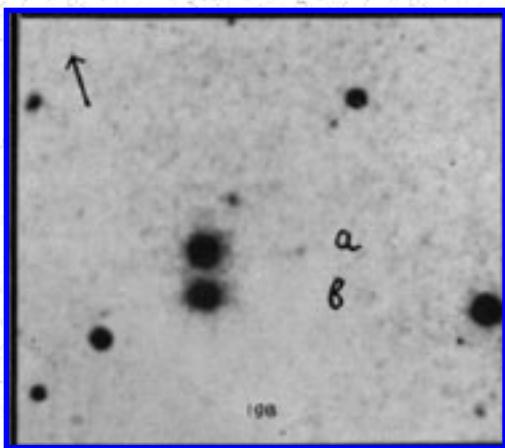
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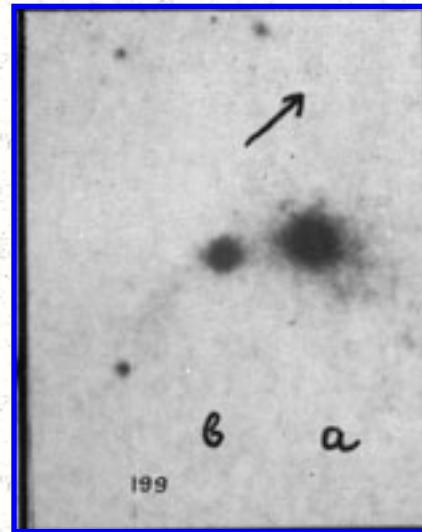
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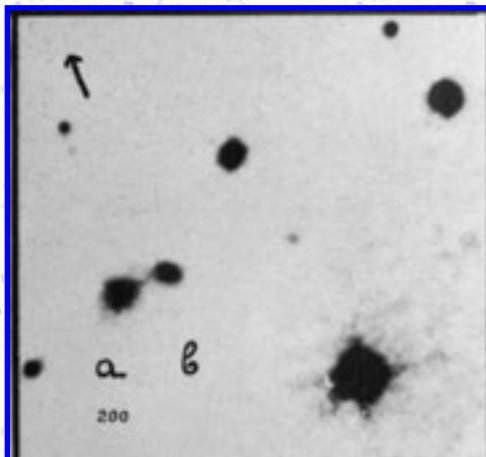
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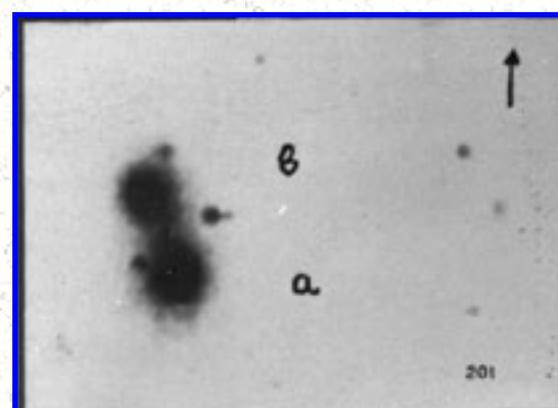
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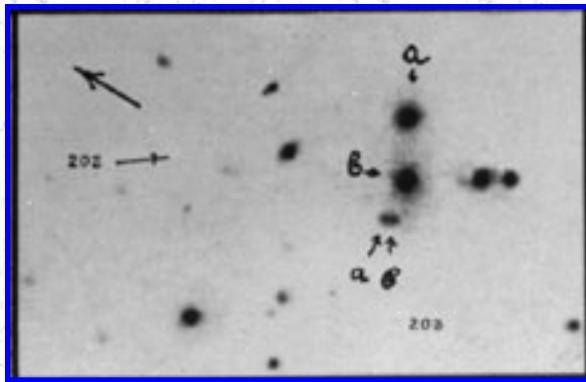
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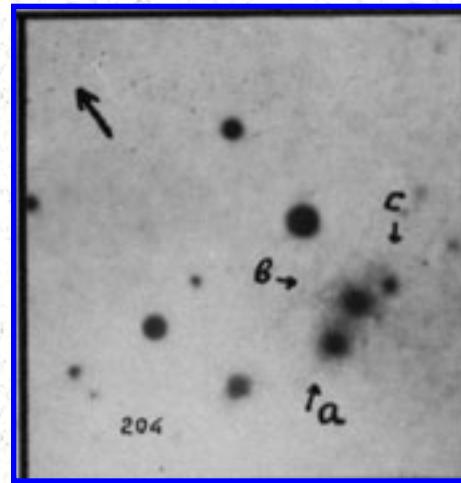
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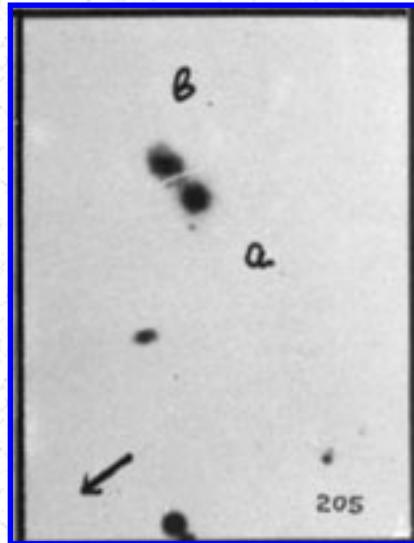
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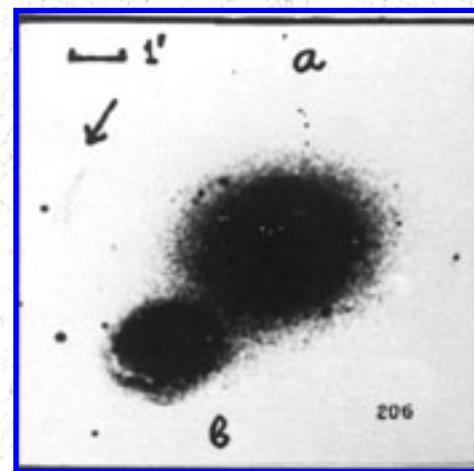
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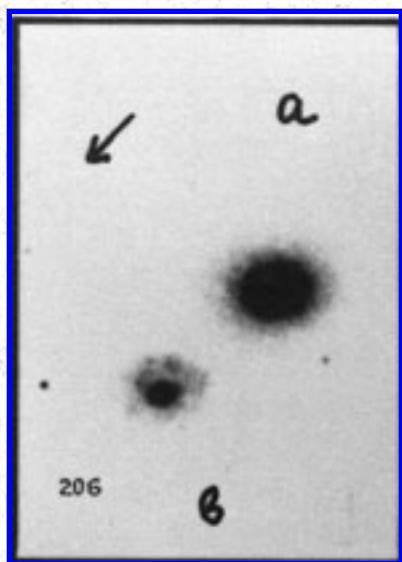
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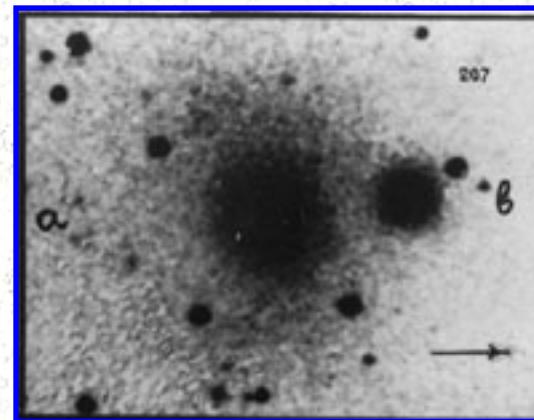
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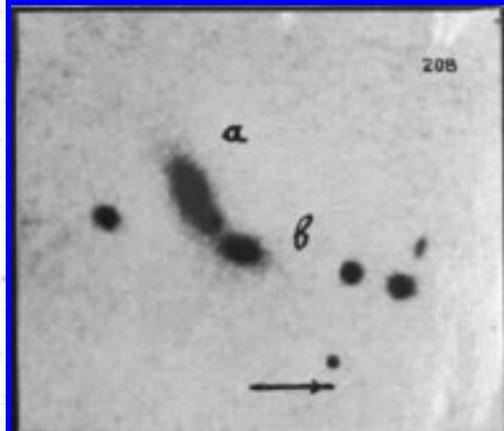
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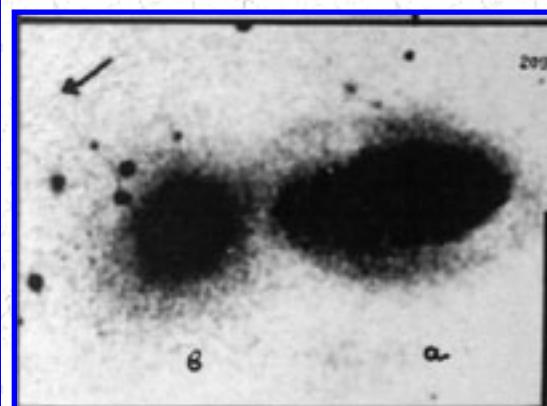
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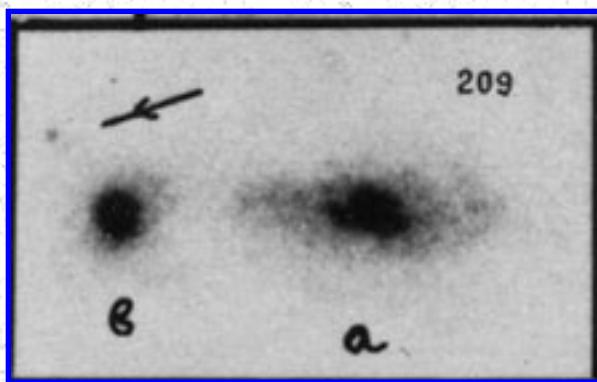
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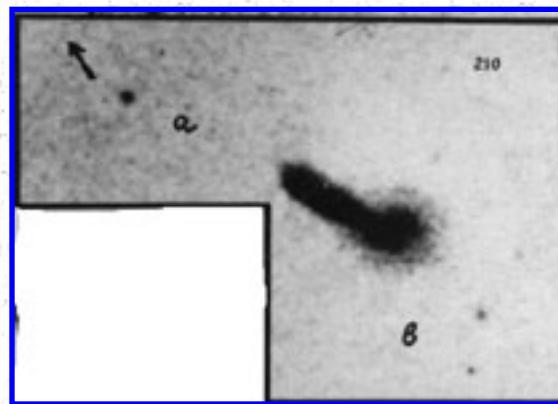
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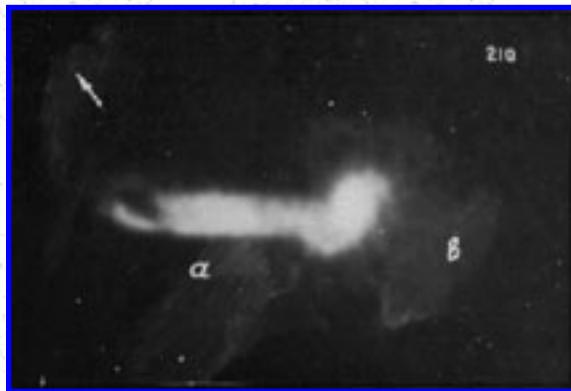
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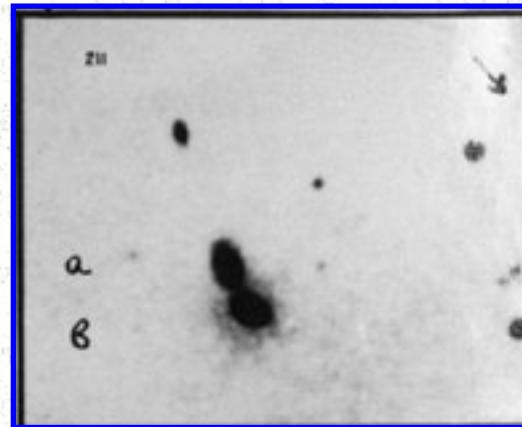
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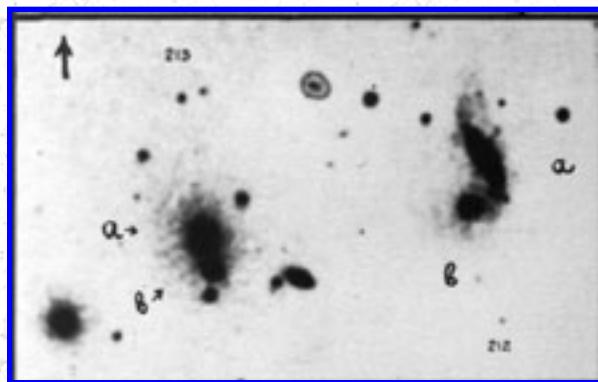
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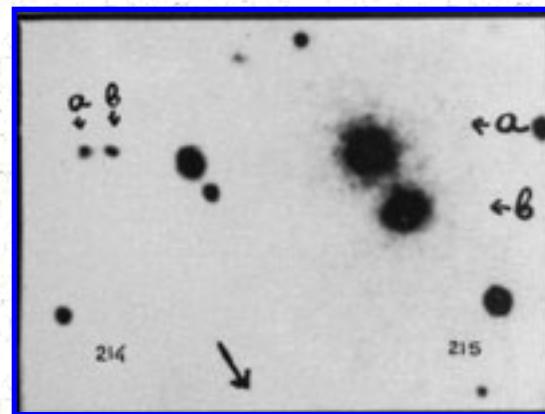
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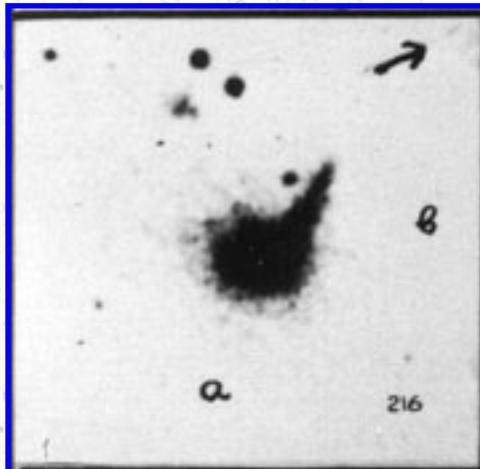
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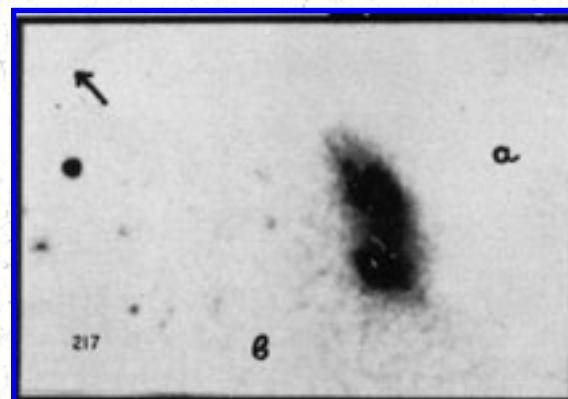
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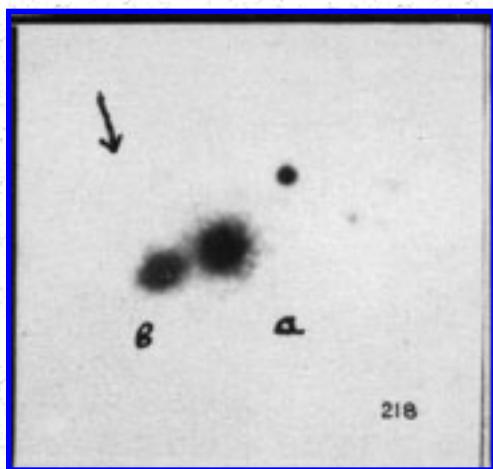
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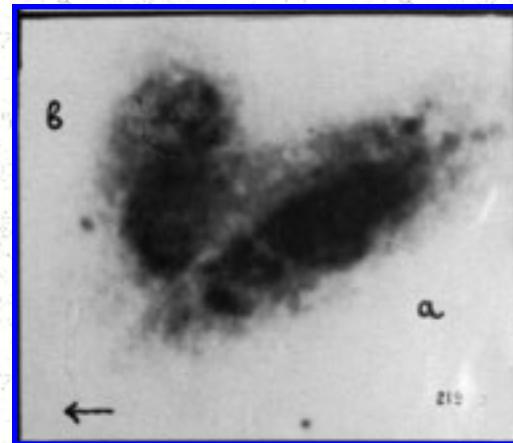
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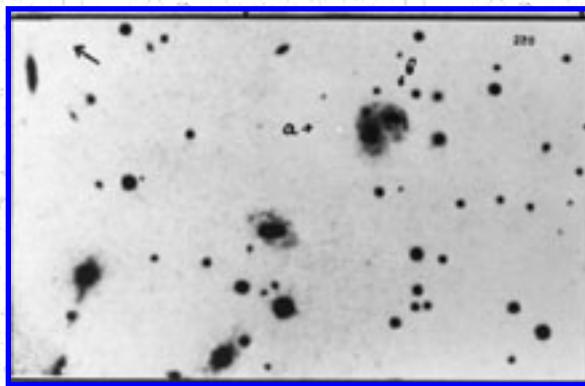
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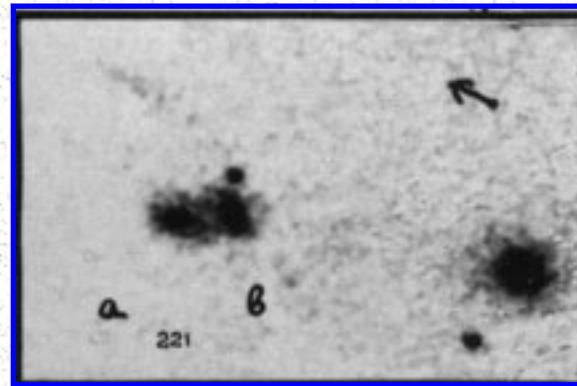
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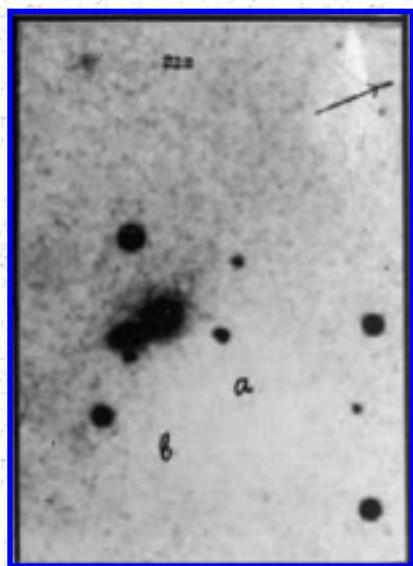
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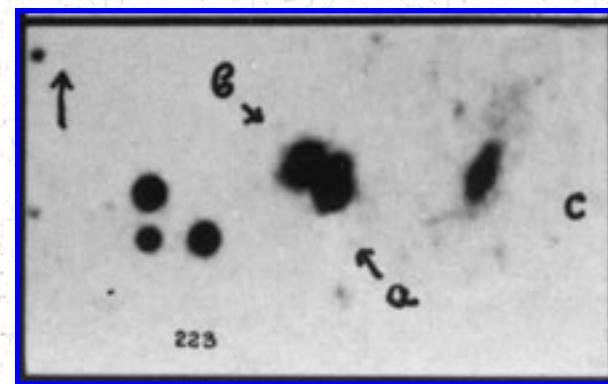
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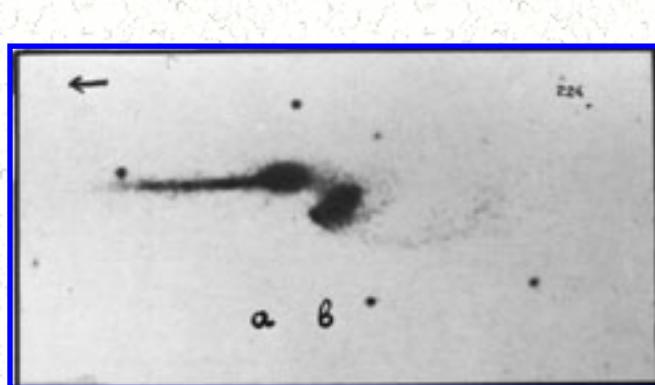
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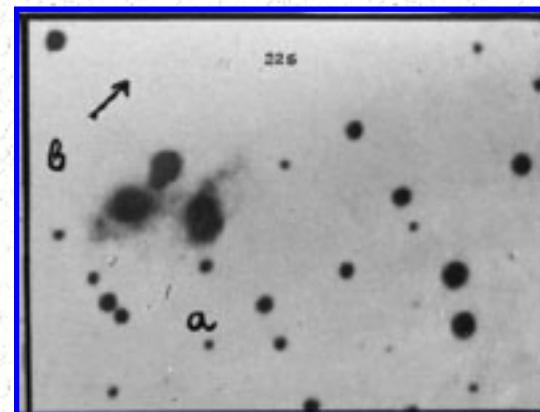
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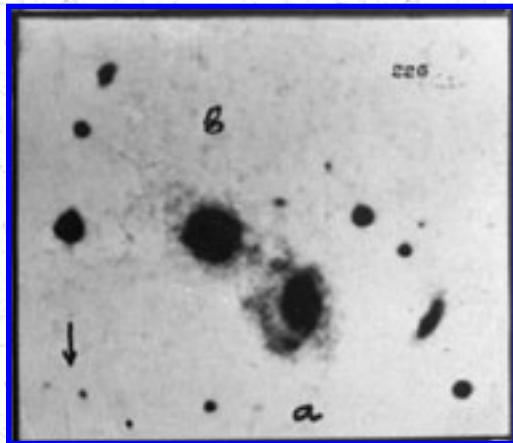
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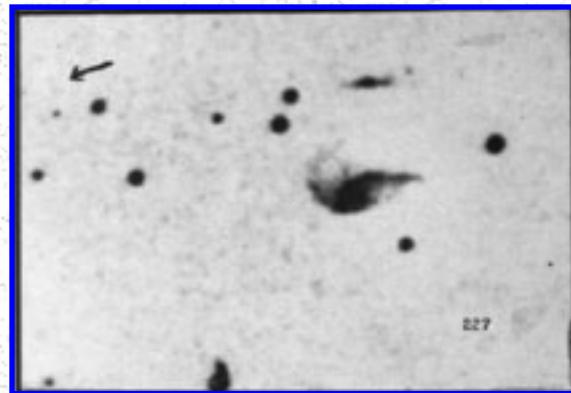
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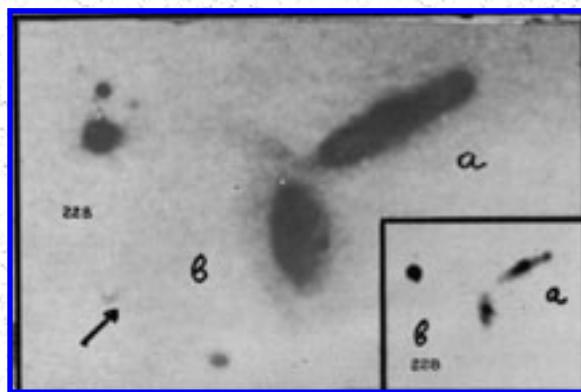
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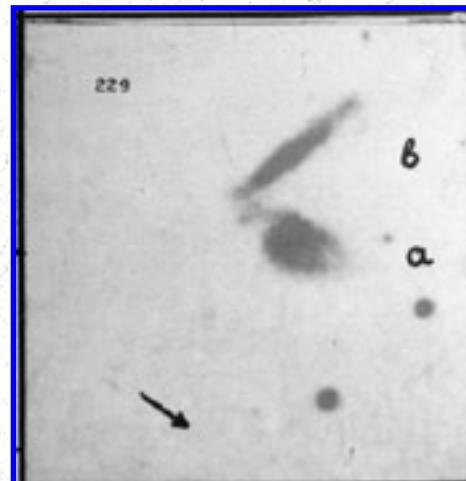
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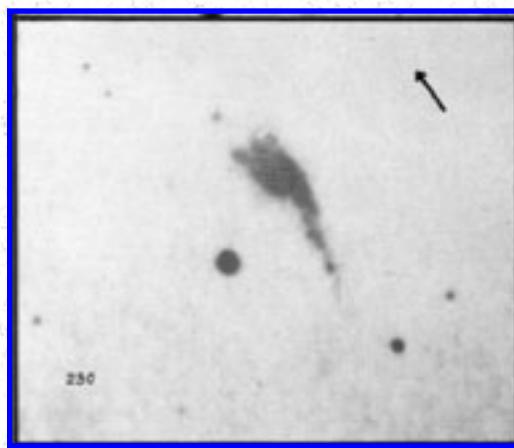
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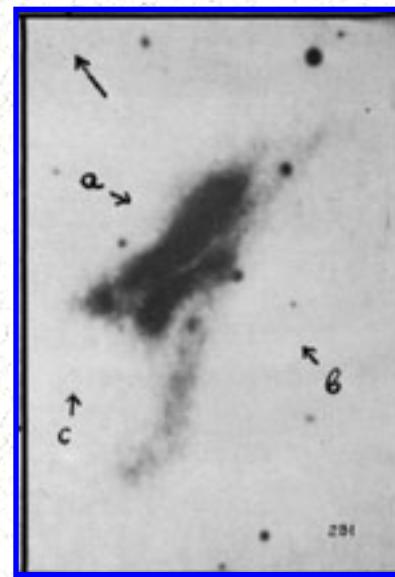
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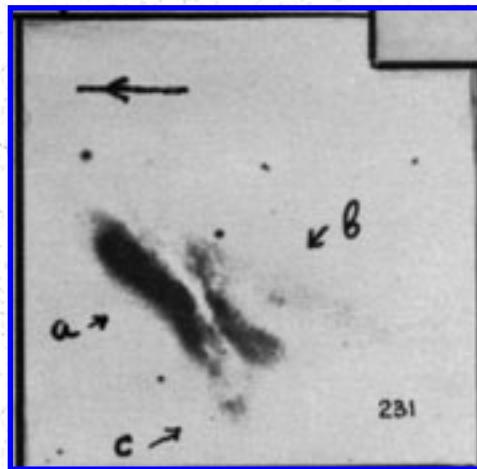
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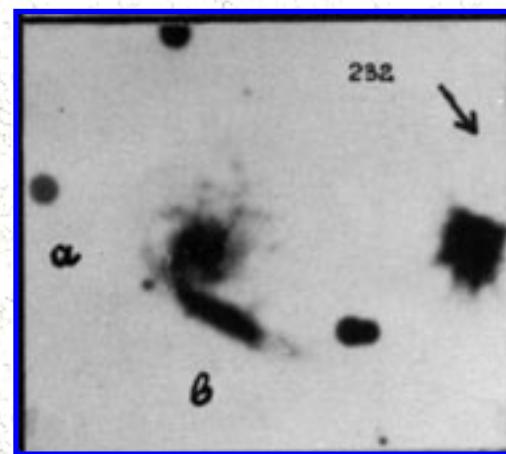
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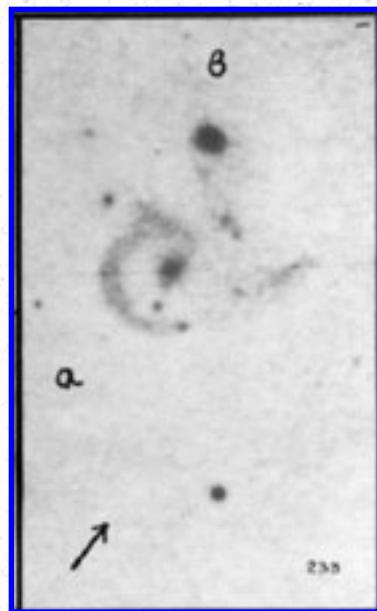
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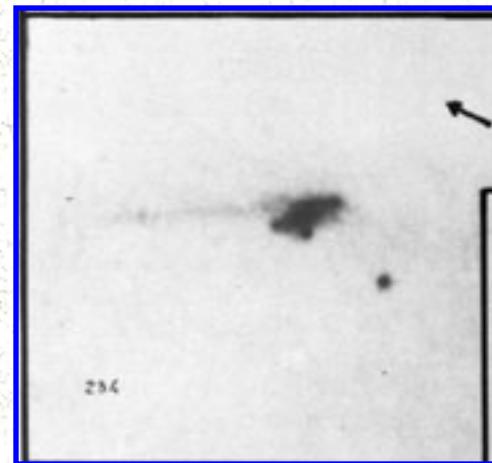
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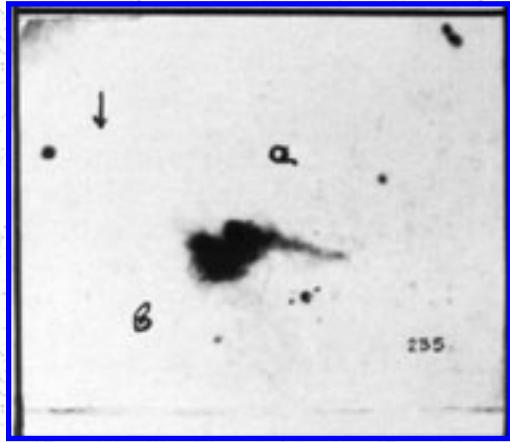
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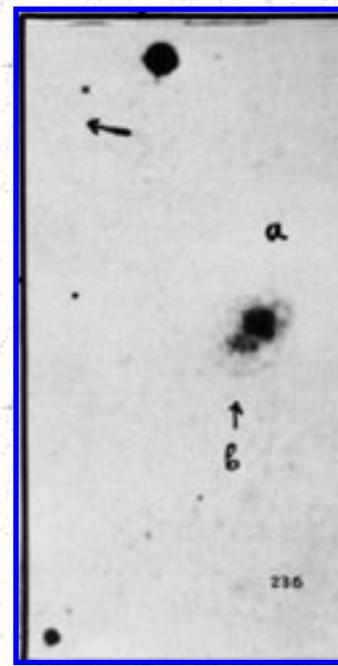
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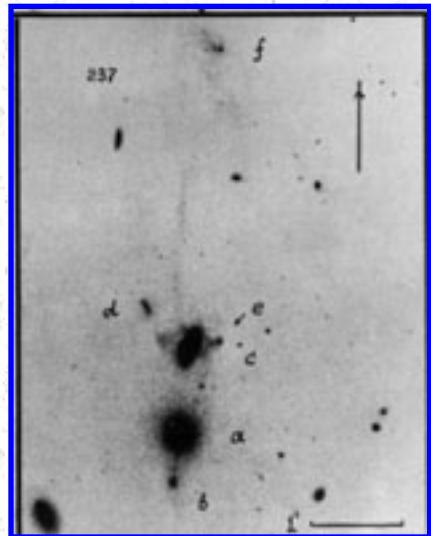
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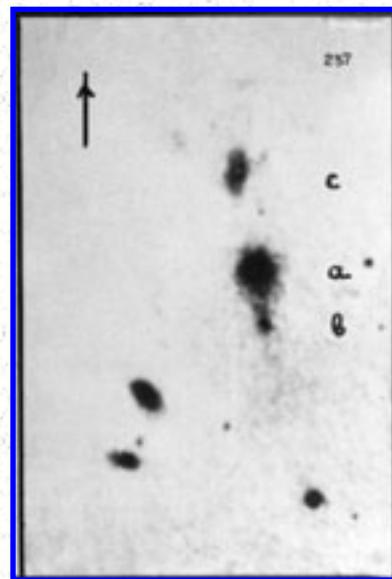
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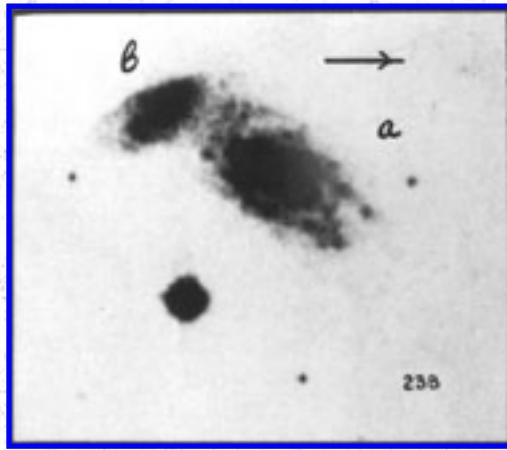
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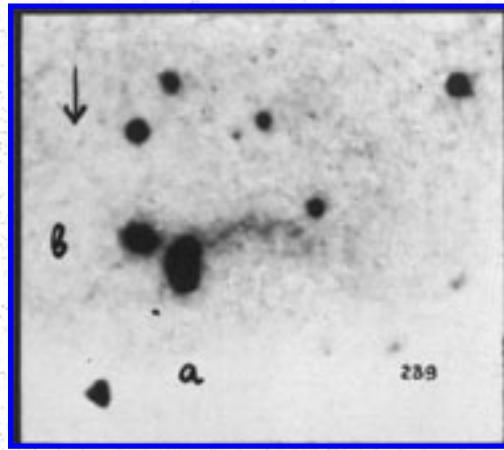
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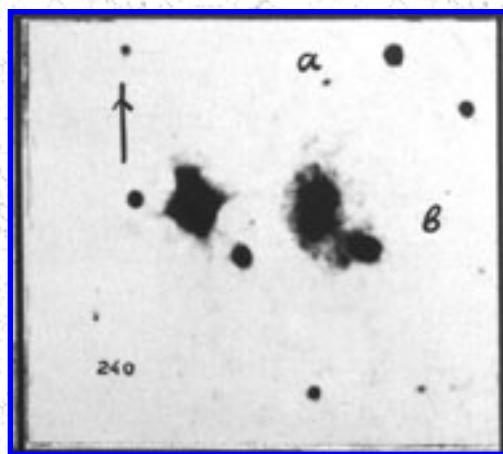
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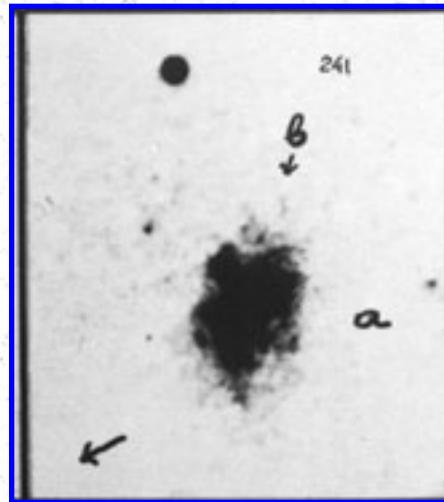
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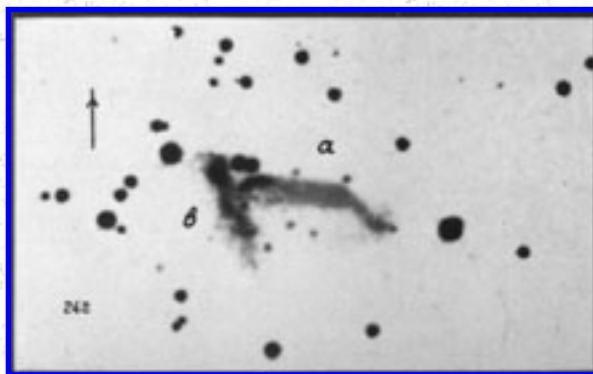
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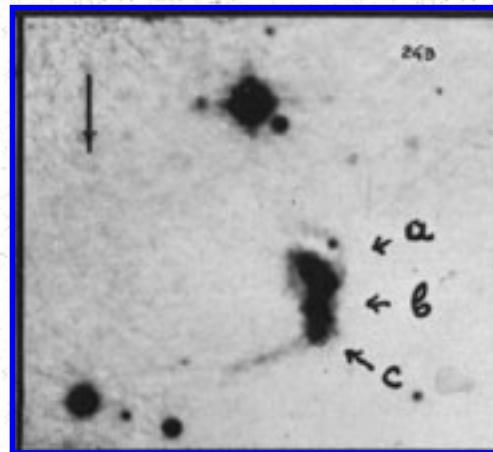
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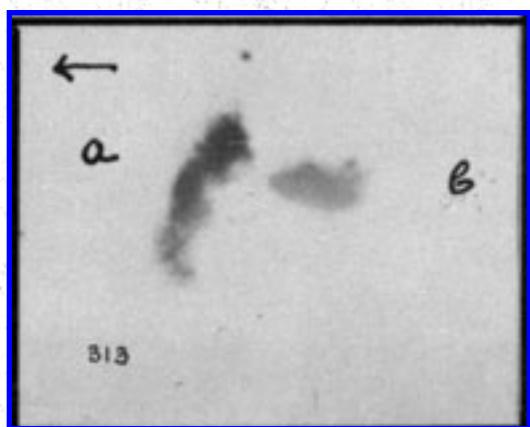
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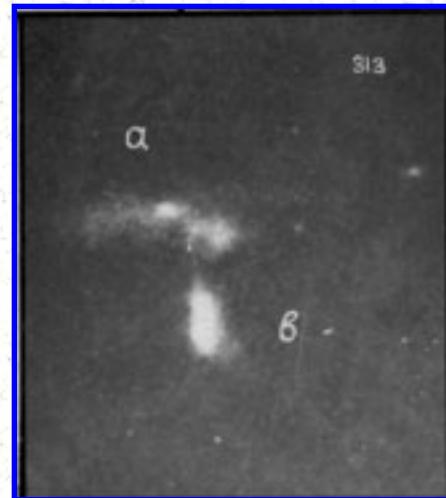
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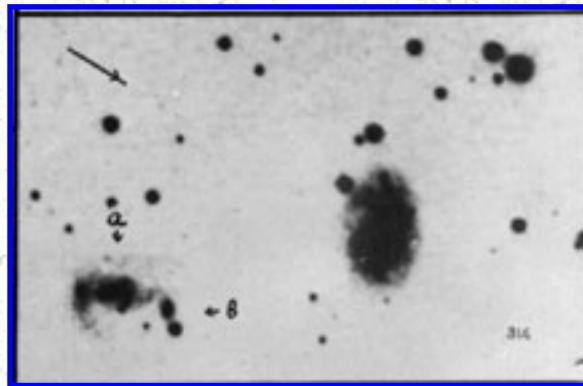
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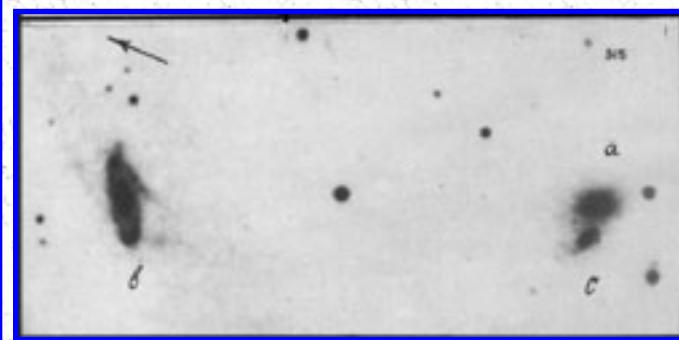
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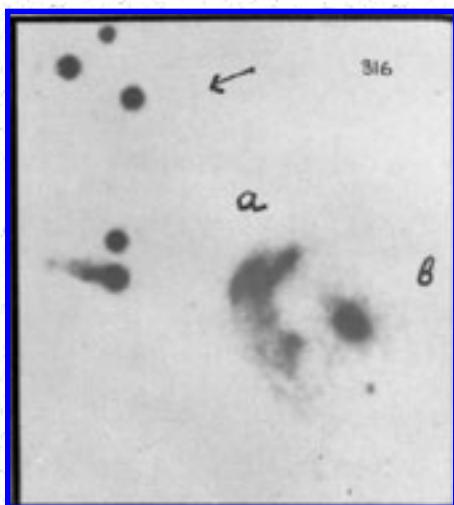
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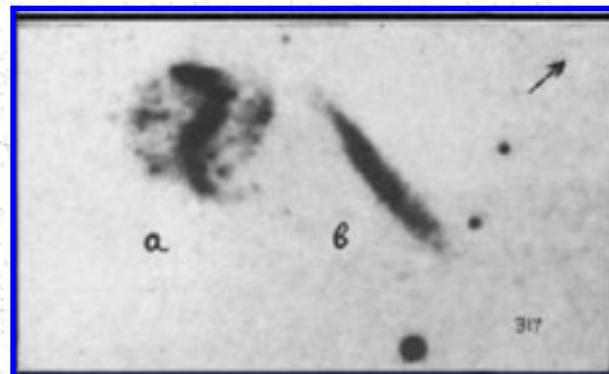
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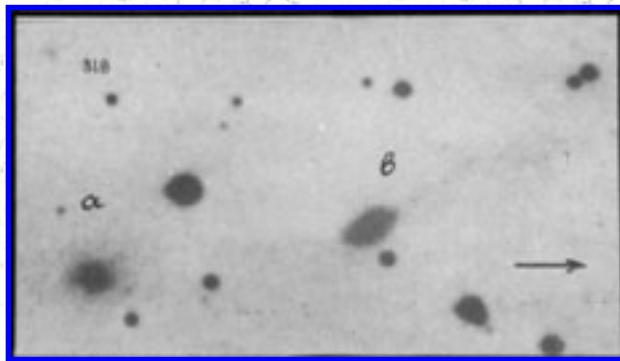
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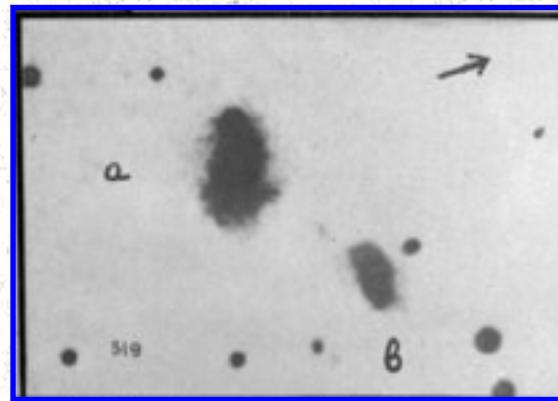
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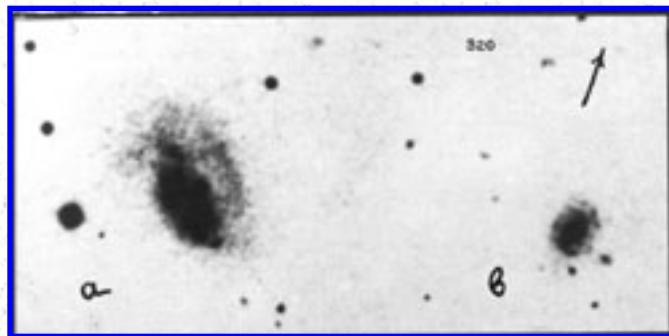
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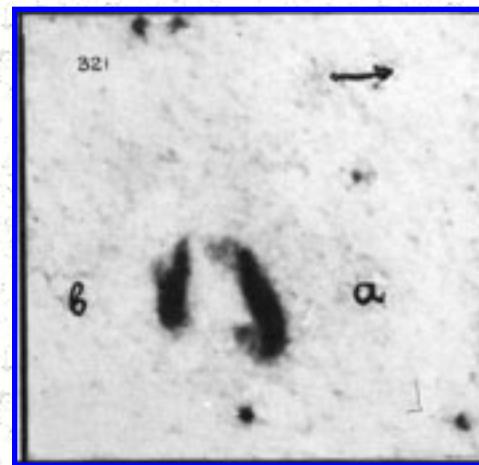
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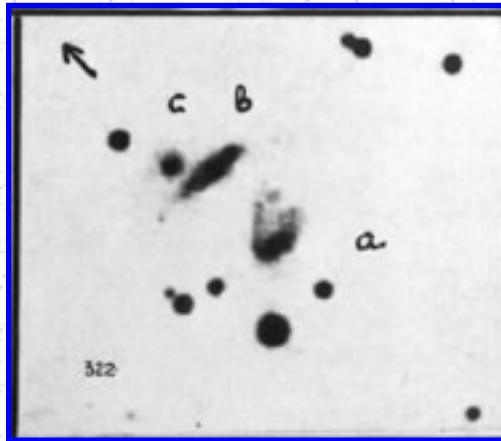
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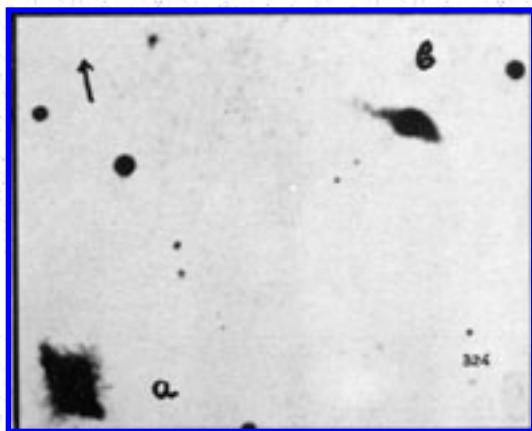
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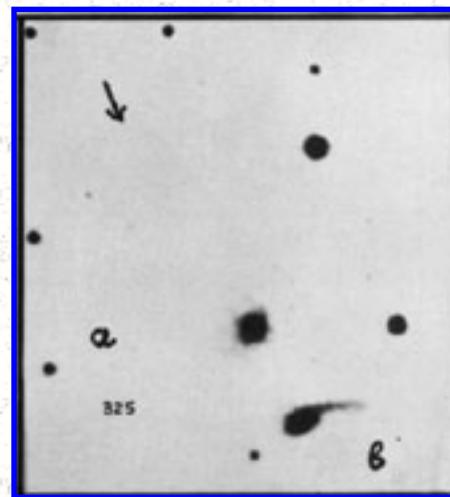
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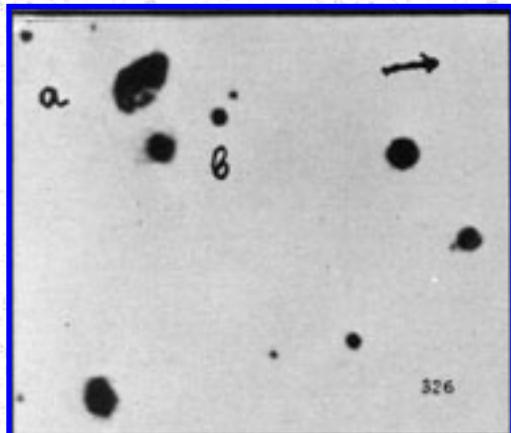
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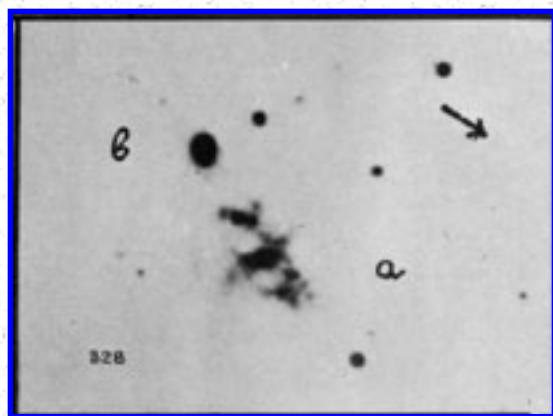
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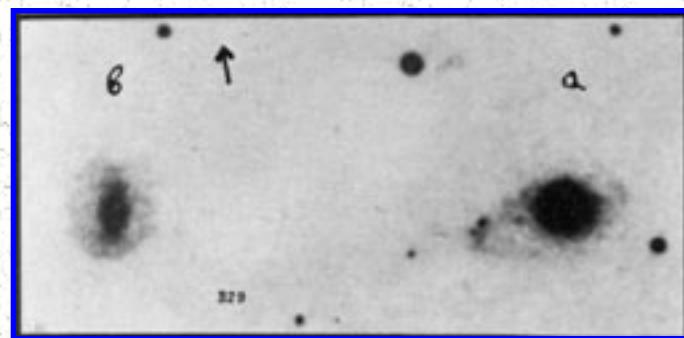
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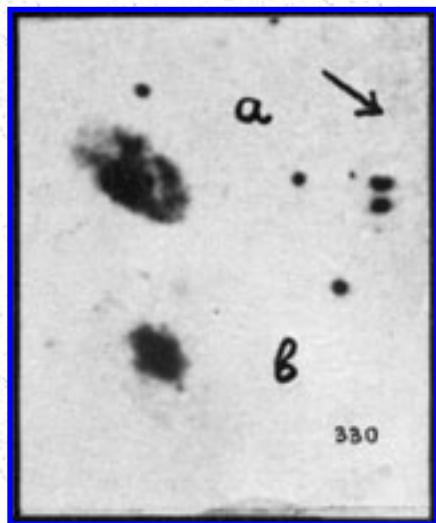
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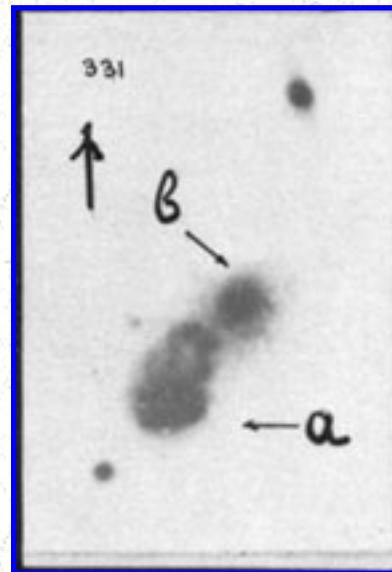
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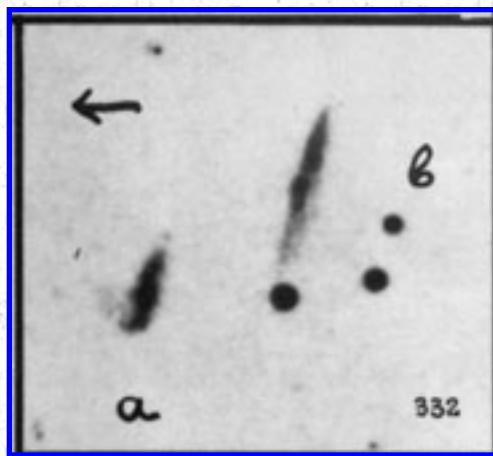
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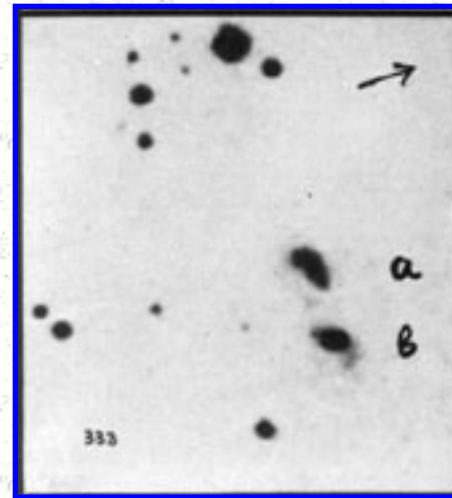
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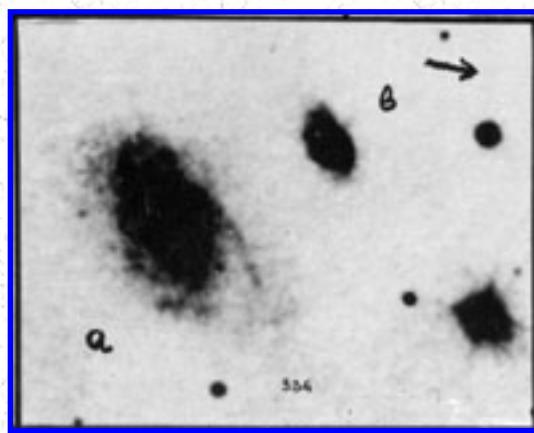
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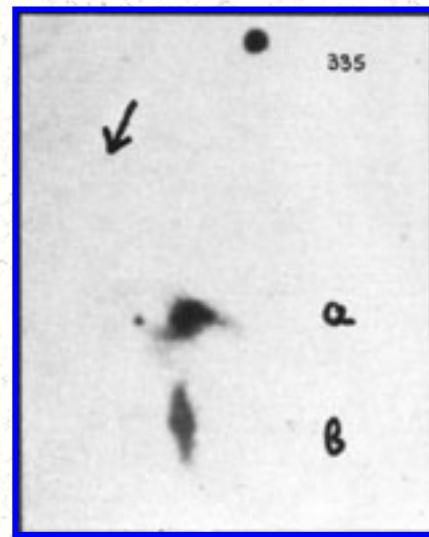
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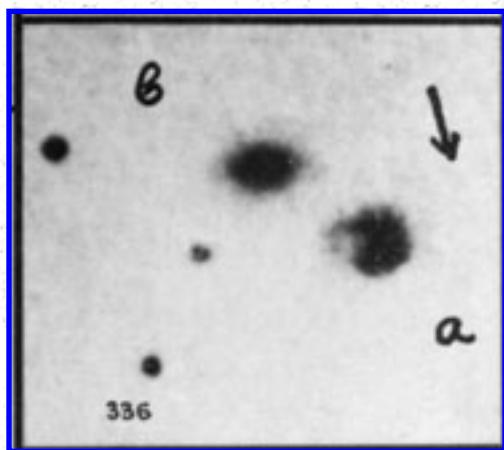
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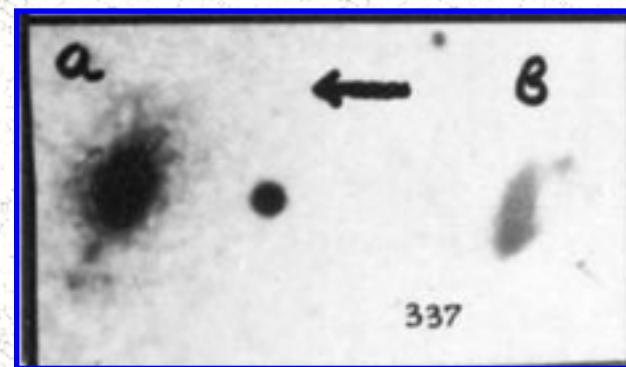
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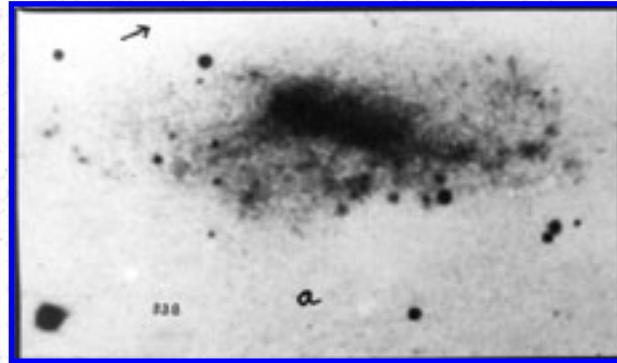
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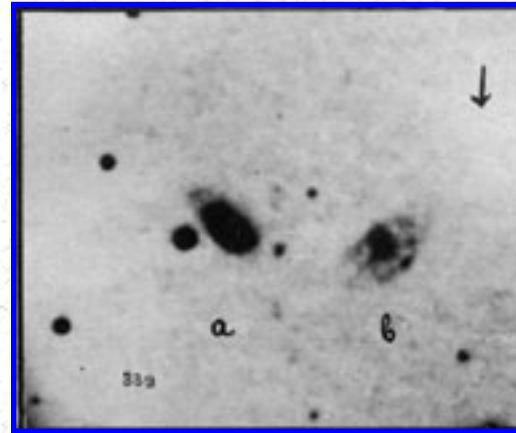
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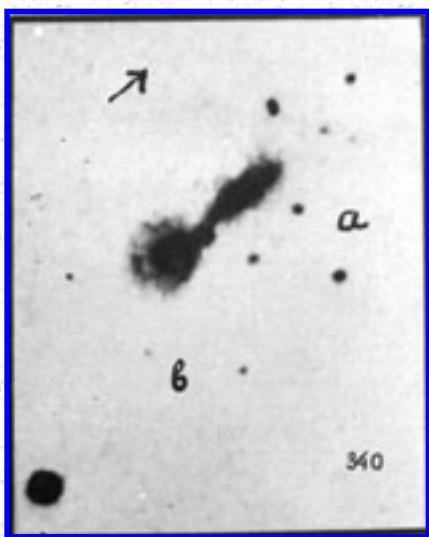
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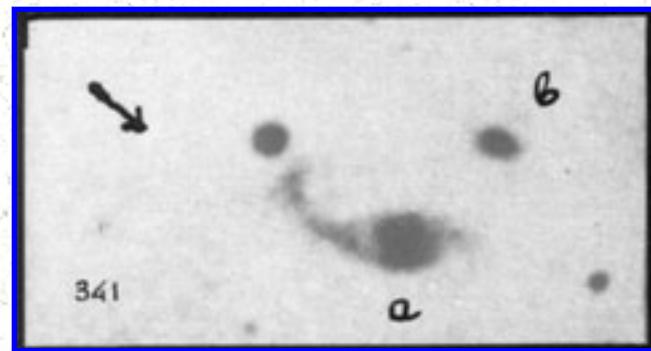
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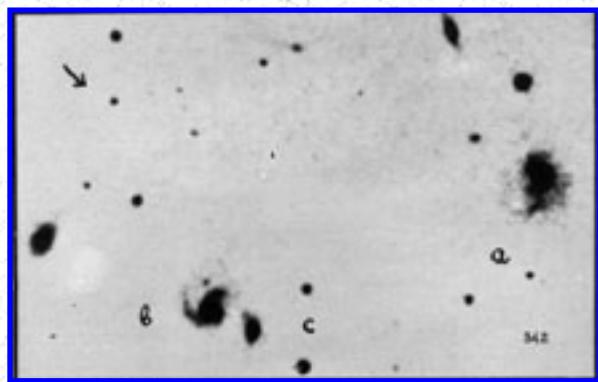
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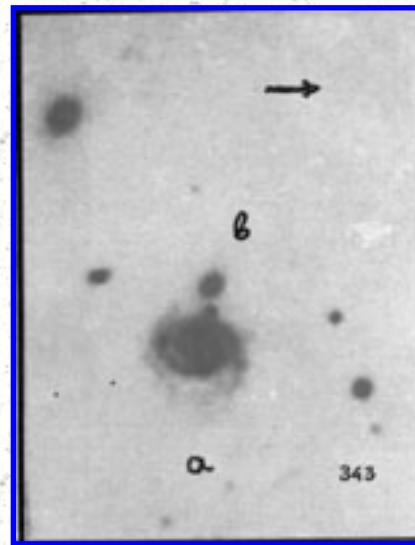
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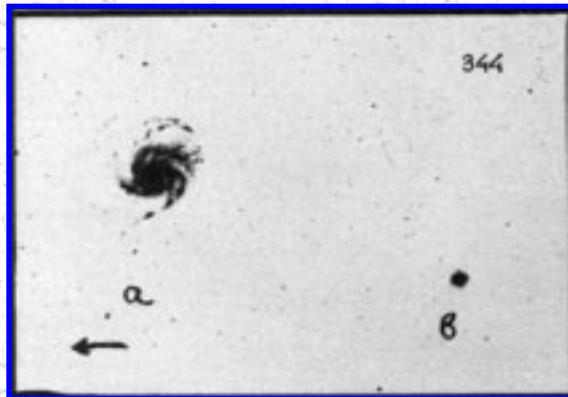
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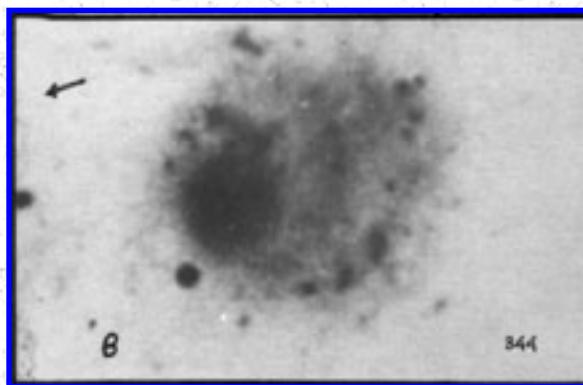
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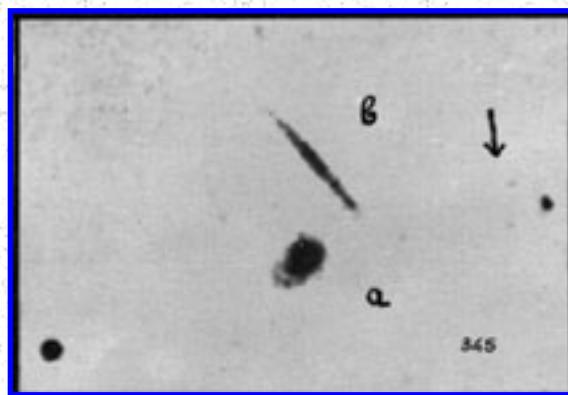
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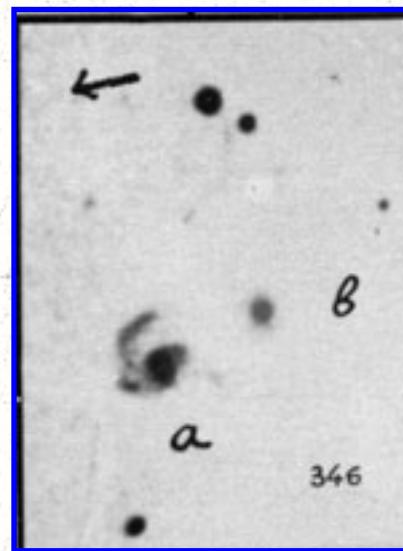
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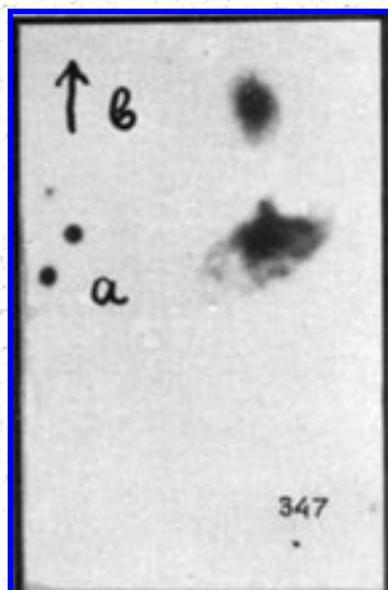
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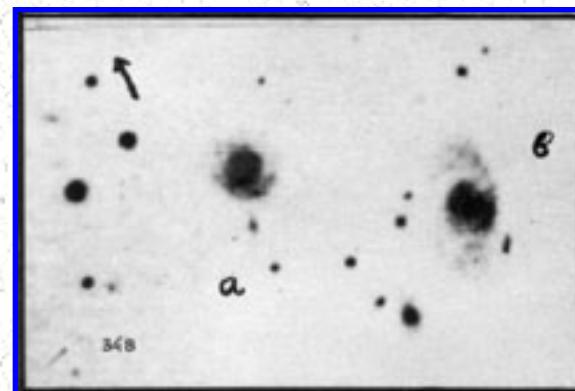
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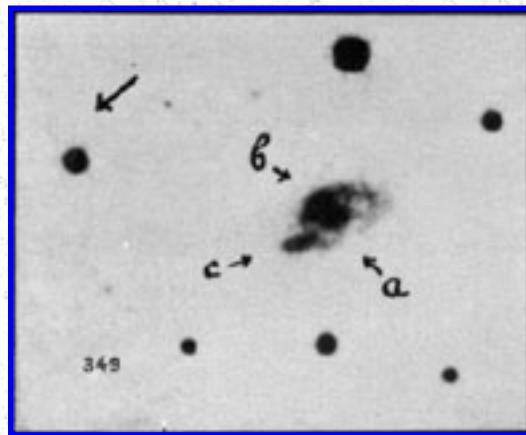
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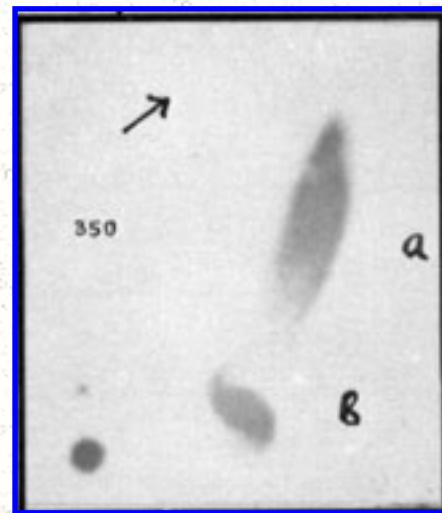
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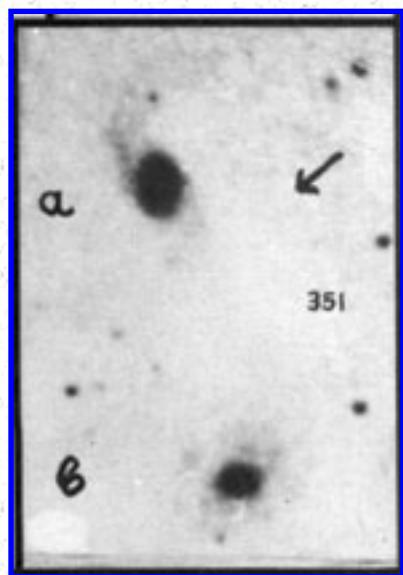
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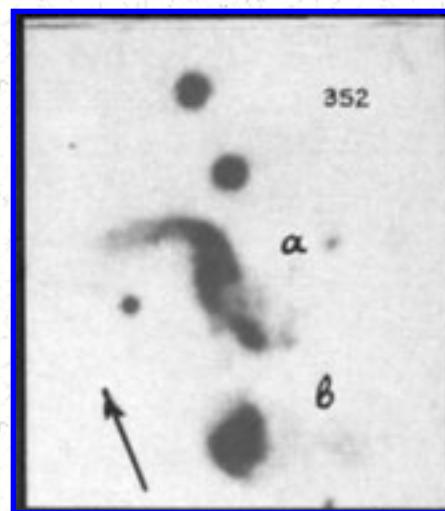
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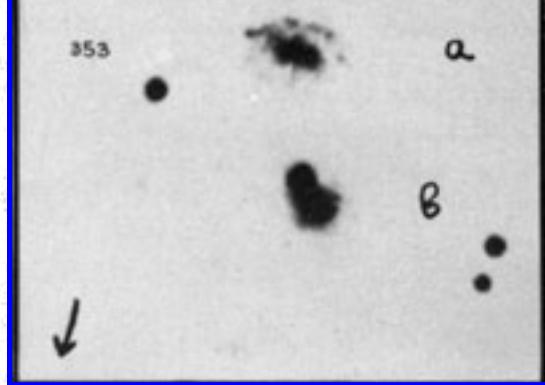
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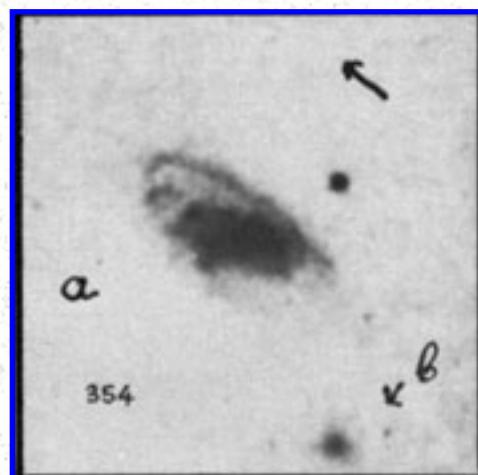
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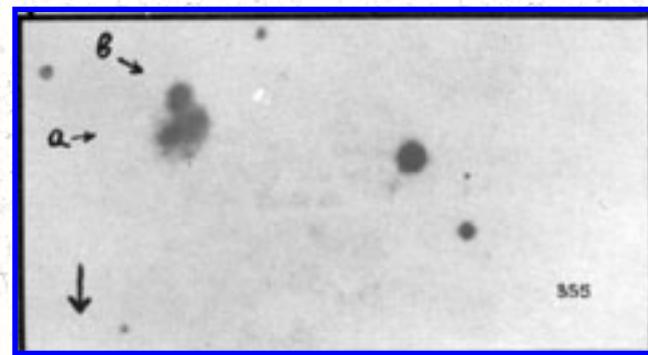


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