where no clear distinction is possible, are marked with—. No foreground galaxy was identified.

In the Southern Extension ($\delta < 5°$), we distinguish only between possible members (—) and background galaxies (B). In the W cloud and M cloud regions, all membership criteria break down, including the velocity criterion, except for the most extreme cases. Most galaxies in the W and M clouds are classified as possible members (—).

e) Galaxian Types (column 5)

The galaxies were classified primarily on the large-scale du Pont plates, but the deep IIIaJ 48″ Schmidt plates were always consulted for comparison and to allow for very faint surface-brightness features.

The classification system is in principle that set out in the *Hubble Atlas* (Sandage 1961) and in the *RSA* (Sandage and Tammann 1981, p. 5f). However, the system had to be extended to encompass the great variety of dwarf galaxies unfolding during the course of the preparation of the present catalog. The extension of the classification is described in Paper III (Sandage and Binggeli 1984). The main features of this extension are:

(1) Dwarf S0 galaxies (dS0) were found in analogy to the much more common dE's. As most dS0's appear to contain no dust, the dust type subscript (in the notation of the *Hubble Atlas*) is given only for the few dusty $dS0_3$ systems.

(2) A large fraction of early-type dwarfs, i.e., dE's and dS0's, show an unresolved, star-like *nucleus* at their centers. The presence of a nucleus is indicated by adding N to the type, e.g., dE3, N. It should be noted that nuclei fainter than $B = 23$ fall below the plate detection limit. Most nuclei in luminous E and S0 galaxies were probably missed due to high surface brightness.

(3) Dwarfish, irregular galaxies of *high* surface brightness—formerly called "extragalactic H II regions"—are classified here as BCD (= *b*lue *c*ompact *d*warfs) following Thuan and Martin (1981). Their closest relatives are probably Im III systems; in fact some galaxies are classified as Im/BCD. Type examples are given in Paper III; more about the BCD's and a complete list is given in Appendix C.

(4) Dwarfish E galaxies of *high* surface brightness (like M32) are not indicated in column 5, but their complete list down to $B_T = 18$ is given in Appendix C (Table XIII).

(5) Very extended dwarf galaxies of extremely low surface brightness may constitute a separate class, but they are not identified in column 5. Their complete list is given in Appendix C (Table XIV).

(6) Ellipticity classes are extended to include dE and dS0 systems. For dE's, simply Hubble's definition $e = 10\,(1 - R^{-1})$ is used, where the axis ratio R is taken to be given by $\log R = 1/2\,(\log R_{\rm est} + \log R_{25})$. Where no R_{25} values are available (cf. column 8), it is assumed $R = R_{\rm est}$. The ellipticity classes (given in parentheses) of dS0 galaxies are eye estimates from the du Pont plates. They refer to the *disk* and they may differ considerably—particularly in the case of barred and edge-on S0's—from the ellipticity classes calculated from the isophotal axis ratios R.

(7) Luminosity classes (LC) in Roman numerals are assigned, where possible, to all galaxies later than Sa. For spirals, the classification is based on the regularity of the spiral arms, as originally proposed by van den Bergh (1960). For faint late-type systems, the spiral structure is lost, and the classification has to rely on surface brightness. A sequence of LC = I to V is illustrated in the RSA. The present classification deviates systematically to some degree from this sequence, as explained in Paper III (p. 922). The luminosity class difference Δ = LC (VCC) − LC (RSA) increases up to one luminosity class for the faintest galaxies. Thus the luminosity classes given here are not in the RSA system, but rather in the system illustrated in Paper III.

Classification uncertainties are indicated by:, more severe uncertainties by?. These symbols follow the uncertain parts of the classification, e.g., dE4?, N versus dE4,N?. Ellipticity class and luminosity class are either given without indicating an uncertainty or are not given at all. In a number of cases, it is impossible to distinguish with any certainty between dE, dS0, and Im galaxies. The classification Im? or Im: means therefore that it could be also a dE or dS0 galaxy. The corresponding alternatives hold for dE?, dE:, dS0?, and dS0: galaxies. In cases where no type assignment could be preferred the ambiguity is spelled out: "dE or Im". At present, it is not clear whether these uncertain cases are due to insufficient resolution or whether they represent truly transitional types.

In some cases, uncertain type assignments are coupled with uncertain membership assignments. For instance, an Im? background? galaxy is a certain cluster member *if* the classification Im is correct; in case it were some giant galaxy it would belong to the background.

f) Magnitudes (column 6)

The total blue magnitudes B_T come from eight sources:

(1) For 139 bright catalog galaxies in the Virgo cluster area, accurate B_T magnitudes are listed by de Vaucouleurs and Pence (1979, DVP), who also give fully corrected Zwicky magnitudes for an additional 373 bright galaxies with a quoted mean error of 0.14 mag.

(2) DVP (Table IV) give B_T values for an additional 668 galaxies. The magnitudes are derived from Zwicky magnitudes by a bulk correction. Their quoted mean error of 0.34 mag seems somewhat optimistic judging from source (4).

(3) Detailed surface photometry for 109 galaxies in Virgo Fields 18 and 25 was carried out on the Las Campanas plates, as described in Paper I. The 1σ errors of these magnitudes down to the plate limit of dE's, i.e., $B_T \sim 20$ mag, was estimated to be 0.1 mag. This estimate has since been confirmed by 21 galaxies for which independent magnitudes of Ichikawa *et al.* (1984) were kindly made available by Dr. S. Okamura. A comparison of the two magnitude systems yields (cf. Fig. 3, dark circles):

$$B_T\,(\text{Paper I}) = 1.09\,B_T\,(\text{Ichikawa } et\ al.) - 1^{\rm m}57 \qquad (1)$$

over the range $14 < B_T \leqslant 19$. The scatter about the correlation line for the 21 galaxies is $0^{\rm m}12 (1\sigma)$.

(4) For about one thousand catalog dwarf galaxies, B_T magnitudes were estimated on the du Pont plates. The eye estimates are based on the estimated *mean* surface brightness of a galaxy and its surface, reckoned from the apparent mean diameter. For the surface-brightness estimates, the galaxies from source (3) were used as photometric standards down to the detection limit.

The procedure requires uniformity for all 67 du Pont plates. The requirement is not fully met, some plates being somewhat deeper, others shallower. Additive Δm corrections were therefore applied to all galaxies on one plate. The (positive or negative) values of Δm were determined from IIIaJ 48″ Schmidt plates, which cover an area about ten times larger. The corrections never exceed 0.3 mag. Another error source comes from the specific optical design of the