



Charlier, Carl V. L.

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| Abstract: | Carl Charlier was a Swedish astronomer and statistician. He was influential in making mathematical statistics a university subject in Sweden. His main statistical contribution was the Gram-Charlier expansions of continuous (Type A) and discrete (Type B) distributions. In astronomy he successfully created a hierarchical galaxy cluster model. |
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C.V.L. Charlier; painting in oil by Henning Malmström, 1922

Born: April 1, 1862 in Östersund, Sweden

Died: November 4, 1934 in Lund, Sweden

Contributed to: Stellar statistics, astronomy, mathematical statistics, series expansions

Carl (Vilhelm Ludvig) Charlier was the son of Inspector Emerich Emanuel Charlier and his wife Aurora Kristina, born Hollstein. He studied astronomy in Uppsala, writing a PhD dissertation on the perturbations caused by Jupiter on the asteroid Thetis, which he successfully defended in 1887. After working at the observatories in Stockholm and Uppsala, he was in 1897 appointed Professor of Astronomy at Lund University, and Director of the University Observatory there. Initially he worked on celestial mechanics, but in 1906 he published *Researches into the Theory of Probability* (Char-

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lier, 1906) in which he expresses admiration for Karl Pearson and says that he intends to develop his research along the line laid down by Pearson and his school.

Much of statistics originated in astronomy. Measurement error, least squares, Poisson processes all came out of astronomical applications (e.g. Sheynin, 1984). Stellar statistics, as a subfield of astronomy, deals with the systematic study of planets, stars, galaxies, and other astronomical entities (<stat00155>). It originated with Kapteyn's 1906 40-observatory collaborative study of our galaxy (Kapteyn, 1922). Kapteyn, known as the astronomer without a telescope, had immense amounts of data flowing into his institute in Groningen, and said "for statistics we must have great masses of data" (Paul, 1985). Charlier would work in a very similar vein. He wanted a modern institute of scientific computation, analysis, and thought. To that avail he employed, instead of university students or astronomers, a cadre of female computers without formal education, who would do the practical number-crunching, leaving the scientists to do the thinking and draw deductions (Holmberg, 1999, pp. 60-63).

His most important astronomical contribution was probably his development of Fournier d'Albe's hypothesis of a hierarchical structure of the universe into a mathematical description that allows for an infinite hierarchy of clusters with vanishing average density (Charlier, 1922). Thus a Newtonian universe can be infinite without gravitational collapse. It also solves Olber's paradox: with an infinite number of stars, why is the night sky dark?

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8 In Charlier's universe the integrated contribution of all the stars is negligible.
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10 The hierarchical structure is, in fact, one of the earliest examples of a fractal
11 distribution (<stat00056>) in science.
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14 While Charlier was first and foremost an astronomer, he emphasised the
15 role of statistics both in astronomy and in other sciences. He argued strongly
16 for the importance of the university having an instructor in mathematical
17 statistics. in addition to a professor in political science and statistics. His
18 argument prevailed in 1915, and his student Sven Wicksell was appointed to
19 the position.
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23 Charlier's methodological work in statistics dealt mainly with series ex-
24 pansion to approximate distributions (? for the continuous case, <stat0996>,
25 and ? for the discrete case, <stat01213>).
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29 In 1897 Charlier was called upon as the secretary in an official committee
30 to design a new tariff system for person transports on Swedish railways. His
31 scientific approach, supported by empirical data from European railways, was
32 to estimate the change in usage income and maintenance costs that could
33 be expected from a reduction in tariffs. The recommendations in the official
34 report (Charlier, 1898) were deemed to require too large investments in short
35 haul infrastructure, and the final system favoured long distance transport.
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