Biographical Encyclopedia of Astronomers

Roche, Édouard Albert

Born Montpellier, Hérault, France, 17 October 1820

Died Montpellier, Hérault, France, 18 April 1883

Édouard Roche is remembered for the study of equipotential surfaces, called Roche lobes, and the calculation of the distance from a planet at which satellites will be torn into rings, called the Roche limit.

Roche continued a family tradition, whereupon several members became professors at the University of Montpellier. There, he earned his doctorate in sciences in 1844 but spent the next three years at the Paris Observatory, working under Dominique Arago. While at Paris, Roche was introduced to Urbain Le Verrier and Augustin Cauchy.

In 1849, Roche accepted the position of *chargé de cours* at Montpellier and in 1852 was appointed professor of pure mathematics. The relative isolation of Montpellier likely helped foster the emergence of Roche's original ideas. He was elected a corresponding member of the Académie des sciences in 1873, but was later denied full membership in the organization. Roche's life was afflicted by poor health; he was forced to take a leave of absence in 1881 and succumbed to a lung inflammation.

Roche devoted himself to topics that lay generally outside of mainstream astronomical research in his time. He studied the equilibrium figure of a rotating fluid body subjected to an external gravitational force caused by another body. This condition is extremely important for determining the equipotential surfaces around a pair of point masses like a binary star. Where one (or both) of the components assumes a teardrop shape, the space(s) so filled is called the Roche lobe. Related to this investigation was Roche's calculation of the minimum distance at which a satellite (of equal density) may revolve above its parent planet. The boundary, inside of which the tidal forces are strong enough to disrupt the satellite into smaller pieces, is called the Roche limit. This condition plays a crucial role in the formation of planetary-ring systems

Roche likewise explained the streamlined shapes of cometary envelopes, under the assumption of a repulsive force originating in the Sun that diminished with the square of its heliocentric distance. His theoretical explanation was offered decades before such radiation pressure was discovered in the form of the "solar wind." In turn, Roche presented a thorough analysis of the "nebular hypothesis" of Immanuel Kant and Pierre de Laplace. His investigation brought a decisive coherence to the notion before it was challenged by rival cosmogonic theories. Roche's treatment of the internal density distribution of the Earth, with appropriate modifications, is still of value today.

Zdeněk Kopal (1989, p. 2) has written that Roche's principal accomplishments "were too far ahead of their time to be fully appreciated."

Martin Solc

Selected References

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