ENCKE'S COMET, AND THE RESISTING MEDIUM.

It is well known to those interested in the subject, that one of the very few cases in which the celestial motions are not perfectly represented by the law of gravitation is afforded by Encke's comet. Half a century has now elapsed since Encke announced that the comet, at each return, reached its perihelion two or three hours sooner than was expected. This lessening of the period was continually repeated at every return, thus showing the action of some continuous cause. He proposed the hypothesis of a resisting medium, or atmosphere, surrounding the sun, as affording the most plausible explanation of the fact. Encke having died in 1865, the subject was next taken up at the Pulkowa observatory by von Asten. The latter died in 1878; and, after some delay, the work was continued by Dr. O. Backlund, a young Swedish astronomer of brilliant reputation. His second memoir on the subject has just been published, and includes a minute discussion of the observations from 1871 to 1881, as well as a revision of some of Asten's work. The most important result which he reaches is, that the acceleration is still going on, but is only half as great as that found by Encke. One of the anomalous results reached by von Asten was, that during the two revolutions from 1865 to 1871 there was no acceleration. The revision of his work by Backlund shows, however, that this result was due to an error in some of the formulae which he used, and that, when this error is corrected, the effect is found to be continuous.

No new light has been thrown on the cause of this result. Astronomers have not generally considered the acceleration as a well-established fact; because the accurate computation of the perturbations produced by the planets, especially by Jupiter, is so intricate as to be very liable to small errors. The fact that Backlund has found an acceleration only half as great as that of Encke, shows that the method of the latter may be subject to doubt. At the same time, the amount of mathematical research which has been applied, and the constancy of the results found by all three investigators, now seem to leave little doubt of the fact. One reason for doubt has been that no other comet exhibited this retardation. This has been especially shown to be true of Faye's comet. But the difference in the two results may be fully explained by supposing that the atmosphere which resisted Encke's comet does not extend far beyond the orbit of Mercury, the fact being that Faye's comet does not even come within the earth's distance from the sun. There is no other comet on which the hypothesis can be tested.

The possibility that there is an exceedingly rare atmosphere around the sun is well worthy the attention of astronomers and physicists. The zodiacal light, the motion of the perihelion of Mercury, and the acceleration of Encke's comet, all point in this direction. The strongest evidence is afforded by the zodiacal light, because this shows that matter of some sort exists within the region referred to. But hitherto no means have been found to decide whether this matter is in a gaseous form, or in that of minute particles. In the latter case, the total mass would be too small to produce any effect upon the motion of either a planet or a comet. In the former case, however, we cannot assign any such limit. Researches into this subject under favorable conditions are greatly to be desired, especially observations upon the zodiacal light at some elevated point near the equator. As science becomes more extended, it is to be hoped that stations for observations will be selected with less regard to local considerations, and with more regard to the conditions of scientific success.

THOUAR AND CREVAUX.

The final report of Thouar, on his search for survivors of the Crevaux party, has been made public, and terminates the record of that gallant but unfortunately fruitless expedition to which reference has several times been made in these columns. By fruitless it is not intended to convey the idea that valuable results for geography and ethnology have not been attained by Thouar, but merely that the forlorn hope of rescuing alive any of Crevaux's party was disappointed.

After traversing with great haste the high plateau of Bolivia between La Paz and Oruro, experiencing a temperature of zero, Sucre, Tarija, and Caïza were successively reached. Conferences were had with all who seemed likely to afford information or advice; and letters written in French, Spanish, and the native dialect, were sent out among adjacent tribes. But even at this time there were no survivors. All that he could rescue was a broken barometer; a letter of Crevaux; a sketch-map of the Pilcomayo, prepared by Crevaux, and annotated by Billet; and a piece of one of the boats. On the 11th of September, 1883, he reached the spot where the massacre took place, where a photograph was taken, and two wooden crosses erected in memory of the victims.

The dead were cut in pieces by the Tobas, and each chief carried to his camp one of these ghastly trophies. The attack was prompted solely by a desire for vengeance. When Thouar inquired why they had killed Crevaux, who was so kindly disposed toward them, they invariably replied, "We killed your brother because those of your color have killed ours." The dead were dismembered on the very spot where, a few days before, several Tobas had been shot by some inhabitants of Caïza. Thouar hardly finds it in his heart to blame the Tobas, who had been wantonly assailed, and who know no distinction between white men. "The Toba," he says, "is strong, muscular, above the middle height. He has a dignified and impressive carriage. His color is that of old mahogany; his face is framed in long hair, black and straight; his forehead is narrow; the eyes slightly oblique; his cheeks prominent; his nose thick, broad, flattened at the tip; his mouth large. He occupies himself exclusively in fishing and hunting. His face, breast, and arms are ele-