Saurin, Joseph | Encyclopedia.com

(*b*, Courthézon, Vaucluse, France, 1 September 1659: d. Paris, France, 29 December 1737)

mathematics, mechanics, cosmology.

The youngest son of Pierre Saurin, a Calvinist minister of Grenoble, Saurin was educated at home and in 1684 entered the ministry as curate of Eure. Outspoken in the pulpit, he soon had to take refuge in Switzerland, where he became pastor of Bercher, Yverdon. No less combative in exile, he refused at first to sign the *Consensus* of Geneva (1685). The pressure brought to bear on him as a result apparently weakened his Calvinist persuasion: after discussions with elders in Holland, he had an audience with Bishop Bossuet in France and shortly thereafter, on 21 September 1690, embraced Roman Catholicism. After an adventurous[1] return to Switzerland to fetch his wife, the daughter of a wealthy family named de Crouzas, Saurin settled in Paris for the rest of his life.

Forced to find a new career, Saurin turned to mathematics, which he studied and then taught. By 1702, as mathematics editor for the*Journal des Sçavans*, he was again involved in dispute, most notably with Rolle, over the infinitesimal calculus. Failing to get a satisfactory response from Rolle. Saurin appealed to the Academy of Sciences, of which Rolle was a member. The Academy avoided a direct decision in favor of an outsider by naming Saurin an *élève géomètre* on 10 March 1707 and a full *pensionnaire géomeétre* on 13 May 1707.

Even this rise to prominence could not keep Saurin out of trouble. Accused by the poet Jean-Baptiste Rouseau of having written libelous poems against him, Saurin spent six months in jail before an *arrêt* of Parlement (7 April 1712) exonerated him and sent Rousseau into exile. There after Saurin appears to have retired to his scientific research, working all night and sleeping all day [2]. His active career ended with his being named a *vétéran* of the Academy in 1731. He died of lethargic fever in 1737, leaving at least one son, Bernard-Joseph (1706–1781), who earned some fame as a dramatic poet.

Saurin made no original contributions to mathematics. Rather, firmly committed to the new infinitesimal calculus, he explored the limits and possibilities of its methods and defended it against criticism based on lack of understanding. Rolle, for example, assumed that the new method of tangents could not handle singularities of multivalued curves where dy/dx took the form 0/0. In reply (1702, 1703, 1716), Saurin explicated the nature and treatment of such indeterminate expressions on the basis of L'Hospital's theorem (*Analyse des infiniment petits* [1969], section 9, article 163), by which, for a $f(x) = g(x)/h(x)$ of the form 0/0 at $x=a$. one determines $f(a)$ by differentiating $g(x)$ and $h(x)$ simultaneously until one of them is nonzero at $x=a$. His further study of multivalued curves (1723, 1725) became the basis for correcting Guisnée's and Crousaz's misunderstanding of the nature of extreme values and of their expression in the new calculus.

Saurin's two papers (1709) on curves of quickest descent represent a solution of a problem first posed by Jakob I bernoulli— to find which of the infinitely many cycloids linking a given point as origin to a given line is the curve of quickest descent from the point to the line— and then an extension of the problem to any family of similar curves. Saurin followed the differential methods of Johann I Bernoulli, although he studiously avoided taking a position in the brothers'famous quarrel.[3]

Combining his command of infinitesimal methods with a firm understanding of the new dynamics, Saurin offered (1722) a sensitive and subtle explanation of why the infinitesimal path of a simple pendulum must be approximated by the arc of a cycloid rather than by the chord subtending the arc of the circle. Thus he defended Huygens' theory of the pendulum against the attacks of Antoine Parent and the Chevalier de Liouville. Saurin had already provided (1703) rather neat algebraic demonstrations of Huygens' theorems on centrifugal force and the cycloidal path and had done an experimental and theoretical study (1720) of the damping and driving effects of the escapement and weight in a pendulum clock.

Huygens himself became the target of Saurin's rebuttals on the issue of Descartes's vortex theory of gravity. Saurin's first effort (1703)—to explain how a terrestrial vortex with lines of force parallel to the equatorial plane could cause bodies to fall toward the center of the earth — was patently clumsy. In 1709, however, to counter Huygens' objection that the necessarily greater speed of the vortex would sweep objects off the earth. Saurin proposed an attenuated ether that, on the basis of Mariotte's experimental findings on the force of moving fluids, made the ether all but nonresisting while still accounting for gravity by its greater speed of rotation. In Johann I Bernoulli's opinion, it was the best theory of gravity devised up to that time. Although, as Aiton points out, [4] it offered the chance for a reconcilliation of Cartesian and Newtonian cosmology, Saurin himself felt that Newtonianism threatened a return to "the ancient shadows of Peripateticism" (*Mémoires de mathématique et physique* [1709], 148).

NOTES

1. The biographical note in Didot speaks of an outstanding charge of theft, while other notices recount the dangers of religious persecution only.

2. Fontenelle, "Eloge de M. Saurin," 120. makes this point and then adds that Saurin had few friends.

3. Saurin did, however, sarcastically reject Johann's claims of priority over L' Hospital in the matter of indeterminate expressions: cf. his 1716 paper and Joseph E. Hofmann, *Geschichte der Mathematik*, III (Berlin, 1957). 11.

4.*Vortex Theory of Planetary Motion*, 176. On Bernoulli's judgment, *ibid*., 188.

BIBLIOGRAPHY

I. Original Works. Saurin's works include "Démonstration des théorèmes que M. Hu(y)gens a proposés dans son Traité de la Pendule sur la force centrifuge des corps mûs circulairement," in*Mémoires pour servir à l'histoire des sciences et des beaux-arts (Mémoires de Trevoux*), 1702 (Addition pour...November et Decembere). 27–60: "Réponse à l'écrit de M. Rolle de l' Académie Royale des Sciences inséré dans le Journal du 13. Avril 1702. sous le titre de Règles et Remarques pour le Problème général des Tangentes par M. Saurin," in*Journal des sçavans* (Amsterdam ed.), **30** (3 Aug. 1702). 831–861: "Solution de la principale difficulté proposée par M. Hu(y)gens contre le système de M. Descartes, sur la cause de la pesanteur," *ibid*., **31** (8 Jan. 1703). 36–47: "Remarques sur les courbes des deux premiers exemples proposés par M. Rolle dans le Journal du jeudi 13. Avril 1702," *ibid*. (15 Jan. 1703), 65–73. (22 Jan. 1703), 78–84: and "Manière aisée de démontrer l'égalité des temps dans les chutes d'un corps tombant parune cycloide de plus ou de moins haut, et de trouver le rapport du temps de la chute par la cycloide au temps de la chute perpendiculaire par son axe". *ibid*. (4 June 1703). 563–570.

In the *Mémoires de mathématique et physique* of the Paris Academy of Sciences, see "Solutions et analyses de quelques problèmes appartenants aux nouvelles méthodes" (1709), 26–33: "Examen d'une difficulté consideérable proposée par M. Hu(y)ghens contre le système cartésien sur la cause de la pesanteur" (1709),131–148: "Solution générale du problème, où parmi une infinité de courbes semblables décrites sur un plan verticale, et ayant un même axe et un même point d'origine, il s'agit de déterminer celle dont l'arc compris entre le point d'origine et une ligne donnée de position, est parcouru dans le plus court temps possible" (1709), 257–266, with addendum in 1710, pp. 208–214; "Remarques sur un cas singulier du problème général des tangentes" (1716), 59–79, 275–289: and "Problème" (1718), 89–92.

In the same journal, see "Démonstration d'une proposition avancée dans un des mémoires de 1709. Avec l'examen de quelques endroits de *la Recherche de la vérité*. qui se trouvent dans la dernière edition, et quit ont rapport à ce mémoire" (1718), 191– 199: "Démonstration de l'impossibiliéte la quadrature indéfinie du cercle. Avec une manière simple de trouver une suite de droites qui approchent de plus en plus d'un arc de cercle proposé. tant en dessus qu'en dessous"s (1720), 15–19: "Remarques sur les horloges àpendule" (1720), 208–230; "Éclaircissement sur une difficulté proposé aux mathématiciens par M. le Chevalier de Liouville" (1722). 70–95: "Sur les figures inscrites et circonscrites au cercle" (1723), 10–11: "Dernières remarques sur un cas singulier du problème des tangentes"s (1723), 222–250: "Observations sur la question des plus grandes et des plus petites quantités" (1725), 238–260: and "Recherches sur la rectification des baromètres" (1727),282–296.

II. Secondary Literature. Bernard Fontenelle's "F´loge de M. Saurin," in *Histoire de l' Académie royale des sciences . . .* (1737), 110–120, is the basis for the account in Joseph Bertrand's *L' Académie des sciences et les académiciens de 1666 à1793* (Paris. 1869). 242–247. The entry in the Didot *Nouvelle biographie généraie* provides some additional details from Swiss sources. Saurin earns only passing mention in histories of mathematics, but his vortex theory of gravity receives considerable attention from Eric J. Aiton in *The Vortex Theory of Planetary Motions* (London–New York, 1972), 172–176 and *passim*.

Michael S. Mahoney