DICTIONARY OF SCIENTIFIC BIOGRAPHY

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IAMBLICHUS (*b.* Chalcis, Syria, *ca.* A.D. 250; *d. ca.* A.D. 330), *philosophy*.

Iamblichus' parents were Syrian and he taught philosophy in Syria. Otherwise almost nothing is known of his life. It is clear from later writers that he was of major importance in the elaborate systematization of Neoplatonism that occurred after Plotinus. He wrote an encyclopedic work on Neopythagorean philosophy which included arithmetic, geometry, physics, and astronomy. But what has survived of this work has virtually no philosophical or scientific interest. We have only the traditional "Pythagorean" claims that all sciences are based on Limit and the Unlimited, that numbers are generated from the One and a principle of plurality, and that geometric solids are generated from unit points, lines, and surfaces. Because this "procession" of the One generates also beauty and then goodness, the study of mathematics and of the sciences based on mathematics is said to be the path to true virtue; individual numbers moreover are symbols of individual gods of the Greek pantheon. But Iamblichus makes all these claims in only a compressed and dogmatic manner. His *Life of Pythagoras* has no historical value.

Iamblichus' commentaries on Aristotle are lost. They contained some acute, if unoriginal, defenses of Aristotelian doctrine as well as some less well-judged attempts to incorporate Neoplatonic metaphysics. For example, he correctly defended Aristotle's definition of motion as incomplete or potential against the claims of both Plotinus and the Stoics that motion was activity and actuality (*energeia*). He argued that Aristotle was concerned with the concept of "being potentially (possibly) so and so" as opposed to "being actually so and so," while his opponents confused this notion with the concept of possibility itself, as opposed to actuality or activity (see Simplicius, "In Aristotelis Categorias," pp. 303 ff.). Historians have perhaps failed to notice the significance of Iamblichus' influential commentary on Aristotle's psychology. By sharpening the distinctions that his Neoplatonic forerunners had blurred between soul and intellect and between a human soul and a pure or disembodied soul, he showed how Platonic prejudices need not stand in the way of separating psychology from metaphysics.

Like most Platonists of his age, Iamblichus was attracted by the prevalent Gnostic and sometimes magical practices that were supposed to lead to salvation. His work *On the Egyptian Mysteries* is a characteristic attempt to reconcile these practices with Platonic philosophy. Although it rationalizes them (more than has been recognized), the work is without scientific significance. In the Renaissance, however, it was partly responsible for the fascination with hieroglyphics and other supposed symbols of the East.

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II. Secondary Literature. Simplicius' commentaries on Aristotle's *On the Soul* and *Categories* are in *Commentaria in Aristotelem graeca*, II (Berlin, 1882), and VIII (Berlin, 1907), respectively—see indexes under Iamblichus.

See also A. H. Armstrong, ed., *Cambridge History of Later Greek and Early Medieval Philosophy* (Cambridge, 1967), pp. 295–301.

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IBÁÑEZ E IBÁÑEZ DE IBERO, CARLOS (*b.* Barcelona, Spain, 14 April 1825; *d.* Nice, France, 28 January 1891), *geodesy*.

Ibáñez' father, Martín Ibáñez de Prado, was a soldier and mathematician: a national hero for his participation in the sieges of Zaragoza and one of the first postulators of non-Euclidean geometry. In 1832, when Ibáñez was barely seven, his father was assassinated for political reasons. The boy entered the

Academy of Army Engineers in 1839, receiving training in both military and scientific subjects.

Ibáñez' interest in geodesy was awakened by the practical courses he taught at the Academy of Engineers. In 1853 he joined the recently created commission for drawing up a national map. As a member he studied and planned a Geodimeter, known as the "Spanish rule," to measure the base at Madridejos. In 1859 he devised a method for carrying out the census of rural and urban real property and for its conservation. He was cofounder (1866) and later president (until his death) of the International Geodesic Association. In 1875, as plenipotentiary envoy of the king, he attended the inauguration of the International Office of Weights and Measures, which he actively promoted in order to achieve a worldwide system of units of measure and decimal currency. He was also its first president.

At Ibáñez' initiative the Census and Geographic Institute was created in 1870—he was its first director, as he was of the Corps of Geodesists (today known as the Geographical Engineers)—and in 1877 he was responsible for creation of the Statistics Corps. An early advocate of international scientific collaboration, he was a member of the Royal Academy of Sciences of Madrid, as well as the corresponding organizations of Barcelona, Paris, Berlin, Rome, Belgium, the United States, Buenos Aires, and Egypt.

Ibáñez was concerned mainly with precision in measurement and with scientific organization. He obtained a probable error of $\pm 1/5{,}800{,}000$ in geodesic bases, compared with the $\pm 1/1{,}200{,}000$ achieved until then. The fifteen-kilometer base measured in La Mancha was of particular note. At the request of the Swiss Confederation he carried out in 1880 the measurement of the central base of Aarberg at 2.4 kilometers.

As a result of Ibáñez' initiative and eagerness to measure the globe, it was agreed in 1860 to remeasure the arc of meridian from Dunkirk to Formentera. He projected the geodesic union of Europe with Africa, with an interruption of 270 kilometers, from Shetland to the Sahara; this had never been achieved by observations of a geodesic landmark. He carried out these observations in 1878 between the inhospitable peaks of Mulhacén and the Teticas in Spain and the Filhaoussen and the M'Sabiha in Algeria. The error in closing the triangles was on the order $\pm$ one second of arc, and the precision brought him the Poncelet Prize of the Academy of Sciences of Paris in 1889. Measurements of horizontal angles with $\pm 1/10{,}000$ of degree in the centesimal system were achieved through his techniques.

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II. SECONDARY LITERATURE. See the following, listed chronologically: A. Hirsch, *Le Général Ibáñez;* C. I. de P. and M., necrological note (Neuchâtel, 1891); *Commemoration du centenaire de la naissance du Général Ibáñez de Ibero* (Paris, 1925); *Inauguración del monumento en memoria del General de Ingenieros Carlos Ibáñez de Ibero, Marqués de Mulhacén* (Madrid, 1957); and Carlos Ibáñez de Ibero, *Biografía del General Ibáñez de Ibero, Marqués de Mulhacén* (Madrid, 1957); and *Episodios de la guerra de la independencia* (Madrid, 1963).

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IBN. See next element of name.

IBRĀHĪM IBN SINĀN IBN THĀBIT IBN QURRA (*b.* Baghdad [?], 908; *d.* Baghdad, 946), *mathematics, astronomy.*

Born into a family of celebrated scholars, Ibn Sinān was the son of Sinān ibn Thābit, a physician, astronomer, and mathematician, and the grandson of Thābit ibn Qurra. Although his scientific career was brief—he died at the age of thirty-eight—he left a notable body of work, the force and perspicuity of which have often been underlined by biographers and historians. This work covers several areas, such as tangents of circles, and geometry in general; the apparent motions of the sun, including an important optical study on shadows; the solar hours; and the astrolabe and other astronomical instruments.

Since it would hardly be feasible to give even a summary sketch of Ibn Sinān's entire work in a brief article, the best course will be to concentrate attention on two important contributions: his discussions of the quadrature of the parabola and of the relations between analysis and synthesis.

His study of the parabola followed directly out of the treatment given the problem in the work of his grandfather. Thābit ibn Qurra had already resolved this problem in a different way from that of Archimedes. Although his method may have been equivalent to that of summing integrals, the approach was