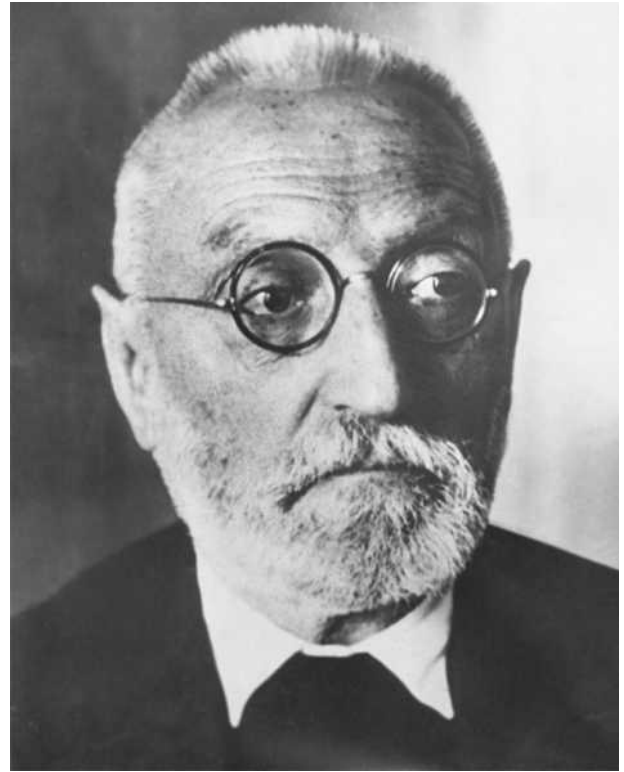


In the short novel, *San Manuel Bueno y martir y historias más* (1933), Unamuno's thought seems to change. It is the story of a priest who, though utterly dedicated to his people, feels that he must protect them from his own conviction that there is no afterlife. The priest is still impelled to do good for his neighbor, but this includes the desire to spare the innocent the agony of his own doubt. Emmanuel is the embodiment of Unamuno's earlier expressed ideal: So live that men will say you deserved immortality even though you cannot expect to attain it. In Unamuno's thought, man is most real when striving, accomplishing, and influencing others, and this reality lasts as long as people are inspired by it. By this criterion Don Quixote is real and immortal, and to such "immortality" Don Miguel de Unamuno aspired. He always considered himself a Catholic. He was certainly unorthodox, but capable of strong religious fervor, as evident in his long poem, *El Cristo de Velazquez* (1920).

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[D. F. BROWN]



Miguel de Unamuno y Jugo.

UNCERTAINTY PRINCIPLE

The uncertainty principle in quantum mechanics states that the velocity and the position of a particle cannot be measured simultaneously with complete accuracy.

After the original ideas were laid down in 1927 by W. Heisenberg, a period followed in which the concepts of quantum mechanics were critically debated. The *Gedanken* experiments provided the primary intellectual ammunition in these discussions between physicists who believed that quantum mechanics was a closed structure free of internal contradictions and those who did not. (See, e.g., the discussions at the Solvay Congresses of 1927 and 1930.) The final word was the famous Niels Bohr paper that included details and examples of what became known as the "Copenhagen Interpretation of Quantum Mechanics." Most physicists accept this interpretation, and modern textbooks treat it in an almost dogmatic fashion. The two important opponents of Bohr are Einstein and D. Bohm.

Philosophical Interpretations. Not all philosophers of science are agreed on the interpretation to be given to the uncertainty principle. The multiplicity of teachings can be separated into broad classes. (1) The first maintains that Heisenberg's uncertainty relations express subjective indeterminacies; i.e., they refer to man's imperfect knowledge of things, not to things themselves.

(2) The second holds that they express objective indeterminacies; i.e., they refer to something that characterizes matter or reality.

Epistemological Indeterminacy. The first type of interpretation, which is epistemological in character, subdivides into a variety of teachings. Some hold that the uncertainties arise from the inability of the human mind to comprehend the microcosm, an inability that necessitates the application of the concepts of particle dynamics to the description of wave phenomena (or vice versa), with a consequent loss of clarity. Others teach that the uncertainty arises from the coarseness of the measuring apparatus, which is very large compared to the thing being measured and thus leaves the result of the measurement indeterminate. Still others hold that the Heisenberg relations are exclusively a consequence of statistical methods of measurement and are independent of the perturbations caused by any measuring instrument. Yet others argue that the uncertainties refer to "observables," but not to "hidden variables," which have precise values at any given instant.

Particularly suited to this type of interpretation is the solution proposed by H. Reichenbach, who has developed a three-valued formal logic that permits questions about the microcosm to be answered with statements that

are either true, false, or undecided. Also in accord with it are the solutions adopted by many logical positivists and linguistic philosophers, who hold generally that the complimentary and uncertainty principles refer not to objects but to ways in which words and concepts are used by contemporary physicists.

Ontological Indeterminacy. Among those who hold that Heisenberg's uncertainty relations express indeterminacies that are objective, or ontological in character, some propose these as ultimately reducible, others as irreducible. Those who claim that such indeterminacies are objective but reducible maintain that they arise from some lower level motion or sub-quantum state that is yet to be identified but nonetheless exists. Those who regard the indeterminacies as irreducible ascribe them either to the operation of absolute CHANCE at the subatomic level or to a basic indeterminacy that resides in some protomatter or substrate of which elementary particles are composed. Related to both views is that of those who see such indeterminacies as irreducible because of something "in the very nature of things" that prevents one ever from drawing a clear line of demarcation between subject and object at the subatomic level.

Philosophers in the Catholic or scholastic tradition recognize elements of truth in both the ontological and the epistemological interpretations of the uncertainty principle. In general they reject solutions that are antimetaphysical or antirealist in character; at the same time, they are wary of attempts to extrapolate interpretations relating to the substructure of matter to the domain of ethical or religious inquiry, e.g., proposing such theories as arguments for the existence of FREE WILL or God's influence in the world. Because of traditional teachings in the philosophy of nature, they are sympathetic to ontological interpretations that root quantum indeterminacy not in absolute chance, which they hold does not exist, but in the potency of primary matter (*see* MATTER AND FORM). Such interpretations have gained support from Heisenberg himself, who, in discussing the meaning of probability in quantum theory, states:

The probability function combines objective and subjective elements. It contains statements about possibilities or better tendencies (*potentia* in Aristotelian philosophy), and these statements are completely objective, they do not depend on any observer; and it contains statements about our knowledge of the system, which of course are subjective in so far as they may be different for different observers. In ideal cases the subjective element in the probability function may be practically negligible as compared with the objective one [53].

If this is true, ontological and epistemological uncertainties do not bespeak incompatible interpretations but rather alternative ways of describing objective properties of matter and man's subjective limitations in comprehending them.

See Also: INDETERMINISM; SCIENCE, PHILOSOPHY OF.

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[W. A. WALLACE/P. H. E. MEIJER]

UNDA

Unda (Latin for "wave") is the international professional Catholic association for radio and television, the *Association Catholique Internationale pour la Radio et la Télévision*. Officially recognized by the Holy See, Unda began as the International Catholic Committee for Radio, founded in 1928 in Cologne, Germany. Unda's members internationally are not individuals but national and continental Catholic organizations which share Unda's objectives, while retaining responsibility for their own activities. Unda's headquarters are in Brussels.

Unda's objectives are: to help coordinate professional and apostolic activities of Catholics in radio and television; to promote collaboration among members, through conferences, publications, information exchanges, research; to represent internationally the interests of members; to help meet communications needs of members; to help meet communications needs of the Third World; and to collaborate with non-Catholic organizations having similar objectives.

At the continental and national levels, Unda conducts a variety of activities and programs suited to individual needs of each region. Development programs in broadcasting, planned, subsidized and executed under the auspices of Unda, are primarily in the Third World countries of Africa, Asia, Latin America, and Oceania. Projects prepared at the local level are presented to the Congregation for the Evangelization of Peoples in Rome and to other world funding agencies. In the past the Congregation has allotted through Unda more than two million U.S. dollars. Unda publishes a bimonthly newsletter (*Unda News*), in English and in French, and a documentation quarterly (*Educommunication News*).

Unda-USA. Unda-USA is a national professional Catholic Association for broadcasters and allied commu-