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## The Instrument and the Spirit

THE instrument is the extension of the senses of the scientific investigator and the refinement and enlargement of his crude powers of manipulation. It renders precise his variable and subjective observations, and records in full and permanent form what would perish if it depended upon his memory and his notes. It has often been said that the history of modern science can be read in the invention and improvement of scientific instruments. For this reason alone it is important for us, at least once a year, to give a special place in the pages of *SCIENCE* to the advances being made in instrumentation.

Leonardo da Vinci, four and a half centuries ago, well knew the significance of new instruments and implements, and turned his giant talents, from painting the fresco of the Last Supper in the chapel of Santa Maria delle Grazie, to invention and engineering. Was art then simply to be a handmaiden of the sciences? Not at all, for what Leonardo sought in the sciences—in his studies of flowers, of the anatomy of the human heart, of the nature of fossils—was what he sought also in his experiments in painting, so often unsuccessful and uncompleted. The quest of Leonardo was the quest of the scientific spirit “to explore and to understand the universe . . . to grasp the forms and laws of nature and life as they revealed themselves to his alert and penetrating eye.” Art thus became the effort to express in spirit the full scope of human knowledge and understanding. That effort by Leonardo to fuse science and art we recognize today as

having been the supreme achievement of the Renaissance.

The role of the instrument in furthering this synthesis of which Leonardo dreamed has grown beyond even the bounds of his imaginative genius. Like thousands of other scientists, I can sit in my room before a few instruments, and have the world before me to see and to hear. Like so many other scientists, I find a special pleasure and refreshment in that synthesis of mathematical proportions, rhythms and harmonies with the creative imagination of the artist to make what we call music. To how many of us, then, the greatest triumph of the instrument is represented by the enlargement of the spirit it brings. The radioed word that death has so untimely claimed Kathleen Ferrier, whom we have never seen or heard in person, creates in us a bitter sense of personal loss. Yet the instrument conquers time as well as space and recreates anew at our will the full marvel of her voice and her artistry. Through the pickups, wires, condensers, electronic tubes, and metal diaphragms of our instruments we learn more fully the meaning, so pregnant for these uneasy times, of the words of John Donne:

No man is an Iland, intire of itselfe; every Man  
is a peece of the Continent, a part of the maine;  
if a Clod be washed away by the Sea, Europe is  
the lesse, as well as if a Mannor of thy friends  
or of thine owne were; any man's death dimin-  
ishes me, because I am involved in Mankinde;  
And therefore never send to know for whome the  
bell tolls; It tolls for thee.

BENTLEY GLASS

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