THE RECENT EARTHQUAKES AT LOS ANGELES, CALIFORNIA

To the late Homer Hamlin more than any one else is due the credit for identifying the connection between certain local structural lines and the earthquakes which have affected the region about Los Angeles, Cal., during the past month. Hamlin's work, to the writer's knowledge, covered a period of over fifteen years prior to his death a few weeks ago. He, single handed, studied the cause of more than twenty earthquakes of varying degrees of intensity which have occurred in southern California during this period. Hamlin's conclusions, few of which unfortunately ever were put in print, were that the line of structural disturbance along which the epicentrums of most of the earthquakes were located, was that which extends from the Santa Monica Mountains, north of the Soldier's Home (about ten miles northwest of the business district of Los Angeles), in a southeasterly direction through the Baldwin Hills, Dominguez Hill, El Cerrito (near Long Beach), and thence easterly to the San Joaquin Hills northeast of Newport. The section along this line which has been the greatest offender is that extending several miles southeasterly from the Baldwin Hills. From a study of the intensity records, Hamlin was inclined to believe that the actual epicentrums were coincident in general with a fault which paralleled the anticline forming the Baldwin and Dominguez Hills, and extending along the northeast base of these hills. This may be true, but the writer is inclined to the theory that the actual crustal movements which produced the shocks took place along the Baldwin Hills-Dominguez Hill line, and that the maximum surface reaction might have been greater to the east of the hills because of the more unconsolidated character of the sediments in this direction.

In the shocks that occurred in the middle of June last, the greatest intensity was at Inglewood, a town lying ten miles southwest of Los Angeles, and only a very short distance southwest of the axis of the Baldwin Hills-Dominguez Hills fold. This would confirm the theory that the main line of disturbance is along the axis of this fold. In the shocks of July 16, the newspaper reports indicate only slight damage in Inglewood with the principal damage in the city of Los Angeles proper. These reports being true, it seems probable that this last tremor originated along the very pronounced fault, that extends east and west through the northwest residential district of Los Angeles, or along one of the lines of disturbance associated with this fault. It is this fault which marks the northern boundary of the oil-producing area of the Los Angeles city field, and is believed to act as a barrier to the northward migration of the oil in the sands on the down-thrown block of Pliocene sediments on the south side of the fault. This fault is part of a zone of disturbance which extends eastward past Whittier and is responsible for the structurally complex Puenta Hills north and west of Whittier. This last named town is mentioned in the dispatches as having been subjected to sharp shocks on July 16; further evidence of the probability of the cause of this earthquake being in the east-west line of disturbance just described. It would be natural to suppose that a readjustment of stresses along the Baldwin Hills-Dominguez Hills line in the earthquakes in June might develop stresses in the east-west line north of Los Angeles that relieved themselves by movements which caused the disturbances of July 16.

In connection with the earthquake history of the Los Angeles region, attention is called to the very recent earth movements that are recorded in the topography thereabouts. San Pedro Hill, over 1,000 feet in height, which marks the southwest corner of the Los Angeles Plain, has eleven wave cut terraces on its southern or ocean side, all of which are believed to be of Pleistocene age. Beds along the flanks of the Baldwin Hills-Dominguez Hills-El Cerrito fold, dipping over 30°, are known to be of Pleistocene age. Pleistocene fossils are found at a depth of over 1,000 feet in a well at Bells Station on the Los Angeles plain south of Los Angeles. At least

two different systems of terraces of Pleistocene age are found within the city of Los Angeles. Many other examples might be enumerated of evidences of the youth of the geologic and topographic features around Los Angeles, and along this part of the California coast in general.

Thus there are many reasons to expect frequent evidences of seismic activity in this region, but owing to the local character of most of the lines of structural weakness, extensive disturbances are not probable. The Great Earthquake Rift, or San Andreas Fault zone lies fully forty miles north of Los Angeles with several granite mountain ranges in between as buffers. Therefore the Los Angelenos may console themselves that they are not in the main earthquake belt.

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AUGUSTO RIGHI

Often the death of a great personality in one of the fields of pure science is only felt directly by the small band of fellow workers in that field, while the passing away of one who has contributed but little original knowledge and has merely popularized the work of investigators makes a disproportionate impression on the general public, but in the death of Augusto Righi, professor of physics in the University of Bologna, and senator of the Kingdom of Italy, both the professional scientist and the amateur have suffered an irreparable loss. Righi combined in an inimitable way the ability to popularize the great central truths of his science with the genius of the born investigator. His published contributions in physical research cover the period of nearly fifty years and number nearly two hundred and fifty papers. Almost none of these papers are published in collaboration with other physicists, but represent his own individual work.

The present writer was privileged to spend part of one year as a guest in Righi's laboratory in Bologna. It was at the period when the first experiments of Sir J. J. Thomson and his pupils at Cambridge were providing the foundation for the beautiful structure of the electron theory which has since been reared. Righi had been carrying on investigations along lines which made him quick to seize the significance in his own problems of the work of the Cambridge School, and there was unmistakable evidence in his laboratory of great investigative activity—every evidence but for one fact: Righi never seemed to be working—he always seemed to have leisure to discuss other peoples' problems and to attend to the direction of the research of his numerous graduate students. Commenting on this one day to Righi the present writer learned that it was his custom to do all of his own investigative work in the three or four hours of the day before breakfast when he had his laboratory wholly to himself.

His treatment of his graduate students followed the German method rather than that which seems to characterize our own methods. He rarely published the results obtained in his laboratory jointly with the student but rather gave freely of his time and advice and let the student be the sole sponsor of his own work. A notable example of this is furnished in the well-known relation between Guglielmo Marconi and Augusto Righi—Righi, the friend and co-worker of Hertz and the teacher of Marconi, the pioneer in the adaptation of the epoch-making discovery of Hertz to telegraphy. Righi's friends appear to have been jealous lest he should fail to receive proper credit for his part in making wireless communication possible; but not so Righi himself, who cared little for popular applause and actually enjoyed a fuller measure of it in his own country than ordinarily falls to the lot of the pure scientist. His own attitude towards science is well expressed in his own words in an address before one of the many societies of which he was president.

> I refer to the pure science of physics, that science which does not occupy itself too much with matters of the practical application of its discoveries and does not trouble itself about the material advantages which may accrue to him who happens to make these discoveries, but above all else sets itself the task of establishing the great laws which govern the phenomena of the inanimate universe.