CHAPTER XVIII

HISTORY OF
THE UNIVERSITY OF SANTA CLARA SEISMOLOGICAL STATION
SANTA CLARA, CALIFORNIA

By Edward Shipsey, S. J.

Editor's Note:---Reverend Edward Shipsey, S. J., is Chairman of the English Department at the University of Santa Clara and Faculty Advisor of The Owl, an undergraduate literary magazine. He wishes to acknowledge extensive help, especially in gathering and verifying material, received from Reverend John A. Weber, S. J., Director of the Station; Mr. Albert J. Newlin, Former Director; Mr. Ignazio Vella and Mr. George C. House, undergraduate history majors. The text was carefully checked by Father Weber and Doctor Newlin.

Santa Clara, California, and Earthquakes - There are two reasons why a seismological station is appropriate at Santa Clara: it lies in California, a known earthquake country; it is situated near and between the San Andreas and Hayward Faults.

The San Andreas Fault or Rift may be traced for more than 500 miles except for short distances where it is under the sea at the northern end. It can be traced from Point Reyes, 46 miles northwest of San Francisco, through California in a southeasterly direction until it is lost in the Colorado Desert. North of Point Reyes, its relation to a fault or faults between Point Reyes and Telegraph Hill (near Eureka) in Humboldt County, Northern California, is not clear.

The San Andreas Fault or Rift is that fracture of the earth's crust which (Macelwane, When the Earth Quakes, p. 26) "follows an old belt of dislocation, a fault zone marked by typical rift features, which are particularly well developed in the San Andres[1] Valley on the San Francisco Peninsula and which have therefore given to this striking geomorphic feature the name of the San Andres Rift. It is one of the major tectonic or structural lines of California. Its seismic activities go back at least to late Tertiary times. Earthquakes are known historically to have recurred on it."

The Hayward Fault is located on the east side of San Francisco Bay, nearly parallel to and some eighteen miles from the San Andreas Fault. It is thought to be twenty to forty miles in length. Santa Clara, fifty miles southeast of San Francisco, lies between these two faults.

California's earthquake activity, then, begins "at least in late Tertiary times." In historic times, 1769 is the beginning date. In that year the first (Portola's) overland expedition of exploration and colonization reached California, coming overland from Mexico. It also produced the first earthquake record. Father Juan Crespi, chaplain

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1 "The correct Spanish name would be, of course, San Andres, but the curious American corruption (San Andreas) has become so rooted in the literature that it will probably be retained." Macelwane, op. cit. pp. pp. 95-96

and diarist, reports in non-technical language: "It lasted about half as long as an Ave Maria, and about ten minutes later was repeated, though not violently."[2] The place was El Rio de Jesus de los Temblores, now the Santa Ana River in Southern California; the date, July 28, 1769. The Indians, also, told the Spaniards many stories of former earthquakes up and down the state; even told of sea water issuing from cracks made by them. (Bancroft's Works, Vol. I, p. 554)

An early English-speaking traveler to California reports: "A Californian would hardly pause in a dance for an earthquake and would renew it before the vibrations ceased." (Hunt, California and Californians, p. 446)

Between the first record in 1769 and the San Francisco Earthquake of 1906 many earthquakes are known to have occurred. The Bulletin of the Seismological Society of America, Vol. 29, uses 107 pages in listing them and commenting on the evidence for them. Three are classified as major earthquakes: those of October 21, 1868, Hayward, Alameda County; March 26, 1872, Owens Valley, Inyo County; and April 18, 1906, Central Coast Region.

Santa Clara and Earthquakes - Santa Clara has been a constant part of this history. The Earthquake History of the United States, Part II, of the Coast and Geodetic Survey, mentions earthquakes in 1812, 1813 or 1815, 1818, and 1822

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2 Caughey, California, p. 129; Bulletin of the Seismological Society of America, Vol. 29, p. 21

which damaged the Santa Clara Mission Church. Colligan, The Three Churches of the Santa Clara Mission, (1921) p. 6, says: "The church was destroyed by an earthquake in 1818 and the Fathers chose to build anew on the site which the present Church occupies."

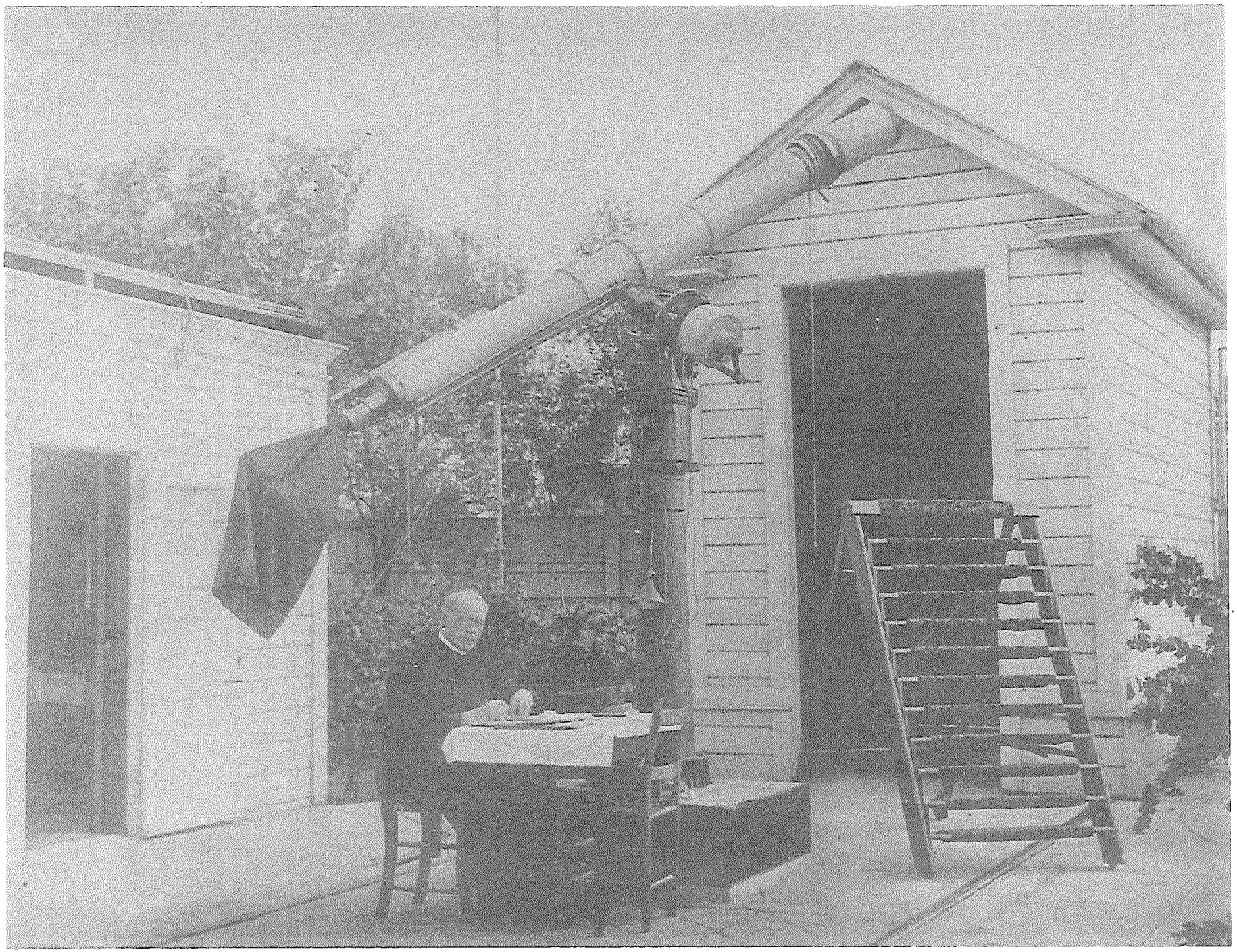
But it was the great earthquake of 1906 which led Santa Clara to pass from a casual to a technical observer of earthquakes. This transition is associated with the name of Reverend Jerome Sixtus Ricard, S. J., who had done some work at Johns Hopkins and Creighton Universities. Already interested in astronomy and meteorology, he took the occasion of the great local earthquake to add seismology to his fields of interest.

Directors of the Station - It has been thought best at this point to give a biographical sketch of each of the Directors of the Santa Clara Station; then to explain why the present Observatory is called the Ricard Observatory, and give a technical description of the Station. The preceding narrative will be resumed after that. There have been five directors:

Reverend Jerome Sixtus Ricard, S. J.
(1850-1930)

Founder of the Station and Director
from 1907 to 1930

Reverend Jerome Sixtus Ricard, S. J., was born June 21, 1850, in Plaissians (spelling uncertain), Duis-les-Baronnies, Department of the Drome, Diocese of Valence, France; entered the Society of Jesus in Monaco, June 1, 1871,



Father Ricard's Meteorological Observatory, the Predecessor of the Ricard Memorial Observatory
The octagon-shaped building which contained the seismographs (1909-1929) does not show in this photograph. Father Ricard sits before the "Shack on Wheels" built to cover his sunspot telescope when not in use. To the left is the Meteorograph Room, containing the Siderial Clock. Year of photo uncertain, probably in the early '20's.

ordained at Woodstock, Maryland, on August 29, 1886; made his last vows as a Jesuit on February 2, 1891, at Santa Clara; died at Santa Clara on December 8, 1930. Father Ricard was ordained by His Eminence, James Cardinal Gibbons, Archbishop of Baltimore.

Doctor Albert Joseph Newlin
(1888 - ---)
Associate of Father Ricard, 1907-1918
Assistant Director, 1918-1932
Director, 1932-1941
Assistant Director, 1941-1948

Albert Joseph Newlin, devoted associate of Father Ricard, was born in New York City in 1888; came to California while very young, his family taking up residence in San Francisco; entered Santa Clara in 1907 for his last years of high school and was graduated, B.S., 1913; LL. B., 1914; J.D., 1916; served in France with the AEF as a meteorologist until his return in 1918. In 1934 he completed a lengthy study of microseisms (unpublished) in recognition of which the University conferred on him the D. Sc. Mr. Newlin's time given to the seismological and meteorological instruments of the Observatory was given after hours and on holidays from his legal studies, legal activity, duties as a public official (Clerk of the Superior Court, County Clerk). He continued to care for the records until forced by illness to give over in 1948.

Reverend James Bernard Henry, S. J.
(1895-1938)
Assistant Director, 1928-1930
Director, December (1930) - March (1931)

Father Henry was born in Sacramento, California, August 20, 1905; entered the Jesuit Order at Los Gatos, California, July 15, 1912; was ordained in Woodstock, Maryland, June 14, 1926. He returned to Santa Clara in July, 1928 and remained until March, 1931, when ill health forced him to resign as Director of the Station. He died, after a severe operation, in Los Angeles on August 31, 1938.

Reverend Raymond Joseph Buckley, S. J. (1898 - ---)
Director, April (1931) - December (1932)

Father Buckley was born in San Francisco on November 21, 1898; entered the Order at Los Gatos, California, July 15, 1916;

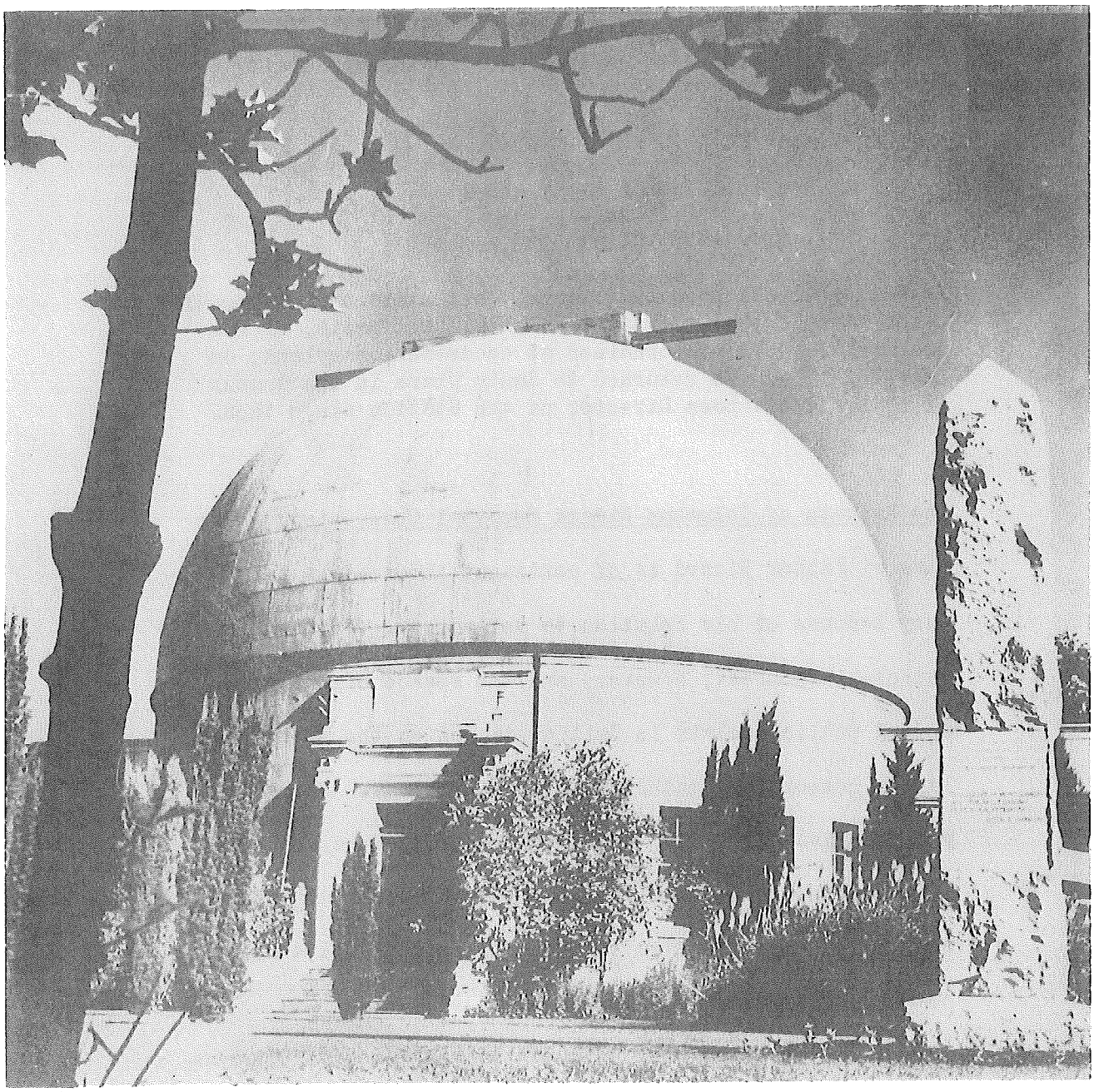
was ordained at Weston, Massachusetts, June 18, 1930. He has for many years been on the staff at the University of San Francisco.

Reverend John Anthony Weber, S. J.
(1906 - ---)
Director, 1941 to the present

Father Weber was born in Oakland, California on October 31, 1906; entered the Order at Los Gatos, California, on December 15, 1925; was ordained at Woodstock, Maryland, on June 21, 1939. He returned to Santa Clara in the summer of 1941 and has been Director of the Station since then.

The Knights of Columbus Ricard Memorial Observatory - The name of Father Ricard is of pertinent interest in this history because of his relation to seismology. Father Ricard's principal interest, however, and the source of his widespread public acclaim in California and on the West Coast, lay in meteorology rather than in seismology. For many years he issued weekly, and later monthly, even seasonal forecasts of California and West Coast weather, rainfall especially. He believed that he had established a relation between sunspots and earth weather.

The Knights of Columbus Ricard Memorial Observatory, in which the seismological instruments are now housed, was begun in 1927, finished in 1928. The funds for its building were raised in a Statewide campaign by California Knights of Columbus in recognition principally of Father Ricard's reputation as a forecaster of California rainfall. In a region of meager and uncertain rainfall, foreknowledge



The Central Dome of the Ricard Memorial Observatory - The granite shaft, erected in 1946, marks the spot where John J. Montgomery, aid to Father Ricard in setting up the first Wiecherts, conducted experiments with gliders. The present seismographic vault is just to the right of the picture.

of rainfall becomes precious. The Knights of Columbus wished to see the aging "Padre of the Rains" move his telescopes, his weather instruments, and his seismographs from "the picturesque vine-clad shacks", in which they had long been placed, into more becoming, commodious and useful quarters. The "New Observatory" was completed about two years before the old gentleman's death.

Technical Description of the Station - The current Bulletin listing member stations of the Jesuit Seismological Association of the United States has the following entry for the Santa Clara Station:

Santa Clara

(inaugurated 1909; expanded, 1929)

Latitude: geographical 37 degrees 21' N; geocentric, 37 degrees 10' N.

Longitude: 121 degrees 57' W. Altitude: h = 28 m; H - h = 4 km.

Lithologic foundation: sand and gravel

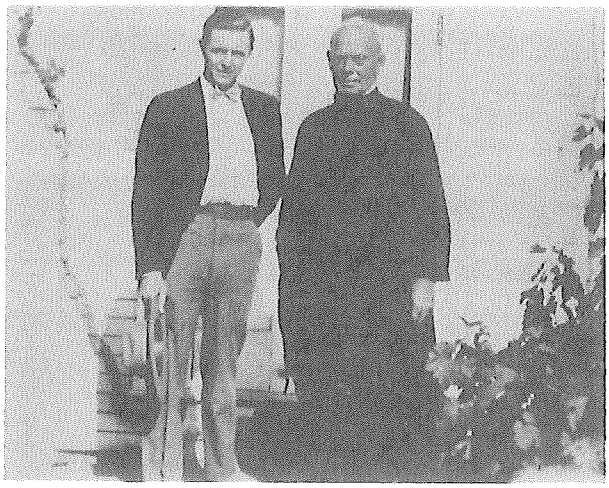
Seismographs: Galitzin-Wilip ENZ, Wood-Anderson short period EN, Wiechert (80 kg) ENZ

Clocks: Grimshaw and Baxter (after Mead); Wiechert

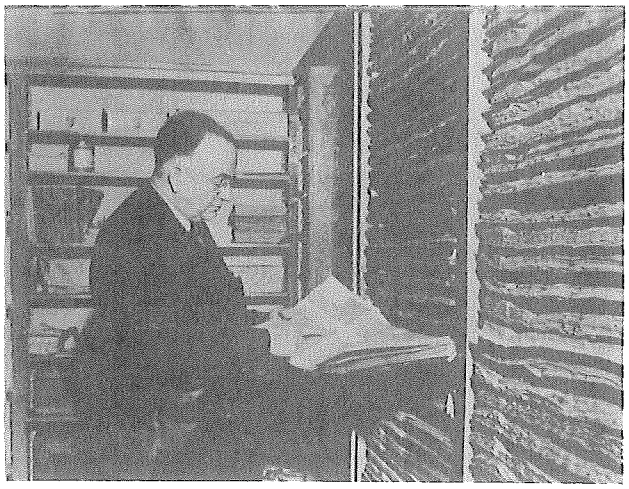
Director: Reverend John A. Weber, S. J.

Address: Ricard Observatory, University of Santa Clara, Santa Clara, California, U. S. A.

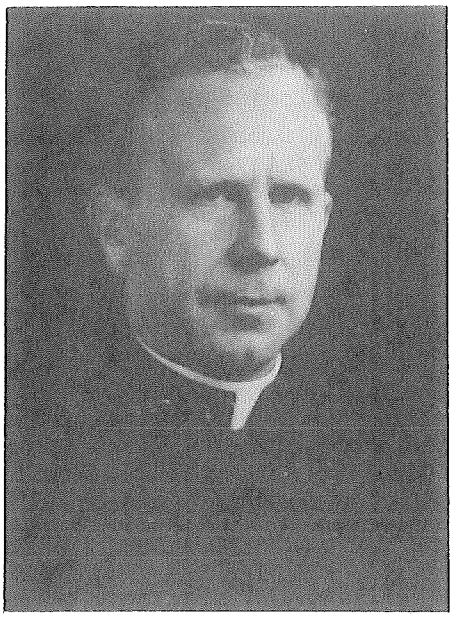
The parenthetical after Mead under the heading Clocks means "that Mr. L. A. Mead, local jeweler and clock maker, drew plans and specifications under Father Ricard's direction which were followed by Grimshaw and



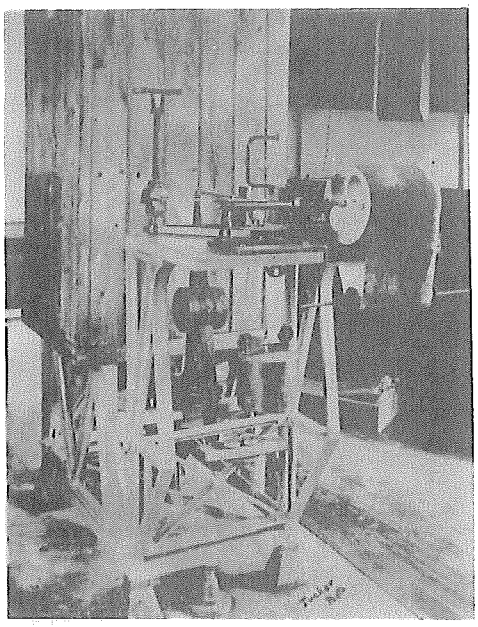
Father Ricard and Mr. Crowe, President
of the Santa Clara University Student Body



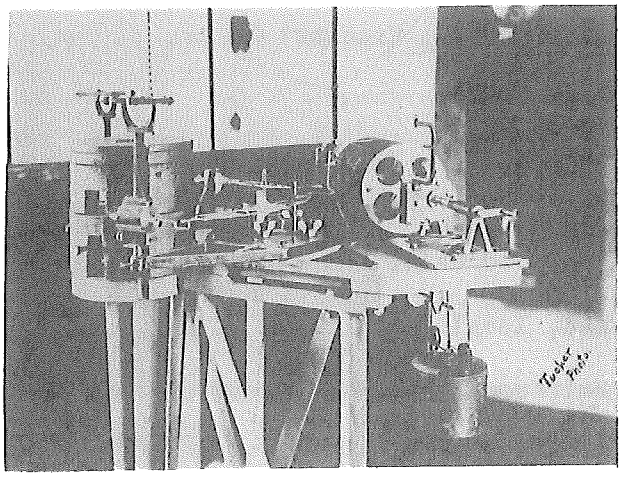
Dr. Albert C. Newlin in the Earthquake
Record Library



Reverend Raymond J. Buckley, S. J.
Director, 1931-1932

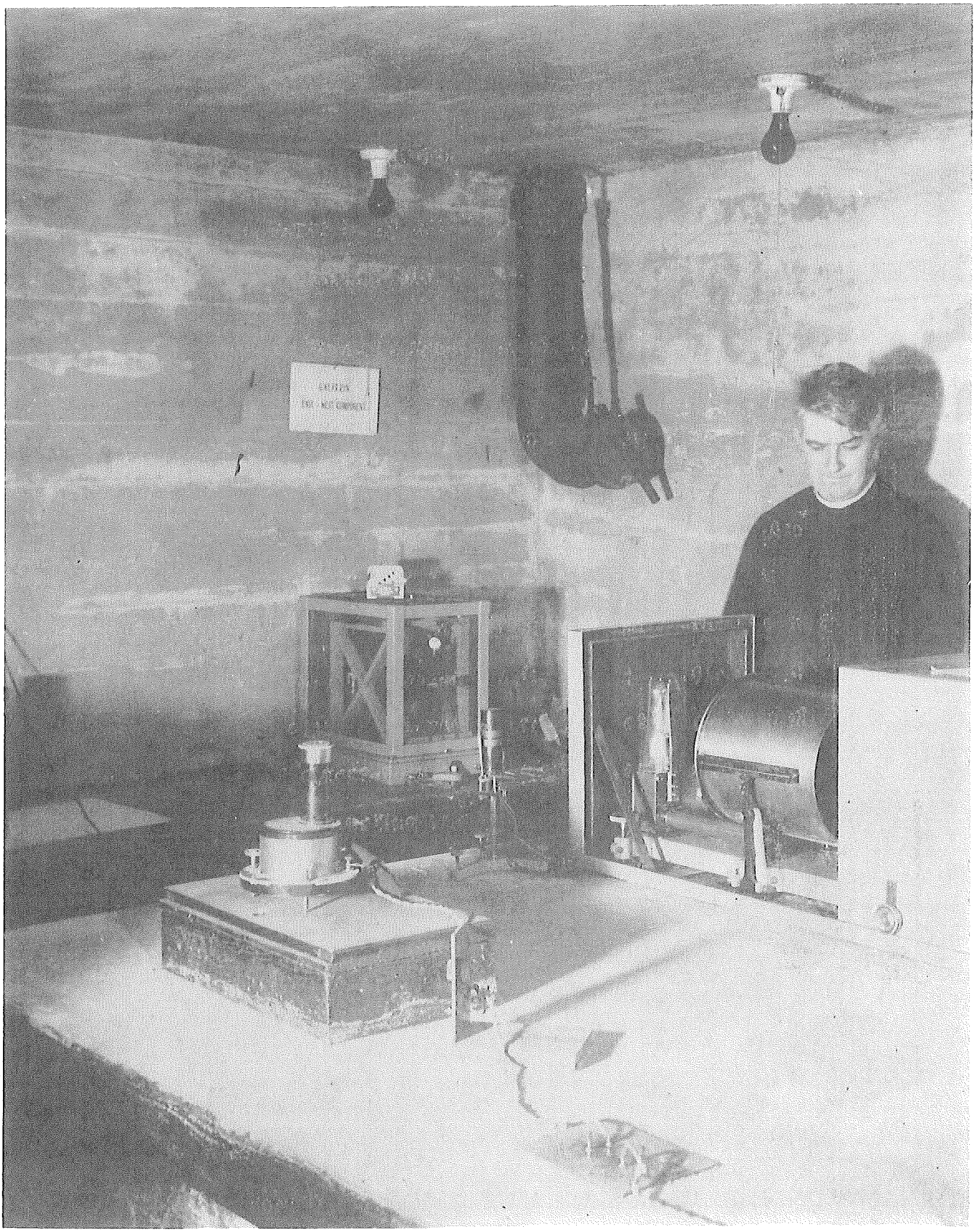


The 80 Kg. Horizontal Component Wiechert
Seismograph



The 80 Kg. Vertical Component Wiechert
Seismograph

Father Henry with a Galitzin Recording Drum



Background: Galitzin East-West Component Seismograph; Foreground: North-South Recorder; Reverend John A. Weber, S. J., Present Director

Foreground: Wood-Anderson Seismograph and Recorder
Background: Galitzin North-South Component Seismograph
Reverend John A. Weber, S. J., Present Director looks on.

Reverend Jerome S. Ricard, S. J. and Mr. L. A. Mead examine the Grimshaw and Baxter Clock (after Mead) at the time of its installation in the Ricard Observatory, 1929.

Baxter in making the clock; that he worked on it when it reached Santa Clara from England and made several modifications on it as well as installing both it and the electric recording system (1929). Mr. Mead has cared for the Observatory clocks for thirty-four years and still continues to do so" - A. J. Newlin.

Both the Wiechert clock (installed, 1909) and the Grimshaw and Baxter (installed, 1929) are still in use in the seismological station. A long-standing hope of obtaining a Shortt Synchronome Clock, or (more recently) an electronic equivalent, has never been fulfilled.

Records made on the above seismographs are continuous as follows: Wiecherts, continuous from May 6, 1910 to the present; Galitzins, continuous from August 16, 1930 to the present. These two dates are used as subdivisions of the following narrative. The earliest record on the Wood-Andersons is that of October 8, 1931. The Wood-Anderson records are intermittent.

April 18, 1906 to May 6, 1910 - The great California Earthquake of April 18, 1906 was the occasion which made intense Father Ricard's existing interest in earthquakes. In characteristically direct fashion, he set about doing something about it. By the fall of 1907, he had a homemade seismograph of sorts in operation. By May 6, 1910, he had the first professionally made seismographs (Wiecherts) in operation. The

oldest extant record in the Observatory is of that date, though the instruments had arrived in 1909.

Long as was the association of Father Ricard with earthquake instruments and their records (1907-1930), Mr. Albert J. Newlin's was even longer. Beginning when Father Ricard's did in 1907, his association with the Santa Clara Station extends to 1948, a period of forty-one years.

Since Mr. Newlin's memory is the principal, sometimes the only source for the early years, his relation to seismology at Santa Clara will now be given in more detail than it was in his previously given biographical sketch.

While a student in the College of Arts and Sciences, and in Law, and while Father Ricard lived (to 1930), he faithfully cared for the seismographs and their records, as well as for the meteorological instruments and their records. But his monumental fidelity to petty, unrelenting and painstaking tasks went beyond this. Out of devotion to Santa Clara and the memory of Father Ricard, in the midst of professional obligations of a very different sort, after hours, holidays or no holidays, he checked the records and kept the instruments (often at his own expense) "just as Father Ricard would have done had he been alive." From the day of Newlin's return from World War I in 1918, until January, 1948, he did not miss a day. Illness then forced him to retire.

He presently occupies a room in the Campus Donohoe Infirmary whose window looks out on the flower beds where

"Ric's picturesque vine-clad shacks" once were; where a monument to John J. Montgomery stands; and where, to the left, there glistens the dome of the Knights of Columbus Ricard Memorial Observatory.

Mr. Newlin recalls that in 1907 Father Ricard permitted him (then a high school student) to aid in constructing a seismograph according to suggestions made by Reverend Joseph M. Neri, S. J., Professor of Physics.

Father Ricard, aided by Mr. Newlin, spent a great deal to time working on the dual principles of the inverted and floating pendulum and finally succeeded in turning out a crude seismograph to which they attempted to add an ink recorder. When this proved impossible because the ink kept splashing onto the records, they installed a recorder using graphite. This instrument was finished and working some time during the fall of 1907.

The first experiment with the homemade seismograph was made in the "Meteorograph Room" in which there was a siderial clock. Each of these rested on a concrete pier. Records made on this seismograph were not only satisfactory; they were thrilling to beginners and experimenters.

The records made previously to May 6, 1910, by Father Ricard's "earthquake machine" have been lost. What is known is this; Father Ricard, working in make-shift quarters out in what was then known as "The Fathers' Vineyard," a name derived from Mission days (1777-1851), did not trust his

records to such flimsy buildings. He kept them very carefully in his living room, in the Jesuit Faculty Residence Hall, "The Fathers' Building", the students called it. On the night of December 22, 1909, "The Fathers' Building" was destroyed by fire and with it went "Ric's records". If between that date and the date of the first preserved seismogram on the Wiecherts (May 6, 1910) any record remains, there is no knowledge of it. No one even knows what became of the instruments that made the records. In any case they were the result of domestic and well-intentioned experimentation, and for the most part of historical interest rather than scientific.

In 1909 Santa Clara College along with some ten or eleven other American Jesuit Universities and Colleges, received its first manufactured seismographs: a pair of Wiechert (80 kg) ENZ vertical and horizontal recorders. At the same time an octagon-shaped frame building was constructed with double walls filled with sawdust insulation to help stabilize the temperature and humidity. The seismographs were placed upon two piers made of concrete, one for the horizontal seismograph and one for the vertical. Aid in this work was given by Professor John J. Montgomery[3] and

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[3] John J. Montgomery, sometimes referred to as "The Father of Aviation" was a pioneer in the study of aerodynamics and in experimenting with gliders, who sent aloft the first heavier than air glider "in controlled flight and maintained equilibrium." Victor Lougheed, Véhicles of the Air, 2nd ed., Chicago: The Reilly and Britton Co., 1910, p. 741.

Mr. Joseph R. Fernandes of the Physics Department. It was located about half way between the Infirmary and the front door of the present Observatory. Santa Clara became the fifty-first station in the world which installed Wiechert seismographs, according to the contemporaneous Company list: Verzeichness der Institute, etc., an welche wir bisjetzt unsere Seismographen lieferten.

Although these instruments were received and set up in 1909, "the first surviving records made on the Wiechert Seismographs at the Observatory were made on May 6, 1910. They were put on the seismographs on May 5, 1910 at 5:50 p.m. and registered a tremor at 30 seconds after midnight on May 6, 1910, PST. There are no existing records prior to this date in the Observatory". - Reverend John A. Weber, S. J., Present Director.

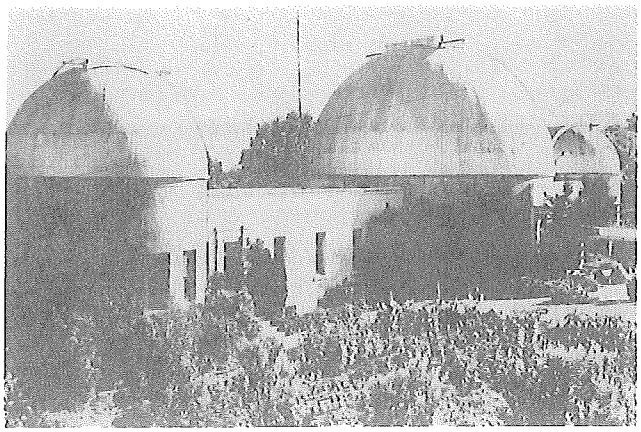
May 6, 1910 to August 16, 1930 - The latter date is that of the first surviving record made on newer instruments in the then new seismographic vault in the present Ricard Observatory.

The period between the two dates of this heading is one of continuous records on the Wiechert seismographs, of sending records made locally out to stations all over the world, of correspondence between Father Ricard and seismologists elsewhere, notably Reverend Frederick L. Odenbach, S.J. in Cleveland and Professor Omori in Japan.

The year 1928 is the next important year in the history of the Santa Clara Station. In the summer of that year the Ricard Memorial Observatory was completed, Reverend James B. Henry, S. J., joined Father Ricard as Assistant Director, and the first West Coast meeting of the Jesuit Seismological Association was held at Santa Clara. In the fall, the underground seismological vault was built, old instruments transferred, and new instruments ordered under the direction of Fathers Ricard and Henry.

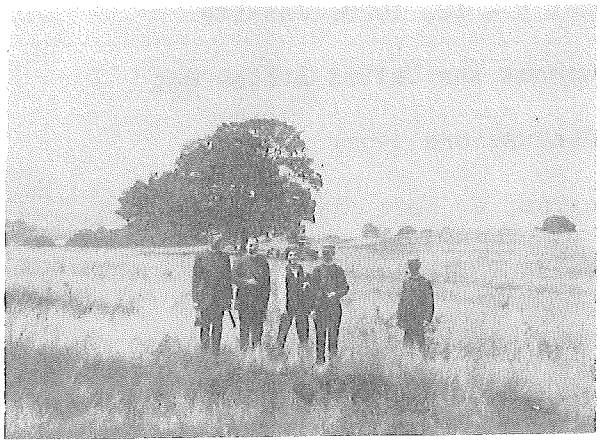
During the week of August 5 - 12, 1928, Jesuits from seismological stations throughout the United States met at Santa Clara. The papers and discussions usual at such annual gatherings were on the program; so were "field trips to the important structural and seismological features of Central California," the greater part of the week being "spent on successive sections of the San Andreas Rift." The words are taken from the Agenda of the Meeting. Opportunities for such trips are one of the principal advantages of Santa Clara as a meeting place for seismologists.

Though the men gathered here were specialists in the study of earthquakes, few of them had felt an earthquake. Father Henry, newly returned to Santa Clara, largeheartedly promised: "We'll put one on for you while you're here." He was as good as his word, but arranged for it at an awkward hour: 2 a.m. Some slept through it, some scurried with bath robes over pajamas to see the seismographs in action.



The Ricard Memorial Observatory

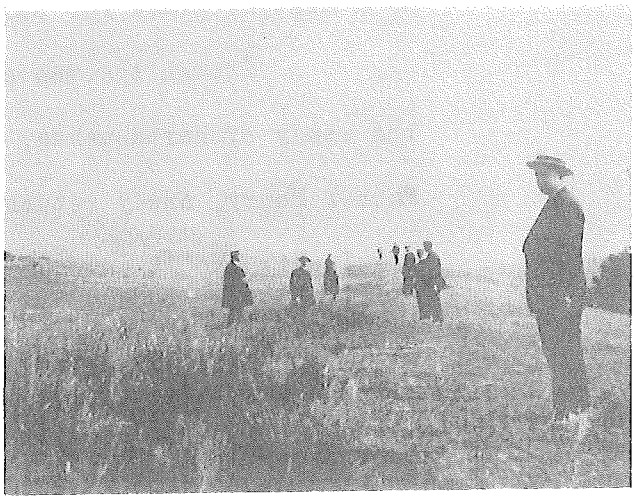
Delegates to the Jesuit Seismological Association, 1928: First Row - Fathers Herr, Odenbach, Ricard, Stechschulte and Joliat; Second Row - Fathers O'Conor, Abell, Brunner, Macelwane and Shannon; Last Row - Father Henry, Doctor Newlin, Father Tynan, Mr. James Stokley, Professor Lotz



In the San Andreas Rift near Portola Fathers Shannon, Henry, Herr, Abell and Odenbach (Jesuit Seismological Association Meeting, 1928)

In the San Andreas Rift, Olema. Fathers Shannon and Abell (Jesuit Seismological Association meeting, 1928)

Father Orie L. Abell on the trace of the fault of the Earthquake of 1906; looking southeast in the San Andreas Rift near Olema.



In the San Andreas Rift near Olema. Fathers Brunner, Joliat, O'Conor, Stechschulte, unidentified, Lynch, McCoy, Abell, Tynan and Henry.

In 1909, as we related earlier, an octagon-shaped frame building had been constructed "with double walls filled with sawdust insulation to help stabilize the temperature and humidity". Father Ricard and Mr. Newlin had often discussed an underground vault to replace this obsolete building. They were now joined by Father Henry who had recently visited seismological stations throughout the country. They took advantage of the presence (1928) at Santa Clara of Reverend James B. Macelwane, then President both of the American and of the Jesuit Seismological Associations, who aided with his advice.

The plans for a vault were then drawn by Father Henry and the rough work of digging the pit and building the vault was done in September and October, 1928. By November 1, the old octagon building had been razed and the Wiecherts moved into the basement of the Observatory, near the vault, where they still are. Since they do not operate on a photographic principle, and the Galitzin and Wood-Anderson instruments do, there was no need of placing them inside the vault.

The vault is really an underground photographic dark-room. It must be a room protected from ordinary actinic rays, because the records are made by a beam of light thrown on sensitized photographic paper. By means of delicately adjusted galvanometers and optical levers (beams of light) the earth's seismic motions are magnified many thousands of times, enabling the observer to estimate the direction, distance, and force of the shock.

The vault is placed underground in order to stabilize the temperature and humidity more than could be done in a building on the surface. For these purposes, the vault (inside measurements, 15 feet wide, 30 feet long; roof to floor 8 feet, roof 3 feet below the surface of the ground) is built of reinforced concrete; with a double wall, separated by a heavy insulating membrane (tar and pitch) protecting the instruments from the extreme effects of moisture and changes of temperature. The latter is approximately the mean temperature of the ground at the various seasons of the year for this part of California.

August 16, 1930 to the Present - Though the rough work on the vault was completed in late 1928, and the Galitzin seismographs, built by Hugo Masing, Dorpat, Estonia, arrived on February 8, 1929, yet the earliest surviving record on the Galitzins is that of August 16, 1931. These records are continuous from that date forward. The instruments are made to record tremors anywhere on the earth.

There are various reasons for this delay: certain Custom's regulations to comply with, the need for interior finishing and furnishing of the vault, for a large amount of necessary electric installations, long periods of testing and adjusting--- all to be done by Father Henry at a time when he was carrying a full load of mathematics instruction in the Engineering College.

The earliest surviving record on the Wood-Anderson seismographs, made in Pasadena by Fred C. Henson in 1929, is that of October 8, 1931. These instruments are made to record local tremors. Their records are intermittent, with various gaps for various reasons. Local tremors are still recorded by the Wiecherts, whose records are continuous from May 6, 1910.

The subsequent history of the Station is the ordinary history of making and filing contemporaneous records and communicating with seismological stations all over the world.

A second meeting of the Jesuit Seismological Association was held at Santa Clara August 17 - 24, 1947. As in the case of the first in 1928, papers were read and field trips made. At the time of the first meeting field studies were made along the San Andreas and Hayward Faults; at the time of the second, earthquake effects on the Sierra Nevada and Owens Valley Fault Zones were studied.

Thus is the account of the University of Santa Clara Seismological Station brought down to the Year of Grace, 1950.

Second Santa Clara Meeting of the Jesuit Seismological Association held in the Ricard Memorial Observatory, August 17-24, 1947. Front row, left to right: Fathers Stechschulte, Blum, Brunner, Macelwane, Downey. Back row, left to right: Fathers Lynch and Maring, Doctor Heinrich, Fathers Powers, Westland, Weber, Birkenhauer, Eisele and Mr. Bates.

Files Consulted

Catalogus Provinciae Californiae Societatis Jesu. (Files of the California Province of the Society of Jesus, 2460 Lyon Street, San Francisco)

Monthly Weather Bulletins sent to the United States Weather Bureau from the Santa Clara Observatory as a Cooperating Weather Station. Signatures on these Bulletins are an aid in fixing dates of tenure of Directors of the Seismological Station.

The Owl, undergraduate literary magazine

The Redwood, formerly the undergraduate literary magazine, currently the University Annual

San Jose Mercury-Herald, San Jose, California (newspaper)

San Jose News, San Jose, California (newspaper)

The Santa Clara, University of Santa Clara Campus Newspaper

The Santa Claran, Alumni Monthly Bulletin

Seismological Records, University of Santa Clara Station

The Sunspot, University of Santa Clara, March, 1915 to August, 1930. A monthly Bulletin chiefly concerning the weather, put out by Father Ricard. There are incidental and largely inconsequential references to seismology.

University of Santa Clara Catalogue

Other obligations are acknowledged in the text.