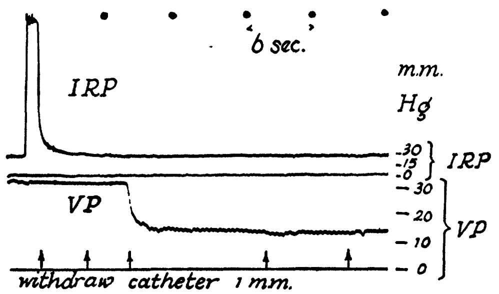

FIG. 1. Pressure changes during withdrawal of renal vein catheter from arcuate into interlobar vein. A simultaneous measurement of intrarenal pressure is shown.

to about 53 mm Hg, just as does the IRP (*4*). With pressor doses of epinephrine, it fell transiently to 9 mm Hg, as does the IRP (*4*). With increased ureteral pressures, it rose sharply, as does the IRP. The two pressures are the same under all conditions (renal arterial occlusion excepted): the coefficient of correlation between them in 23 dogs, each one subjected to various experiments, was 0.85 in a range of IRPs from 6 to 73.

When the catheter was pulled out, a millimeter at a time, while simultaneously recording its pressure changes, at a certain point during the withdrawal the pressure abruptly dropped to about 7 mm Hg. Fig. 1 shows such an experiment; in this instance the pressure dropped from 32 to 15 mm Hg. At this point, the tip of the catheter was found, by necropsy, to be in an interlobar vein, about a millimeter below the confluence of the arcuates. Evidently the point of abrupt pressure change, which we have previously postulated to be somewhere above the epithelial lining of the pelvis (*5*), lies, in the renal venous system, close to the junction of arcuates with interlobars.

Because the arcuate venous pressure is some 25 mm Hg, the pressure farther back—i.e., in the renal venules and peritubular capillaries—must be greater than 25 in order for blood to flow through them. The initial hypothesis that intrarenal venous pressure exceeds 25 mm Hg is therefore proved. At the arcuate-interlobar junction, there is presumed to be formed a physiological constriction similar to that described in a model we have constructed to study the dynamics of renal blood flow (*5*). This constriction, by interposing a resistance in the renal venous circulation, has the effect of keeping renal venous pressure higher than intrarenal pressure. Blood is, in effect, dammed up behind the constriction at relatively high pressures, and the kidney is kept inflated with blood by hydrostatic pressure from the heart (*6*).

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Establishment of an Antarctic Seismological Station[1]

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Earthquakes are believed to involve the breaking of the earth's crust under stress. Actual discovery of their location is the only means of ascertaining the action that takes place beneath the surface. They occur mainly in belts of orogenic activity and where the earth's crust is weak, and it is significant that the earthquake belts include most important mountain ranges both above and below sea level and are associated particularly with regions of major gravity anomalies.

Recording by instruments of present-day sensitivity has been carried on for the past 40 years. For accurate location three or more stations must pick up the tremors with sufficient strength, and the stations should be located at distinctly different azimuths from the quake. Thus certain belts are not completely defined, especially where they do not come within range of recording instruments, and much of the activity goes unnoticed or unlocated. This is not true for quakes of major magnitude, but the situation does exist for much of the Southern Hemisphere. Antarctica has never had an adequate teleseismic station, and the great surrounding water body prevents any good station from existing even close to the continent. Many of the Southern Hemisphere's large earthquakes are picked up only by stations of a northerly azimuth from the quake, and as a result, exact location is poor. Recordings of an antarctic seismograph station, therefore, are of definite significance.

Instruments. In choosing instruments for such a region, three important facts must be considered: first, the uncertain and difficult conditions under which they are to be established and operated; second, the instrument or combination of instruments suited for recording the data desired; and, third, the unavailability of replacements. Thus, every attempt should be made to keep the program as simple as possible.

The two seismographs used on the Ronne Antarctic Research Expedition were: (1) the Neumann-Labarre horizontal component, a tough mechanical instrument having an adjustable natural period of 1–4 sec, a magnification of about 5,000, and on which any delicate part, such as the fiber or hinge, could be easily replaced; and (2) the Sprengnether, series H, horizontal component, having an adjustable natural period of 6½–22½ sec, and a magnification varying from 2,000 to 3,000. The latter instrument was supplied with two galvanometers: one with natural period of 6½ sec, and the other with natural period of 22½ sec. Besides providing two different

[1] This paper comprises Technical Report No. 10 in the ONR Series covering the work of the Ronne Antarctic Research Expedition 1946–1948. The work was done under contract (No. N6-onr-280) with the Geophysics Branch, Physical Sciences Division, and it benefitted from the assistance and cooperation of the U. S. Coast and Geodetic Survey, the Jesuit Seismological Association, and Columbia University.

period ranges with which to work, the two galvanometers established a safety factor in case one of them was broken beyond repair. Spare parts included suspensions and coils for both galvanometers, and coils for the Sprengnether seismometer. Both seismographs worked photographically, largely eliminating friction and contraction troubles found with extreme temperatures. Other equipment included two photographic recording machines, either of which could be used for both instruments concomitantly, and an ample supply of electrical accessory equipment, consisting of light sources, bulbs, ammeters, batteries, wiring, etc. Two Navy break-circuit chronometers supplied the need for time marks, since a good timepiece is most important when it is difficult to get time checks by radio.

Setting up the station. Many fine points should be considered in selecting a site for a seismograph station; however, on an expedition such as this, consideration could be given to the major ones only; namely, solid bedrock close to base over which a strong and fairly airtight shelter can be erected. Much trouble can be eliminated if such a shelter can join the main base hut, as this one did. Digging in permanent frost where the ground is a conglomerate of boulders is practically impossible.

Solid granite bedrock within 10 ft of one of the three main buildings, built and occupied by members of the U. S. Antarctic Expedition of 1939 and 1941 (Fig. 1), was 24 ft above mean sea level and surrounded by boulders on all sides. A shack was built adjoining the main building and covering a sufficient portion of the rock for emplacement of the instruments. Although good covering wood was scarce, two layers of canvas with insulating material made the shack fairly airtight. Since it covered only part of the bedrock, and one corner did not rest on rock, this corner was supported by barrels on each side and sufficient canvas hung down to keep the enclosure airtight. Thus, vibration of the building resulting from wind or walking would not cause undue vibration in the bedrock. A floor was laid three feet above the ground with a trap door over the rock base.

After the building was completed and the trap door was made lightproof, installation began. Parts of the bedrock had to be chipped away to level the two seismographs. Later, a cement pier was used when moisture caused difficulties during the summer, but during the fall, winter, and spring such troubles did not occur.

The orientation of the Neumann-Labarre was such as to measure motion along a line 37° E of true north. The Sprengnether measured motion along a line 62° E of true north from May 24, 1947, through November 23, 1947; along a line 48° W of true north from November 24 through December 13; along a line 2° E of true north from December 14, 1947, through February 15, 1948. The seismographs were not placed at right angles because there was not enough space on the bedrock in the shack, and the instruments were used as supplements to each other, since they were of entirely different characteristics. The shorter-period

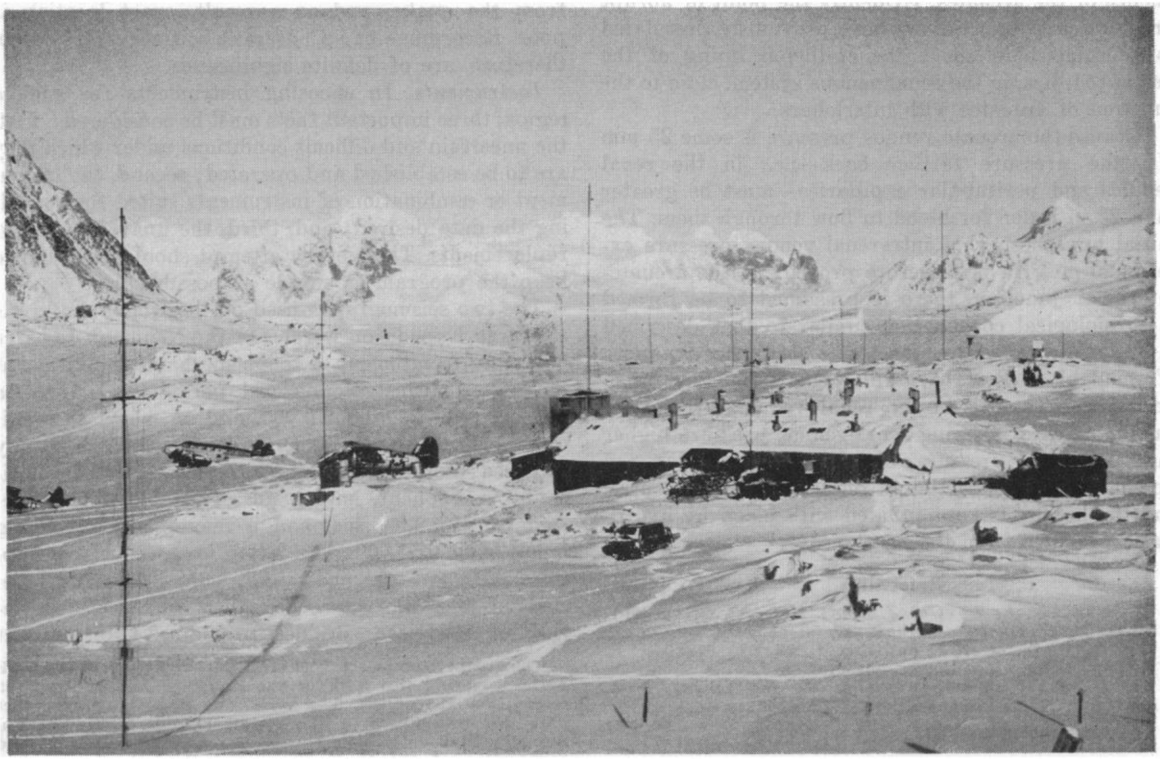

FIG. 1. Over-all view of the base.

Neumann-Labarre picked up the initial phase, whereas the Sprengnether operated better on the subsequent phases. Moreover, during microseism storms the Neumann-Labarre, being less sensitive, picked up the initial phase sharply, when the phases would otherwise be indistinguishable.

Working in the cold is most disagreeable and difficult; heavy clothes are a hindrance and gloves impossible in such work. A primus heater helped solve the problem. The two seismographs, the recorder, the galvanometer, the light sources, and necessary relays and resistances (Fig. 2) were put into the compartment below the trap door. All other necessities and controls, including batteries, chronometers, light source, and time mark controls, were put in the main building, which was usually heated. Charging the batteries, checking and winding the chronometer, and adjusting the current through the light source could all be done in relative comfort and convenience. A visit into the shack had to be made only twice a day to change paper, unless trouble was encountered.

Operation. The Neumann-Labarre seismograph ran at a natural period of 2 sec from May 18 through June 10, 1947, but the instrument did not prove sensitive enough until changed to a period of 3½ sec, using the large weight on the pendulum. At 3½ sec it ran satisfactorily from June 11 through November 15; however, as the weather grew warmer and some of the snow melted away, tilt troubles became more and more obvious. There seemed to be a correlation between the tilting of the bedrock and the heating of the sun, because the lines on the seismograms separated during the night and came together and overlapped during the warmer part of the day. On December 1, 1947, the period was cut down to 2 sec, using the small weight, and the tilt effect was partially eliminated, but the instrument also lost a great deal of its sensitivity. This may have been due to friction troubles resulting from imperfect balance of the rotating spindle. The larger weight probably had overcome some of this friction.

The Sprengnether was operated at 6½ sec natural period from May 24 through November 23; at 20 sec from November 24 through December 13; and at 22 sec from December 14, 1947, through February 15, 1948. The natural period of the seismograph was adjusted to be the same or nearly the same as the natural period of the galvanometer used in each case. The instrument worked satisfactorily with few serious difficulties.

In November, however, trouble developed with stray currents. A slight constant potential appeared in the leads to the galvanometer, gradually changing the so-called zero point on the seismogram, and as time went on this potential changed back and forth suddenly, ruining some of the seismograms. During this month the first traces of water accumulated from the melting surface snow, which was possibly responsible for a ground potential being conveyed to the circuit. A charged wire was found lying on the snow close to the shack, coming from the radio room. Consequently, the

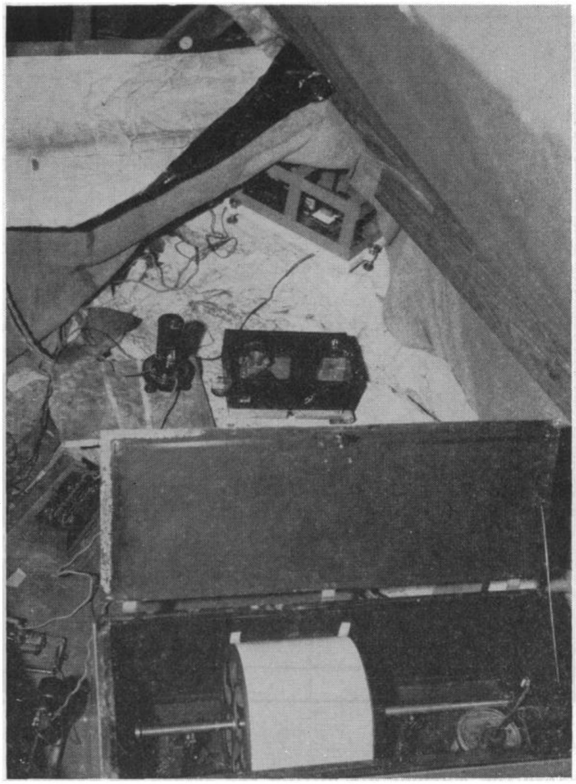

FIG. 2. Instruments in shack.

Sprengnether was mounted on a cement pier—a far superior position as far as moisture was concerned. All leads of the circuit were more thoroughly insulated and protected, and current troubles were thereby eliminated.

At the longer natural period of 22 sec, some regular long-period seismographic disturbances of almost a minute were recorded. As reported by Florence Robertson (*1*), they were found to be correlated and eliminated by temperature and humidity control. Microseism storms were more frequent and stronger when the Sprengnether operated at 6½ sec natural period. The microseisms themselves were of a period of 4½–6½ sec, and such waves are amplified more when the seismograph operates near their period; and during the summer months of December and January the low pressure storms causing such disturbances were less frequent and severe.

Both seismographs were set up to record on the same recorder and seismogram. The recorder drum was rotated by a spring, as in a clock. During extreme cold weather the recorder exhibited a tendency to stop. This trouble was decreased by warming the instrument with a 25-w bulb in a lightproof can, placed in the recorder next to the clockwork.

Some temperature control was provided by installing a pipe from the adjoining building to the seismological shack and using a fan to blow the warmer air from the main building to the shack. This procedure proved unnecessary and completely unfeasible, be-

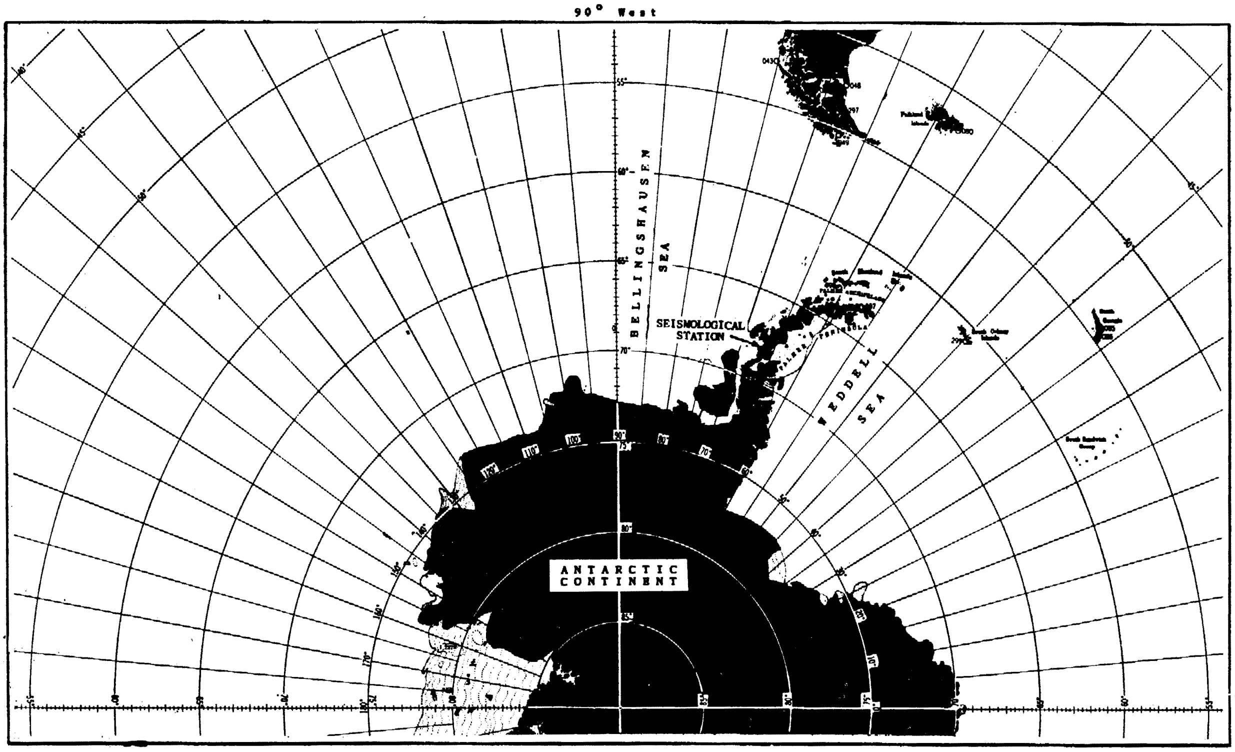

FIG. 3. Map of western half of antarctic continent.

cause the warmer air hitting the colder air naturally caused condensation. This moisture collected on the reflecting mirrors and destroyed completely the trace on the seismogram. Wind currents were guarded against with canvas and insulating material. Snow that piled high around the shack was an added and even better protection against winds.

A fairly routine operation schedule was established. The paper was changed twice a day, and the seismograms were developed and interpreted about every three days. The interpretations were radioed to the Coast and Geodetic Survey, Office of Naval Research, and the Jesuit Seismological Association on the next radio schedule with the U. S. The break-circuit chronometers, which put time marks on the seismogram every minute, were checked with the radio time signals to at least the nearest half-second every four or five days. Both light sources worked from batteries of 4 or 6 v, adjustable by rheostat, which were charged when necessary, usually every three or four weeks.

Results. In the nine months of operation about 170 earthquakes were recorded, and their interpretations are listed in *Antarctic Seismological Bulletin* (*2*). Such interpretations proved helpful in locating southern earthquakes, especially near South America and New Zealand. Some of the closer earthquakes were recorded only by the Antarctic Station. Many local disturbances were recorded, of which about 40 are listed in the *Antarctic Seismological Bulletin*. It is difficult to say which of these 40 are small local earthquakes and which are avalanches or ice falls. Since the loud avalanches noted correlated only with small local disturbance on the seismograms, it is suspected that many of the strong local disturbances may be a result of small local earthquakes. In support of this belief is the fact that local disturbances on the seismograms did not increase markedly during the warm months, when avalanches and ice falls were more frequent; but any final conclusion would be premature.

As previously stated, strong microseisms were recorded frequently by the Sprengnether seismograph. There was definite correlation between these microseisms and meteorological conditions of the area, as estimated from weather data from five British bases in the area, our station on the 6,000-ft plateau 17 miles east of the Ronne Antarctic Research Expedition Base, our base at Cape Keeler on the east side of the peninsula, and ship reports (Fig. 3). Approximate locations of the bases are as follows:

Ronne Antarctic Research Expedition Base (Marguerite Bay)—68° 11′ S, 67° 11′ W
Laurie Island in the South Orkneys—60° 45′ S, 44° 30′ W
Hope Bay—63° 15′ S, 56° 45′ W
Deception Island—62° 58′ S, 60° 35′ W
Port Lock Roy in Argentina
The Falkland Islands

There is correlation between barometric lows of sufficient depth passing over the peninsula and the microseismic activity at the main base. The same principle is used by the Navy to locate and track hurricanes in the Caribbean and Pacific Ocean areas.[2] In Antarctica, however, extratropical rather than

[2] U. S. Navy Hurricane Microseismic Research Project NAVAER 50-1R-189.

tropical lows are present. The peak of this microseismic activity usually comes when these eastward-moving low pressure storms reach the Weddell Sea (Fig. 3). There are several possible explanations as to why the storms are recorded more precisely when east of the station than west. There is the possibility of two different geological structures across which microseismic energy does not carry. The lows may deepen considerably after reaching the Weddell Sea. The bottom of the Bellingshausen Sea may be such that microseisms are not generated when a cyclone is in that vicinity. A detailed analysis of the phenomenon has been reported elsewhere (*2*).

The seismograms and all other original data can be obtained from the archives of the Geophysics Laboratory, Department of Geology, Columbia University.

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Sodium Nucleate Inhibition of Arginase Activity [1]

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It was found that under certain conditions sodium nucleate (yeast sodium nucleate, Schwartz) inhibited arginase activity. This finding was considered significant because of the universal presence of nucleic acids in all cells. A further study was then undertaken to determine the nature of this inhibition. The results of these studies are summarized in Table 1.

TABLE 1

Effect of Sodium Nucleate on Arginase Activity

Reaction mixture	No. determinations	Micromoles urea/ml*	Percentage inhibition
Enzyme + substrate (control)	10	0.195	
Enzyme-nucleate + substrate	5	.000	100
Enzyme + substrate-nucleate	5	.190	None
Enzyme + substrate + added Mn^{++}	3	.195	
Enzyme-nucleate + substrate + added Mn^{++}	3	0.200	None

* All determinations are ± 0.015.

[1] The author is indebted to M. J. Kopac, professor of biology, New York University, for encouragement and guidance while working in his laboratory on this problem.

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The enzyme was prepared by extracting dried acetone powder of beef liver with tribasic potassium phosphate and by precipitation of the nonarginase protein by heating the extract to 60° C. The enzyme was then activated with Mn^{++} according to the method of Mohamed and Greenberg (*1*). Arginase activity was determined according to the photometric method of Van Slyke and Archibald (*2*). The enzyme contained 103 Van Slyke units of arginase per ml or 9.42 such units per mg protein. The enzyme was diluted just prior to the reaction with the special salt solution of Kallman and Kopac (*3*). The enzyme dilution was 1:500. For the enzyme-nucleate mixture this consisted of equal aliquots of sodium nucleate dissolved in enzyme diluent and of 1:250 diluted enzyme preparation. The substrate-buffer mixture consisted of 0.06 *M* 1(+)-arginine monohydrochloride (Eastman Kodak Company) dissolved in 0.1 *M* diethyl-barbiturate buffer of pH 9.5, prepared according to Michaelis (*4*). The enzyme reaction was initiated by mixing 0.5 ml diluted enzyme preparation with 0.5 ml substrate-buffer mixture. The final substrate concentration was thus 0.03 *M*. The incubation temperature was 25° C, and the reaction period was 15 min. Under these conditions it was found that 1 mg sodium nucleate per ml of reaction mixture caused complete inhibition of arginase activity. It should be pointed out here that the sodium nucleate gradually loses its inhibitory power on standing for a few days in a dissolved state; hence, for maximum inhibition, the nucleate should be dissolved just prior to use.

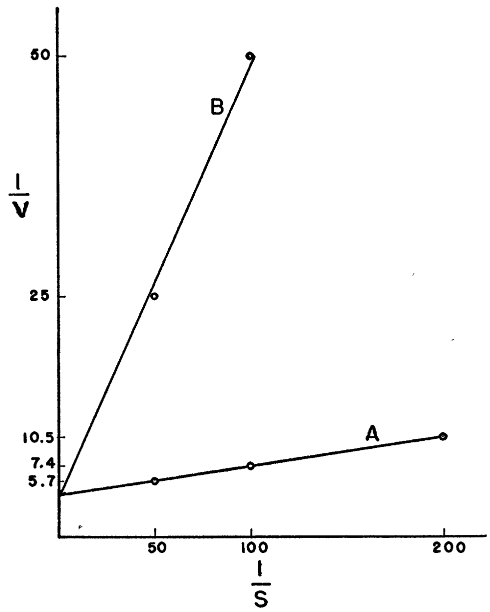

Fig. 1. Competitive inhibition of arginase by sodium nucleate. *A* represents arginase activity with no added nucleate, *B* with 0.75 mg sodium nucleate/ml added to the enzyme portion. *S* = substrate concentration in moles. *V* = enzyme activity, expressed in μM/ml.

In order to determine whether this inhibition was competitive, it was necessary to study the effect of