93°24′W. Almost vertical, west-facing cliffs stand above the sea ice and form the shoreline of the island. The rock is cut by a large number of slickensided and grooved vertical slip planes and vertical cataclastic zones showing dip-slip movement. The slip planes and cataclastic zones strike north, parallel to the shoreline. This similar orientation suggests that the shoreline is fault controlled.

Rocks of two types were collected from the exposure in Paradise Harbor. The first of these is a medium-gray, medium-grained, sparsely mafic rock of dioritic composition that is not at all like the quartz diorite of the Eights Coast. The second type occurs as inclusions in the dioritic rock and is an odd, dark-gray, fine-grained to fine-medium-grained rock that is composed principally of calcic plagioclase—either calcic andesine or laboradorite. Epidote, sparse masses of chlorite, and magnetite-ilmenite are the only other minerals identified as yet. This rock may be an old andesite or crystal tuff, although it does not resemble Adie's descriptions of such rocks (*2*). A University of Wisconsin geological party did considerable work in this area last austral summer and will undoubtedly present much more geologic data (*3*).

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Histochemical Distribution of Acid Phosphatase in Healing Wounds

Abstract. When wounds are inflicted in the palate, tongue and skin of Wistar rats and guinea pigs, acid phospatase activity in proliferating epithelium of these wounds is markedly decreased from that in normal epithelium; the enzyme reappears as soon as keratinization is evident. In connective tissue the enzyme is found especially in foreign body giant cells and in histiocytes in macrophagic function.

The histochemical distribution of acid phosphatase has been studied in wounds of the palate, tongue, and dorsal skin of 30 Wistar rats and 50 guinea pigs. The wounds were inflicted in such a way as to produce a loss of substance of convenient size, and the animals were killed after 3 days and 1, 2, and 3 weeks. The area of the wound, including a wide margin of normal tissue, was removed.

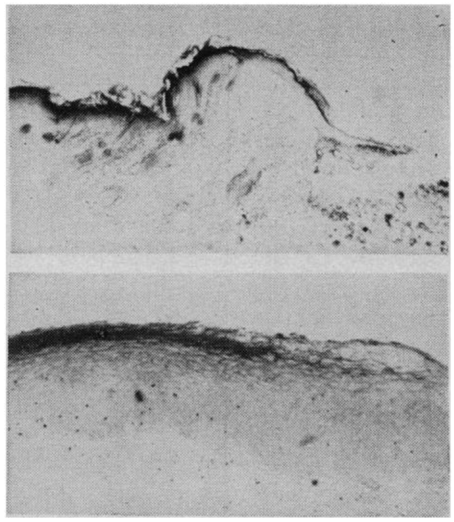

Fig. 1. (Top) Survey view of a 7-day-old wound in skin of guinea pig. Note the marked reduction in enzymic activity in the margins of the proliferated epithelium. Rutenburg and Seligman technique; incubation time 2 hours (about × 13). (Bottom) Part of margin of 7-day-old wound in guinea pig tongue. Note the abrupt decrease in the response of the upper epithelial layer. Rutenburg and Seligman technique (about × 60).

The demonstration of acid phosphatase was done with the methods of Burton (*1*), Gomori (*2*), and Rutenburg and Seligman (*3*) on unfixed sections and on sections fixed in formalin–chloral hydrate (*4*). Different incubation times ranging from 10 minutes to 24 hours were used. The most demonstrative slides were obtained after 1 to 3 hours of incubation. Similar results were obtained with the three techniques, but the two last mentioned produced better responses.

The epithelium of skin and oral mucosae of the rat show an intense reaction in the subcorneal layers and another less intense reaction in the basal cell layers; the latter reaction is especially evident in oral mucosa (*5*).

Similar histochemical behavior occurs in skin wounds and in wounds of the oral mucous membrane. During all the healing process and until epithelialization is complete, the epithelial margin of the wound shows a marked reduction in acid phosphatase activity with loss of the characteristic enzyme pattern, giving a weak diffuse reaction (Fig. 1). The same reduction in enzymic activity is seen in occasional acanthotic epithelium close to infected wounds.

Acid phosphatase appears in the superficial layers of proliferated epithelium as soon as histologic evidence of keratinization is detected.

Healing connective tissue contains isolated, intensely positive cells which are probably histiocytes in macrophagic function. Newly formed fibroblasts give a moderately positive reaction which is stronger than that of fibrocytes in normal corium. The fibrous tissue which occupies the area of the wound is also slightly positive, while normal connective tissue is almost negative. Foreign body giant cells occasionally found in wounds are strongly positive.

These results indicate that acid phosphatase is related to keratinization and not to epithelial proliferation. In connective tissue, acid phosphatase appears to be associated with macrophagic function and not with tissue formation (*6*).

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Excessive Irrigation and the Soils and Ground Water of Oahu, Hawaii

Abstract. In the cultivation of sugar cane in Hawaii irrigation water is applied at very high rates. More than half of this water returns to the basalt aquifer by infiltrating through the highly permeable lateritic soils. The excessive rate of irrigation alters the composition of the ground water and accelerates the evolution of the low humic latosols to humic latosols.

About 30 square miles of the south central portion of the island of Oahu, Hawaii, is devoted to the cultivation of sugar cane, all of which is heavily irrigated. Of the total crop area, nearly 23 square miles directly overlies the basalt aquifer and is thus tributary to it;

the remainder covers a poorly pervious sedimentary coastal plain called "caprock," which prevents percolation to the water table.

The aquifer of south central Oahu consists of Koolau basalt and extends from Honolulu westward approximately 15 miles to the Waianae Mountains. In the Honolulu region, the aquifer is compartmented by deep valley fills, but the compartments are in hydraulic continuity. The Koolau basalt is strikingly homogeneous both chemically and mineralogically and weathers *in situ* to lateritic soils.

In dry areas, the lateritic soils are classified as "low humic latosols," while those in the moderate rainfall belt are classified as "humic latosols" (*1*). Most of the sugar cane is grown on low humic latosols. These soils are characterized by a low organic matter content, a kaolinitic clay fraction, and by an accumulation of iron and aluminum oxides at the expense of silica and bases. The humic latosols are generally similar but are poorer in silica and bases. The range of rainfall for the low humic latosols is 10 to 80 inches per year, and for humic latosols it is 40 to 150 inches per year. The average annual rainfall in the sugar cane area is 30 inches.

The principal fresh water recharge to the aquifer occurs in the Koolau Mountains where the rainfall approaches an average of 300 inches per year. The water that infiltrates to the ground-water body moves seaward under a hydraulic gradient of about 1 foot per mile. The fresh water in the aquifer floats on saline water in approximate accord with the Ghyben-Herzberg principle. The saline water originally moved through the subterranean rock mass from the sea.

The chemistry of the fresh water, before contamination by the saline or other extraneous source of water, is a function of the composition of the rainfall and the changes it undergoes during its passage through the surface mantle, where weathering occurs, to the unaltered rock below. Weathering activity may extend for several hundred feet below the surface. Once the water reaches the ground-water body its composition is stable and is independent of distance from the point of recharge or of residence time in the aquifer (*2*). Subsequent contamination may occur from mixing with saline water, through agricultural and industrial activities, or from sewage. Saline water is by far the most important contaminant and completely dominates the others where it occurs. Contamination by saline water increases the content of chloride, sulfate and the bases, but not of nitrate or silica. Recognizable contamination from agricultural fertilizers is indicated by significant increases in nitrate content. The silica content is not affected by any of the contaminants. Because neither the silica nor nitrate contents are affected by saline contamination, and also because they are free of significant soil-water ion-exchange reactions, they are excellent indices of changes that the ground water may undergo through processes other than mixing of the fresh and saline waters.

Table 1. Mean concentrations (with standard deviations) of silica and nitrate for unirrigated and irrigated regions of southern Oahu.

Source	No. of analyses	Mean concn. (ppm)
Silica (SiO_2)		
Moanalua wells	23	34 ± 4.3
Kalauao Springs	28	54 ± 4.2
Ewa wells	11	63 ± 7.9
Nitrate (NO_3)		
Moanalua wells	23	1.0 ± 0.22
Kalauao Springs	18	2.7 ± 1.1
Ewa wells	9	8.2 ± 2.4

The high permeability of the low humic latosols requires that an unusually great quantity of water be used for effective irrigation. On an annual basis, an average of 123 inches is applied as irrigation, which when combined with the average annual rainfall gives a total of 153 inches of water per year that is made available to the sugar cane. Hydrologic budgeting has indicated that between 50 and 60 percent of this amount escapes evapotranspiration and returns to the ground-water body.

The irrigated region overlying the aquifer is well defined and is down the hydraulic gradient from the unirrigated region near Honolulu. Thus, any changes in composition of the fresh ground water resulting from irrigation practices should be readily apparent. Many wells are located where the sugar cane is grown, and in addition large artesian springs discharge into Pearl Harbor at the coastal limit of the cultivated region. A comparison of spring water and of well water from the farthest limit of the irrigated region with fresh water from the district just west of Honolulu clearly shows an increase in the two constituents, silica and nitrate, that are unaffected by saline water contamination. Table 1 gives the mean concentration of these constituents for Kalauao Springs, which is in the midportion of the irrigated area, the Ewa wells in southwestern Oahu toward which the ground water from the irrigated region moves, and of well water from the unirrigated area (Moanalua). Tests of the similarity of the means for the Kalauao-Moanalua pair, and the Ewa-Moanalua pair show that the differences in means are significant at the 1-percent level.

The increase in nitrate in irrigated areas evidently results from percolation to the aquifer of soluble nitrates used in fertilizers, although a small fraction may be due to concentration caused by evapotranspiration. Up to 300 lb of nitrogen per 2-year-crop period are applied in a fertilizer form in sugar cultivation in Hawaii. On Oahu much of this nitrogen is applied as hydrous ammonia.

The reason for the large increase in silica in the irrigated region is not as apparent as in the case of nitrate. Neither fertilizer contamination nor evapotranspiration can explain the phenomenon. However, it is reasonable to expect the soil to be the chief source of the additional silica. As previously mentioned, the soils on which irrigation is practiced are mostly low humic latosols, which are characteristic of most of the dry areas of Oahu. These soils contain about 30 to 35 percent silica. With increasing rainfall, the low humic latosols grade into humic latosols, for which the average silica content is 15 to 20 percent, the remainder having been lost through leaching. Since, in irrigating, an additional 123 inches of water above the 30-inch average rainfall is added to the fields per year, it is probable that the low humic latosols are being forced to evolve to the humic latosols with attendant loss of silica by leaching.

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