liable to oscillate between aggradation and degradation ; and (d) the extent to which original mineral composition (and parental sources) can be inferred from the actual mineral assemblage in any particular case.

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Active Absorption of Anions in the Animal Kingdom

IN recent papers (1933–37), Lundegårdh[1] has demonstrated in the roots of plants a mechanism for absorbing and concentrating salts out of very dilute solutions. This mechanism utilizes energy derived from the oxidation of sugar and acts by transport of anions (in Lundegårdh's experiments, NO_3^- and Cl^-) from the outside medium through the active cells to the inside. It is a specially important point that the energy used up is proportional to the anion exchange, while cations cause no increase in respiration. In carbonate solutions no active transport can take place and the exchanges of cations are slight only.

I submit that a mechanism closely resembling Lundegårdh's is of widespread occurrence and of great biological significance in the animal kingdom.

H. Koch (1934)[2] discussed the occurrence in a number of freshwater arthropods of certain groups of cells which take up silver nitrate from very dilute solutions and become deeply stained when the silver chloride formed is afterwards reduced under the influence of light. He suggested that these special cells normally act by actively absorbing salts which go to maintain the osmotic concentration of the organism. Working in my laboratory, he was able to prove the correctness of this suggestion.

I studied[3] simultaneously the active absorption of salts by frogs. Frogs which have been deprived of a certain amount of salt will take up actively Cl^- ions from solutions down to 10^{-5} molar or less, either with Na^+, (K^+) or in exchange against HCO_3^-. While in plant roots the process is apparently going on indiscriminately all the time, in the frog's skin it is definitely regulated. It takes place only when the salt content of the body has been depleted, and when potassium chloride only is available it soon stops. Calcium is scarcely taken up at all, but from calcium chloride there is a quantitative exchange of Cl^- ions against HCO_3^-. Br^- is absorbed just as rapidly as Cl^-, and I find now that the nitrate ion also is absorbed from a $n/1,000$ solution. In an experiment with sodium chloride plus nitrate, each 0·002 molar, the initial uptake of Cl^- was thrice as rapid as that of NO_3^-. Iodine penetrates only slowly and probably by diffusion.

Corresponding mechanisms exist in a large number of freshwater animals where they seem to be located in the gills. I have found them in several fishes, crustaceans, gastropods and mussels.

In the eel in sea water, a mechanism for excreting Cl^- through certain cells in the gills was demonstrated by Keys (1931)[4], and it is significant that this mechanism cannot act in the opposite direction when the eel is living in fresh-water.

Ingraham and Visscher (1936)[5] describe a mechanism, which is probably similar, for the absorption of Cl^- from the intestine, and I venture the prediction that the Cl^- absorption taking place in the kidney tubule is also similar in nature. It is well known that bromide is not distinguished from chloride by the kidneys.

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A Lead Extrusion Phenomenon

IT has been known for the past two decades that in the extrusion of lead cable sheaths and pipe on the hydraulic press, the presence of oxides may result in the existence of irregularities in the structure which are brought to light by suitably etching a polished section. In this case, the feature originates in the oxidation of a surface of the metal exposed at an earlier stage in the process, and the layer of oxide, formed at right angles to the direction of flow, may be folded over, and appear afterwards as a radial line of weakness in the finished pipe. An important distinguishing feature in this type of irregularity is the fact that the crystal structures on the two sides of the feature are quite separate and distinct ; there is no growing of the crystals across the line of oxide (see Fig. 1).
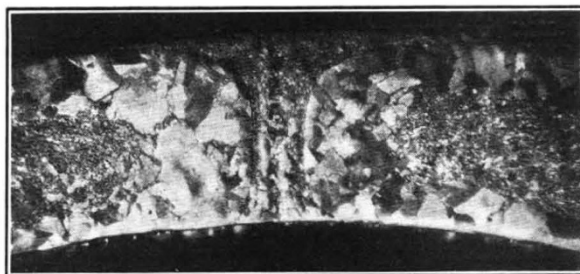

Fig. 1.

WELL-KNOWN INCIPIENT FISSURE DUE TO OXIDE LAYERING. CRYSTAL SYSTEMS DISTINCT ON TWO SIDES.

In the production of pipe and cable sheath by the continuous lead extrusion machine, the formation of oxide layers has been avoided by the exclusion of air from the device. Notwithstanding the complete absence of oxidation, however, it has been found possible, by the use of bridge supports dividing the flow of lead on its passage to the forming die, to produce radial lines in the etched section of the finished pipe showing that an impression has been left on the structure of the lead. In this case, although the crystals grow continuously across the line, it