no change of absorption can be observed. By addition of red.In., however, all changes of absorption, as well as those caused by X/X^- , reappear. Therefore, in this case, cycles 1, 2, 3, 4 and 5 are operating and Y^+ must be reduced by red.In. instead of OH^- (Fig. 2).

Losada *et al.*⁶ have assumed that in fresh chloroplasts with CMU and red.In. one light reaction was separated by blocking the other one with CMU. This cannot have been the case, since from the results reported here it follows that addition of CMU (blocking the production of oxygen by poisoning the reaction of Y^+ and OH^-) has together with red.In. no effect on either light reaction, because Y^+ can react with red.In. instead of water (OH^-).

Note added in proof. Recently Kok⁷ has reported changes in absorption at 432 m μ in inactive chloroplasts extracted with acetone. He tends to ascribe these changes to those at 703 m μ and assumes tentatively that both changes are caused by a chlorophyll-*a*.

H. T. WITT
A. MÜLLER
B. RUMBERG

Physikalisch-Chemisches Institut,
Universität Marburg/Lahn, Germany.

^{1a} Chance, B., and Nishimura, M., *Proc. U.S. Nat. Acad. Sci.*, **46**, 12 (1960). ^b Müller, A., and Witt, H. T., *Nature*, **189**, 944 (1961).

² Witt, H. T., Müller, A., and Rumberg, B., *Nature*, **191**, 194 (1961).

³ Witt, H. T., Müller, A., and Rumberg, B., *Angew. Chem.*, **73**, 507 (1961).

⁴ Vernon, L. P., and Kamen, M. D., *Arch. Biochem. Biophys.*, **51**, 122 (1954). Vernon, L. P., and Zaugg, W. S., *Biochem.*, **235**, 2728 (1960).

⁵ Kok, B., *Acta Botan. Neerl.*, **6**, 316 (1957). Kok, B., and Hoch, G., *Light and Life*, 397, ed. by McElroy and Glass (Johns Hopkins Press, 1961).

⁶ Losada, M., Whately, F. R., and Arnon, D. J., *Nature*, **190**, 606 (1961).

⁷ Kok, B., *Biochim. Biophys. Acta*, **43**, 527 (1961).

⁸ Allen, M. B., Pietti, L. H., and Murchio, J. C., *Biochem. Biophys. Res. Comm.*, **4**, 271 (1961). Duysens, L. N. M., Ames, J., and Kamp, B. M., *Nature*, **190**, 510 (1961).

New Ninhydrin-Reactive Substance from Red Algae

DURING an investigation on the free amino-acids in marine algae, I isolated a new ninhydrin-reactive substance from three species of red algae *Chondrus ocellatus*, *Neodulsea yendoana* and *Iridaea cornucopiae* by the use of anionic ion-exchange resin 'Amberlite IR-45' and 'Dowex 2'. This substance gave an empirical formula $C_5H_{11}O_5NS$ and melted at 258° C. Optical rotation gave a value $[\alpha]_D^{13} = -1.15$ ($c = 5$, M sodium hydroxide solution). It was not very sensitive to ninhydrin, but gave a bright brown colour with Plattner's reagent. Titration with 0.1 N sodium hydroxide, in alcoholic solution, gave a value 63.80 per cent (calculated as $C_4H_9N-SO_3H-COOH$, 66.16 per cent). By the method of Kuhn and Roth, at least one radical, $C-CH_3$, was estimated. The oxidation products obtained, after treatment with potassium permanganate solution, were taurine, alanine and propionic acid. From these results, the structure $N-(1\text{-carboxy-ethyl})\text{-taurine}$, that is $(HO_2S-CH_2-CH_2-NH-CH-COOH)$, was

assumed. Crystals obtained from α -bromopropionic acid and taurine by chemical synthesis corresponded well with the isolated substance not only in melting point but also in R_F values on various paper chromatograms.

Further investigations on the non-absorbable fraction of algal extracts on strong cationic ion-exchange resin revealed the wide distribution of this

substance with taurine in red algae. The only exception was in the case of *Chondria crassicaulis*, from which a sulphur-containing amino-acid, 1,4-thiazane-3-carboxylic acid *S*-oxide had previously been isolated¹. Not a trace of this substance could be detected here. Furthermore, they have not been detected so far in brown or green algae.

MITSUO KURIYAMA

Faculty of Fisheries,
Hokkaido University,
Hakodate.

¹ Kuriyama, M., Takagi, M., and Murata, K., *Bull. Fac. Fish., Hokkaido Univ.*, **11**, 58 (1960).

Sex Hormones as a Possible Factor controlling Biosynthesis of Arylesterase

BLOOD plasma arylesterase in pigs is controlled genetically by a set of alleles, each determining a plasma arylesterase activity of 0, 25, 50, 75 and 100¹. The distinguishable phenotypes are the manifestation of an additive effect of a pair of these alleles. The plasma of new-born piglets has no arylesterase activity, and differentiation into groups of various esterase activities begins on the second to fourth day of life, adult values being reached at the age of about 50 days. There are no sex differences for the biosynthesis of this enzyme, which, however, is influenced by sex hormones, as will be briefly reported here.

In the genetical work, the male piglets were castrated at the age of three to four weeks. The adult arylesterase activity values of these boars were fairly constant. However, certain male piglets were selected for use in later cross-tests. With these uncastrated boars, it was observed that arylesterase activity after maturity was much lower than before sexual maturity². For example, it was demonstrated that with a boar of esterase activity (phenotype) 150 before maturity, the activity gradually decreased with increasing age to a value of about 30, and that this low phenotypic activity was then fairly constant. This phenomenon was found to be common to all mature boars, the low phenotypic esterase activity of which had no influence on expected segregation in the progeny. Evidence has now been presented that this decrease in arylesterase activity is due to the influence of male sex hormones on the biosynthesis of active protein. When a mature boar with a low phenotypic activity of 30 was castrated (Fig. 1B) the arylesterase activity increased gradually and had reached after 3 weeks a value (120-140) close to that found before maturity (150). Moreover, this high activity could again be reduced to the low value when 100-250 mgm. of testosterone propionate was administered daily intramuscularly. The low value was reached about three weeks after hormone treatment began. Testosterone had no effect on the enzyme *in vitro*.

This observation has been confirmed with boars of various genotypes. Testosterone also enhanced the decrease in arylesterase activity when administered shortly after maturity (Fig. 1A). Female sex hormones (for example, oestradiol) had no effect on the biosynthesis of this esterase. It is possible, however, that in addition to testosterone other agents (for example, the adrenocortical hormones) are also engaged in the regulation of plasma arylesterase activity in boars.

In contrast to mature boars, sows show small normal variations in plasma arylesterase activity.