

These observations lead also to a modification of the hitherto accepted activation scheme, in which α -chymotrypsin is formed by autolysis of the δ -form. This is now rendered unlikely by the conformational identity of the δ - and γ -enzymes. Instead it is suggested that one of the known transients during activation, neo-chymotrypsinogen (in which the chymotrypsin produced removes the 147-148 dipeptide in surviving zymogen without cleaving at 15-16), is activated directly to α -chymotrypsin. In this case the change to the α -type of conformation is presumed to occur in the neo-chymotrypsinogen.

A recent avalanche of papers on the ionizing groups which are implicated in the binding of substrate by chymotrypsin has produced a slightly numbing effect. An interesting and persuasive study has, however, appeared (Glick, *Biochemistry*, 7, 3391; 1968), in which pH changes have been measured on addition of uncharged ligands to the enzyme. These ligands, anisole, coumarin and formanilide, all behave similarly, and provoke uptake or release of protons, according to the pH at which they are added. This signifies a change in pK of one or more ionizing groups, and it is clear that the difference between two ionization curves, one displaced relative to the other, must have a bell-shaped profile. The profiles obtained by Glick show clearly that two groups are affected, with pK s (in the absence of the ligands) of 6.7 and 8.6. A novel feature of the treatment is to consider the proton as a competitive inhibitor, and to apply the standard procedure of enzymology to obtain an inhibitor binding constant. For the above ligands, this turns out to be identical with the binding constant of the ligand itself, as determined from the inhibition of hydrolysis of a model substrate. The suggestion is that the lower pK corresponds to his-57, which is known to have a pK of this value, and the higher one to the N-terminal ile-16. The X-ray data show that the latter is involved in an ion-pair in tosyl- α -chymotrypsin, whereas his-57 is hydrogen-bonded to the tosylated ser-195. Glick suggests that these interactions occur only in the presence of the substrate (or inhibitor), and certainly they account qualitatively for the observed changes in pK . It should be noted at the same time that McConnell *et al.* (*Science*, 161, 274; 1968) from similar principles, involving the use of the substrate and inhibitor, L- and D-acetyltryptophanamide, derived an ionizing group of pK 9 (though with a rather generous scatter of points), shifting still higher on adding these ligands.

ARCHAEOLOGY

A Welsh Romano-British Villa

from our Archaeology Correspondent

ARCHAEOLOGISTS have, of course, grown accustomed to playing Cinderella to landowners and for that matter to all the other disciplines. Even when a monument is scheduled for preservation, the landowner is not prevented from pursuing normal agricultural operations; it is possible to find the Ministry of Agriculture paying subsidies to a farmer for ploughing marginal land and, a few years later, the Ministry of Public Building and Works paying the same farmer to stop ploughing while it mounts a rescue excavation to salvage what is left of a monument. At Whitton in Glamorgan, the remains of a Romano-British villa and

its predecessor, an Iron Age fortified farm, have been badly damaged by ploughing. For at least 400 years the site was unploughed, but about fourteen years ago the farmer who owns the land began ploughing. Between 1956, when the site was discovered and scheduled, and 1966, the second year of a rescue dig directed by Dr M. G. Jarrett of the University College, Cardiff, and financed by the ministry, parts of the site were lowered by 0.5 m, substantial walls destroyed and clay flooring ripped up. As a result, although the ministry is now paying the farmer not to plough until 1970 when the whole area will have been excavated, it is unlikely that a complete plan will be recovered.

But does it matter if yet another Roman villa is destroyed? Have not enough been excavated already? Elsewhere in Britain that might be a perfectly reasonable argument, but virtually nothing is known about Romano-British villas in South Wales. In other words, very little is known of the impact of the Romans on the economy and environment of the Silures, that warlike tribe which gave the Romans such stiff resistance.

Although there are still two seasons' excavating to be done, and although Whitton would have been much more valuable before the ploughing, Dr Jarrett and his colleagues have, since 1965, made several important discoveries. First, all the evidence indicates that the Romans brought peace, stability and prosperity to the Silures. The earliest structures on the site, which could date from anywhere between 350 and 50 BC, are the strong defence works—a ditch 6–7 m wide and 2.5 m deep enclosing an earth bank—which were deliberately levelled off in Roman times. Second, there was no battle at Whitton; the site was continuously occupied, probably throughout by Silures, who, once conquered, appear to have taken advantage of Roman civilization. The small finds at the site all testify to the economic superiority of the inhabitants; even the animal bones suggest that the people only ate the choicest joints of meat, and although there is no evidence of a bath some of the buildings had painted plaster walls. Third, the villa at Whitton, so-called for want of a better description, is manifestly unlike any known Roman villa. The building succession and plan is complex, but there are at least four phases: circular wooden houses, of Iron Age type, although at least one is of Roman date, and sub-square houses of early Roman date; a first stone phase which included a large, two storey building; then a phase including a stone granary; and finally the third and main phase, of stone buildings with cellars attached—in one case an unfired hypocaust. The outstanding feature of these stone buildings is the absence of any coherent pattern. Unlike the usual Roman villa with a series of rooms joined by corridors, the buildings at Whitton were always detached, resembling a modern farm with a farmhouse and detached barns and outhouses scattered about the enclosure. Furthermore, there was never any attempt to build round corners.

Finally, the coinage that has been found presents a problem. There are no early fourth century coins, which usually account for at least 20 per cent of the coins found at Romano-British sites; the latest coin found at Whitton was minted in 293, and yet the pottery suggests the site was occupied until about 350, so there is no obvious reason why the coin series stops so abruptly. The excavations during the next two seasons may provide an answer.