value. A large fraction of the substitutions are, as usual, conservative in nature (hydrophobic or polar character preserved). Attention is drawn to the relative invariance of the glycines, as previously also noted by Smith in relation to the cytochrome *C*s, reflecting perhaps a specific conformational function. Smith *et al.* also note that certain sequences of residues recur within each chain, suggesting duplication from some short primitive precursor.

The two sequences contain five moderately long homologous segments (the longest of 23 residues), but it is not possible to identify the active site residues uniquely; a histidine is known to be critical, but only one of the six histidines of the BPN′ enzyme is changed in the Carlsberg. An active serine residue, which reacts with diisopropylfluorophosphate, has been recognized. It is mentioned that a subtilisin from a third strain (Novo) has also been studied, and appears to be identical with subtilisin BPN′. An interesting observation is the complete lack of similarity to other proteases, either of the pancreatic type (trypsin, chymotrypsin) or the papain family. In this respect, these enzymes differ from the cytochrome *C*s, which are structurally similar whatever the phylum of their origin.

Similarities of a very broad kind are, however, found between hydrolytic enzymes when one examines the new three-dimensional structure of papain at 2·8 Å, a short account of which has just been published (Drenth *et al.*, *Nature*, **218**, 929; 1968). One striking result of this work is the recognition, by juxtaposition of the more readily recognizable side-chains in the electron density map, of errors in the published tentative sequence. These are mainly of the commonest kind, involving transposition of large segments. There is also, however, an omission, and the total number of residues turns out to be 200, not 211. The structure shows four short segments of α-helix and one of β-structure (10 residues). As in other enzymes, the molecule has a deep cleft down the centre, largely hydrophobic in character; indeed, one side contains a cluster of 12–14 leucine, isoleucine, valine and phenylalanine side-chains. The residues identified by chemical studies as part of the active site, namely cys-25 and his-106, lie within the cleft on opposite sides. Other identifiable residues may also be involved. A specific inhibitor has been introduced by attachment to cys-25, and appears to implicate another residue, asp-160. It will be interesting to have further details.

Supercoiled DNA. A reader has pointed out an ambiguity in this column of May 4, 1968. Vinograd *et al.* (*J. Mol. Biol.*, **33**, 173; 1968) show that supercoiling may be introduced into two-stranded DNA in two ways, one by making a left-handed superhelix to form a toroid, the other by interwinding the turns in a right-handed double superhelix. The latter form is observed in *SV*40 DNA. The superhelix screw-sense is here *right-handed*; only when viewing a turn perpendicularly to the superhelix axis does this appear left-handed.

Static Hazards

from a Correspondent

THE Static Electrification Group of the Institute of Physics and the Physical Society (as it is still called) held the last meeting of its first season on May 29 at the Shirley Institute, Manchester.

Dr N. Gibson (ICI Ltd) spoke about the risk of ignition of dust clouds by charges produced when powders are handled during the manufacture of chemicals, foods and the like. Most finely divided organic materials can form explosive clouds in air, and more than 1,000 different substances were investigated in the speaker's experiments. In each case the charge per unit weight of powder produced by six industrial processes was measured, together with the electrical resistivity of the powder *en masse* and the energy required in a spark from a conductor to ignite a cloud of it. Whether ignition will occur in practice depends also on particle size, humidity, proximity of insulated conductors and other variables. One general conclusion was that the highest charges are produced by the finest powders, which also give rise to the most easily ignited clouds. Since sparks from conductors are usually more incendiary than those coming directly from insulators, an important precaution is to earth all large conductors, such as metal containers or the human body. A colour film was shown illustrating the precautions taken in industry.

Dr W. D. Rees (BP Research Centre) spoke of the fires and explosions that can result from static charges produced when liquid fuels are pumped from one container to another. These charges are thought to arise in much the same manner as those responsible for streaming potentials in aqueous solutions, but they are several orders of magnitude greater, because of the higher resistivity of hydrocarbon fuels. They increase markedly with speed of pumping, and hence safety has to be balanced against commercial efficiency. Especially large charges may arise after water has been used to clear the pipes of a previous fuel. The speaker discussed the effects of tank size and pipe length on the maximum safe pumping speed, and showed the results of observations made during full-scale fuelling operations.

Dr C. D. Stow (University of Manchester Institute of Science and Technology) described the structure of thunder-clouds and the several mechanisms which have been proposed to account for the separation of charge which occurs when a mass of warm moist air rises in the atmosphere. He then gave some results of electrostatic and other measurements made from a light aeroplane while exploring the interior of thunder-clouds; these showed greatest charging when the conditions were such that three elements—soft hail, ice particles and droplets—were all present together. Lightning in the USA causes some 70,000 forest fires a year, and any method of reducing the number of strikes would be valuable. Some success has been achieved by early and heavy "seeding" of the cloud with silver iodide from an aeroplane, but if this is too little or too late it may increase the charging. It is believed to work by reducing the extent of supercooling and thus causing the inevitable condensation to take place more gradually.

Glasses and Glass Ceramics

from a Correspondent

MANY mechanical and physical properties of glasses and glass ceramics are structure-sensitive, but satisfactory correlations between the microstructure and properties of glass are still lacking. Greater understanding and control of many technologically significant processes