groups of molecules acting together.

Whether these tiny units are the genes themselves, or only the "genophores" or gene-bearers, is a matter of relative unimportance. The important thing is that they have now been unveiled, so that the searching finger of science may probe a little further into the secrets of life.

The principal milestones in the development of modern genetics may be listed as four: Gregor Mendel's proof, three generations ago, that genetic units determine the inheritance of characters; Otto Bütschli's demonstration of the existence of chromosomes; Thomas Hunt Morgan's concept of the gene; Painter and Bridges' separation of the chromosome into its finer structural units and their correlation with the location of the genes.

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MARINE ENGINEERING

Science Aided the Endeavour In Her Race for the Cup

"New-Fangled Gadgets," Including a Triangular Boom And Instrument Board With Stress Meter Helped

SCIENCE and mechanics can claim their share of credit for the showing of the British yacht *Endeavour* in the races for the America's Cup off Newport, R. I.

Old salts may shake their heads over instrument boards for yachts, triangle booms and all the other "gadgets," but both cup contestants have their share of them. A large part of the job of the scientists in the afterguards of both cup racers is devoted to the perfection and maintenance of "new-fangled" mechanical helpmates to the art of sailboat navigation.

To any yachtsman a boom is—or perhaps it is better to say, used to be—a piece of wood to which the lower edge of the mainsail was attached with rings. The boom rotated about the mast and by setting it at different angles the maximum velocity through the water was obtained.

Not on Endeavour

But on the *Endeavour* the boom is not just a cylindrical length of wood; it is triangular in cross-section. Such a triangular boom is a three-sided structure of wood with a flat side just under the edge of the mainsail. Rings attached to the "foot" or bottom of the sail slide along metal rods on the boom and set in it at right angles to its axis.

As the yacht tacks the rings slide along the rods and allow the foot of the sail to assume the best aerodynamic curve. Said another way, the sail takes a "set" which brings about the least "spilling" of air from it and hence the maximum driving force.

Convenient to the helmsman on the *Endeavour* is the instrument board of the vessel containing instruments for telling wind velocity and wind direction, and a mechanical log, or speed indicator of the yacht relative to the water.

Hot Wire Anemometer

The wind indicator is known technically as a hot wire anemometer, working on the Wheatstone bridge principle. Its workings are not as complicated as its name. Two equal resistance wires have a given electrical current passing through them. One resistance wire is shielded from the wind; the other is exposed to it. The cooling of the exposed wire changes its current-carrying capacity and throws the hitherto balanced Wheatstone bridge circuit out of balance. The out-of-balance current registers on a meter whose dial is before the helmsman. The out-of-balance current varies in proportion to the wind velocity.

The wind direction indicator is a rigid racing pennant acting as a weather vane high up on the peak of the main mast. Variations in its position control an electrical circuit acting on a voltmeter on the instrument board which is calibrated in wind direction.

Still another device is a stress meter giving the helmsman continuous knowledge of the forces acting on important bracing cables in the rigging. When the forces reach a point where there is a possibility of their breaking vital stays in the rigging the suitable ropes may be "eased off."

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ARCHAEOLOGY

Prehistoric Java Race Had Tools Like Neandertaler's

HOMO *soloensis*, a prehistoric race that lived in Java 40,000 years or more ago, had tools and weapons resembling those of Neandertal Man in Europe. This is the conclusion of Dr. P. V. van Stein Callenfels, based on a study of a large collection of such implements of stone, bone and horn collected on a terrace of the River Solo. This terrace was apparently formed during pleistocene or Ice Age times. The animal bones found associated with the relics of human occupation included an extinct elephant, a hippopotamus, and other animals no longer known in Java.

Striking among the implements found on the Solo terraces are a notched bone harpoon, showing a high degree of workmanship, and several of the barbed spines from stingray tails, which apparently were used as dart or arrow points, as they still are used by some island tribes. These spines argue the existence of trade between the hill-dwellers on the river terraces and the shore-dwellers of the coast, far back in cave-man times.

The stone tools and weapons include no flints, for flint is not found on the island of Java. Instead, this ancient race used chalcedony, chipping and flaking at least the better pieces with as much skill as did Neandertal man in Europe, at the culture level known as Mousterian.

Although *Homo soloensis* and his handicrafts are known from specimens found along the same river whose gravels yielded the much-discussed skull, teeth and thighbone of *Pithecanthropus erectus* something over forty years ago, Solo man is considered a far more advanced race than *Pithecanthropus*, and probably much later in time. His head was much larger and more highly domed, although still possessing the very heavy eyebrow ridges characteristic of Neandertal man in Europe and Peking man on the Asian mainland.

As yet, no artifacts assignable to *Pithecanthropus* have been found, so that a culture comparison between these two ancient Javanese races is not possible.

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Rainfall may wash 21 times as much plant food from the soil as growing crops would consume.