

cylinders; and, in the second place, why they vary in their shape, so as to appear to the superficial observer irregular.

The reasoning that applies to the hollow cylindrical bone serves equally to explain the admirable structure of many other natural forms, as that of a quill, a reed, or a straw. The last example reminds us of the unfortunate man who was drawn from his cell before the Inquisition, and accused of having denied that there was a God; when, picking up a straw that had stuck to his garments, he said, "If there were nothing else in nature to teach me the existence of a Deity, this straw would be sufficient."

It hardly requires demonstration to prove that, with a given mass of material to make a pillar or column, the hollow cylinder will be the form of strength. The experiments of Du Hamel on the strength of beams afford us the best illustration how the material should be arranged to resist transverse fracture. When a beam rests on its extremities, bearing a weight upon its centre, it admits of being divided into three portions; for these three parts are in a different condition with regard to the weight. The lower part resists fracture by its toughness: the upper part, by its density and resistance to compression: but there is a portion between these which is not acted upon at all; which might be taken away without any considerable weakening of the