a distinguished surgeon, was born in London on the 23rd of August 1852. He had originally intended to enter the army, but ill health and a growing love of books changed his plans, and he settled down to read for the bar. Here again the same causes produced a change of purpose, and he entered as a student at Pembroke College, Oxford. Finding himself by no means at ease in that college he migrated after two years to Balliol College. Continued ill health prevented his reading for honours, but he made so deep an impression on the authori- ties of his college that on taking his degree he was appointed lecturer and tutor to students preparing for the Indian civil service. He devoted himself to the study of economics and economic history. He was active also as a practical social reformer, taking part in much public work and delivering lectures in the large industrial centres on economic problems. He overtaxed his strength, and after lecturing in London in January 1883 he had a complete break-down, and died of inflammation of the brain at Wimbledon on the 9th of March.

Toynbee had a striking influence on his contemporaries, not merely through his intellectual powers, but by his strength of character. He left behind him a beautiful memory, filled as he was with the love of truth and an ardent and active zeal for the public good. He was the author of some fragmentary pieces, published after his death by his widow, under the title of *The Industrial Revolution.* This volume deserves attention both for its intrinsic merit and as indicating the first drift of a changing method in the treatment of economic problems. He, however, fluctuated considerably in his opinion of the Ricardian political economy, in one place declaring it to be a detected “ intellectual imposture,” whilst elsewhere, apparently under the influence of Bagehot, he speaks of it as having been in recent times “ only corrected, re-stated, and put into the proper relation to the science of life,” meaning apparently, by this last, general sociology. He saw that the great help in the future for the science of economics must come from the historical method, to which in his own researches he gave preponderant weight. Toyn- bee’s interest in the poor and his anxiety to be personally acquainted with them led to his close association with the district of Whitc- chapel in London, where the Rev. Canon S. A. Barnett *(q.v.)* was at that time vicar—an association which was commemorated after his death by the social settlement of Toynbee Hall, the first of many similar institutions erected in the East End of London for the purpose of uplifting and brightening the lives of the poorer classes.

See F. C. Montague’s *Arnold Toynbee* (Johns Hopkins University Studies, 1889); Lord Milner’s *Arnold Toynbee: a Reminiscence* (1901); and L. L. Price’s *Short History of Political Economy in England* for a criticism of Toynbee as an economist.

**TRABEATED,** the architectural term given to those styles in which the architrave or beam (Lat. *lrabs)* is employed instead of the arch, in the Iatter case the term “ arcuated ” being used. The principal trabeated styles are the Egyptian, Persian, Greek, Lycian, nearly all the Indian styles, the Chinese, Japanese and South American styles, in all cases owing their origin to the timber construction, for which reason the term ρost-and-lintel architecture is sometimes applied to it.

**TRACERY,** a late coined word from “ trace,” track, Lat. *trahere,* to draw; the term given in architecture (French equivalents are *réseau, remplissage)* to the intersecting rib­work in the upper part of a Gothic window; applied also to the interlaced work of a vault, or on walls, in panels and in tabernacle work or screens. The tracery in windows is usually divided into two sections, plate tracery and rib or bar tracery, the latter rising out of the former, and entirely superseding it in the geometrical, flowing and rectilineal designs. The windows of the Early English period were comparatively narrow slits, and were sometimes grouped together under a single enclosing arch; the piercing of the tympanum of this arch with a circular light produced what is known as plate tracery, which is found in windows of the late 12th century, as in St Maurice, York, but became more common in the first half of the 13th century. In England the opening pierced in the head was comparatively small, its diameter never exceeding the width of one of the windows below, but in France it occupied the full width of the enclosing arch and was filled with cusping, and sometimes, as in Chartres, with cusping in the centre and a series of small quatrefoils round, all pierced on one plane face. In order further to enrich the mullions and arches of the window, they were moulded, as in Stowe church, Kent; the other portions were pierced; and finally, to give more importance to the principal lights, additional depth was given to their mouldings, so that they gradually developed into bar or rib tracery, of which the earliest examples in England are those in Westminster Abbey (*c*. 1250) and Netley Abbey near Southampton. Henceforth that which is described in architecture as the “ element ” ruled the design of the window, and led to the development of geometrical tracery, in which the bars or ribs are all about equidistant from one another. In windows of three lights the heads of the windows consisted of three circular openings, but with four lights they were grouped in two pairs, with a single circle over each and a larger one at the top in the centre. This led to increased dimensions being given to the moulding of the enclosing arches and the upper circle, forming virtually two planes in the tracery. In the great east window at Lincoln, with eight lights, there was a double subdivision and three planes, and here the upper circle was filled with semicircles, so that the openings were all about the same width. In France the upper circle always maintained its predominance, its subdivisions only retaining the scale. The next development, which would seem to have taken place in Gloucester Cathedral, was the omission of portions of the enclosing circle, so as to allow the ribs to run one into the other, forming therefore lines of double curvature, and giving rise to what is known as flowing or flamboyant tracery, of which the great window in Carlisle Cathedral is the most important example. In this window there are nine lights, the four outer ones in each rib being grouped together; these were not sub- divided again, and consequently there are only two planes of tracery. The Perpendicular style which followed might per- haps be considered as a reaction against the abuse of the flowing lines in masonry, were it not that in the earlier examples it appears timidly. At Edington church in Wiltshire (1361), in a five-light window, the centre light is wider than the others and its mullions run straight up into the arch mould. In New College chapel, Oxford (1386), the head of the window is sub- divided into narrow vertical lights, each half the width of those below, and this is followed in some counties, but not in all, in the east of England the flamboyant tracery being retained a century later. In St Mary’s church, Oxford, with seven lights, all the mullions run straight up into the arch mould, and another feature is introduced, already found in New College chapel, and at a much earlier date in domestic work and in spire-lights, viz. the transom. In the later Perpendicular work another change takes place; the pointed arch struck from two centres is replaced by one struck from four centres, and this eventually in domestic work is superseded by the flat arch.

So far reference has been made only to that which may be called the “ element ” of the window. The enrichment of the lights with cusping gave additional beauty to them, took away the hard wire- drawn effect of the mouldings, and formed openings of great variety; in some of the windows of the Decorated period the ball flower and other foliage is introduced into the mouldings. In French work the geometrical style lasted till the 14th century, and then there was a lapse in building, so that the flamboyant style which followed, and from which at one time it was assumed that the English mason had derived the style, was apparently taken up by the French after its abandonment in England in favour of Perpendicular work. Germany and Spain have always followed in the wake of the French ; and in Italy, where architects preferred to decorate their walls with frescoes, the light from stained glass interfered with their effect, so that there was no demand for huge windows or their subdivision with mullions. At the same time there are many beautiful examples of tracery in Italy, generally in marble, such as those of Giotto’s Campanile and the cathedral at Florence, in the Ducal and other palaces at Venice, and in the triforium arcades of Pisa and Siena cathedrals; but they destroyed its effect by the insertion of small capitals to the mullions, which gave horizontal lines where they were not wanted, virtually dividing the window into two parts instead of emphasizing, as was done in the Perpendicular period, the verticality of the mullions.

Among the most glorious features in the Gothic architecture of France, England and Spain are the immense rose windows which were introduced, generally speaking, in the transepts of the cathedrals; the tracery of these follows on the lines of those of the windows, changing from geometrical to Decorated and afterwards to flam­boyant. In some respects perhaps the finest examples of plate- tracery were produced in the rose windows of the 13th century.