and can easily shelter a force of 100,000 men ; its peace garrison is 5600.

Ulm is mentioned as early as the year 854. It subsequently became a free imperial city, and the leading town in Swabia. In the 15th century it attained the summit of its prosperity, and ruled over a district of many square miles, with a population, rural and urban, of about 60,000. Towards the end of the Middle Ages it frequently appears at the head of various Swabian leagues. In 1530 it adopted the Augsburg Confession. In 1803 it passed to Bavaria, and in 1810 to Würtemberg. In 1805 General Mack, with 33,000 Austrians, capitulated to Napoleon at Ulm. Ulm is remarkable in the history of German literature as the spot where the “ meistersänger ” lingered longest, preserving, without text and without notes, the traditional lore of their craft. In 1830 there were twelve “ meistersänger” alive at Ulm; but in 1839 the four survivors formally made over their insignia and guild property to a modern singing society, and closed the record of “Meister­gesang” in Germany. The last formal meeting of the Nuremberg “meister” took place in 1770.

ULPIANUS, Domitius, Roman jurist, was of Tyrian ancestry, but the time and place of his birth are unknown. He made his first appearance in public life as assessor in the *auditorium* of Papinian and member of the council of Septimius Severus ; under Caracalla he was master of the requests. Elagabalus deprived him of his functions and banished him from Rome, but on the accession of Alex­ander (222) he was at once recalled and reinstated, and finally became the emperor’s chief adviser and præfectus prætorio. His curtailment of the privileges granted to the prætorian guard by Elagabalus provoked their enmity, and several times he only narrowly escaped their vengeance ; ultimately, in 228, he was murdered in the palace, in the course of a riot between the soldiers and the mob.

Ulpian’s period of literary activity extended from about 211 to 222 A.D. His works include *Ad Sabinum,* a commentary on the *jus civile* in over fifty books ; *Ad Edictum,* a commentary on the Edict, in eighty-three books; collections of Opinions, Responses, and Disputations ; books of Rules and Institutions ; treatises on the functions of the different magistrates,—one of them, the *De Officio Proconsulis Libri X.,* being a comprehensive exposition of the criminal law ; monographs on various statutes, on testamentary trusts, and a variety of other works. His writings altogether have supplied to Justinian’s *Digest* about a third of its contents, and his commentary on the Edict alone about a fifth. As an author he is characterized by doctrinal exposition of a high order, judiciousness of criticism, and lucidity of arrangement, style, and language. *Domitii Ulpiani Fragmenta,* consisting of twenty-nine titles, were first edited by Tilius (Paris, 1549). There are modern editions by Hugo (Berlin, 1834) and Booking (Bonn, 1836), the latter containing fragments of the first book of the *Institutiones* discovered by Endlicher at Vienna in 1835.

ULRICI, Hermann (1806-1884), one of the most active philosophical writers in Germany since Hegel’s death, was born at Pforten, Prussia, on March 23, 1806. Educated for the law, he gave up his profession upon the death of his father in 1829, and after four years of further study, devoted to literature, philosophy, and science, qualified as a university lecturer. In 1834 he was called to a professorship at Halle, where he remained till his death on the 11th January 1884. His first works were in the domain of literary criticism. His treatise *On Shake­speare's Dramatic Art* (1839) has been translated into English. In 1841 he published a work *Ueber Princip u. Methode der Hegelschen Philosophie,* in which he subjected Hegel’s system to a severe criticism. The critical attack was continued in the *Grundprinzip der Philosophie* (1845-6), which at the same time expounds his own speculative position ; to this must be added as comple­mentary his *System der Logik* (1852). His later works, dealing with perennial problems of philosophy, have found a more extended circle of readers. Such are *Glauben und Wissen* (1858), *Gott und die Natur* (1862, 3d ed. 1875), *Gott und der Mensch* (2 vols., 1866-73, 2d ed. 1874). From 1847 onward Ulrici was associated with the younger Fichte in the editorship of the *Zeitschrift für Philosophie.*

His philosophical standpoint may be characterized as a reaction from the pantheistic tendency of Hegel’s idealistic rationalism towards a more pronouncedly theistic position. The Hegelian identity of being and thought is also abandoned and the truth of realism acknowledged, an attempt being made to exhibit idealism and realism as respectively incomplete but mutually complementary systems. Ulrici’s later works, while expressing the same views, are largely occupied in proving the existence of God and the soul from the basis of scientific conceptions, and in opposition to the materialistic current of thought then popular in Germany.

ULSTER. See Ireland.

ULTRAMARINE, a magnificent blue pigment, which occurs in nature as a proximate component of Lapis La­zuli (*q.v.*). Lapis lazuli has long been known as a precious stone, and highly valued as such, and as early at least as the 11th century the art of extracting a blue pigment from it was practised. From the beginning of the 16th century this pigment began to be imported into Europe from “ over the sea,” as *azurrum ultramarinum.* To extract it, the stone, after having been powdered coarsely, is heated to redness and thrown into cold water to facilitate its con­version into a very fine powder, which is next treated with dilute acetic acid to remove the carbonate of lime which is present in almost all specimens. The insoluble blue residue is mixed up into a “ dough ” with a composition of resin, pitch, and linseed oil, and this dough is then kneaded under water, which is renewed as long as it runs off with a blue colour. The blue liquor, when allowed to stand, deposits a fine precipitate, which is collected, washed, dried, and sold as ultramarine. As the yield amounts to only 2 to 3 per cent. of the mineral used, it is not surprising to learn that the pigment used to be weighed up with gold. It was valued chiefly on account of its brilliancy of tone and its inertness in opposition to sunlight, oil, and slaked lime (in fresco-painting).

Lapis lazuli has the composition of a double silicate of lime and soda combined with sulphates and sulphides of the metals named. Of the many analyses made (compare Lapis Lazuli) we quote the following, carried out by Schultz in Rammelsberg’s laboratory :— combined sulphur (not SO3), 3∙16; combined sulphuric acid, SO3, 5∙67; silica, 43∙26 ; alumina, 20∙22 ; oxide of iron, calculated as Fe2O3, 4∙20; lime, 14∙73; soda, 8∙76.

In 1814 Tassaer observed the spontaneous formation of a blue compound, very similar to ultramarine, if not identical with it, in a soda-furnace at St Gobain, which caused the “Société pour l'En- couragement d’Industrie” to offer a prize for the artificial production of the precious colour. The problem was solved almost simultane­ously by Guimet and by Christian Gmelin, then professor of chem­istry in Tübingen ; but while Guimet kept his process a secret (it has indeed never become known) Gmelin published his, and thus became the originator of an industry which flourishes to this day chiefly in Germany. There are very few ultramarine works in other countries, and none, as far as we know, in Great Britain. The raw materials used in the manufacture are—(1) iron-free kaolin, or some other kind of pure clay, which should contain its silica and alumina as nearly as possible in the proportion of 2SiO2 : A12O3 demanded by the formula assigned to ideal kaolin (a deficit of silica, how­ever, it appears can be made up for by addition of the calculated weight of finely divided silica) ; (2) anhydrous sulphate of soda ; (3) anhydrous carbonate of soda ; (4) sulphur (in the state of powder) ; and (5) powdered charcoal or relatively ash-free coal, or colophony in lumps. The numerous modes of manufacture may be viewed as modifications or combinations of three processes.

(1) In the *Nuremberg process* the soda is used as sulphate, or partly as such and partly as carbonate. The following recipe gives an idea of the proportions in which the materials are used :—kaolin (calculated as anhydrous matter) 100 parts ; calcined sulphate of soda 83 to 100 (or 41 of sulphate and 41 of carbonate) ; charcoal 17 ; powdered sulphur 13. These ingredients are mixed most inti­mately ; they are then rammed tight into fire-clay crucibles and kept at a nearly white heat for 7 to 10 hours, access of air being prevented as far as possible. The product obtained is a greyish or yellowish green mass, which is soaked in and washed with water ; the porous residue is ground very fine in mills, again washed, dried, and again ground in the dry state and passed through sieves. The product at this stage has a green colour, and is sometimes sold as “green ultramarine,” although it has not a high standing amongst green pigments. For its conversion into blue ultramarine it is heated with sulphur in the presence of air to a relatively low tem­perature. Of the various apparatus used for this important stage of the manufacture, the easiest to describe is a large muffle, heated from the outside. On its floor the green ultramarine is spread out to a depth of 2½ to 3 inches, and heated (with closed doors) to a