

symmetrical in their structure. The first moves with deliberate swiftness from heaven through the world to hell; the second returns therefrom through the world to heaven. Between the two lies the emancipation of Faust from the torment of his conscious guilt, lies his Lethe, his assimilation of the past. In regard to substance, the first part begins religiously, becomes metaphysical, and terminates ethically; the second part begins ethically, becomes æsthetic, and terminates religiously. In one, love and knowledge are confronted with each other; in the other, practical activity and art, the ideal of the beautiful. In regard to form, the first part advances from the hymnal shout to monologue and dialogue; the second part from monologue and dialogue to the dithyrambic, closing with the hymn, which here glorifies not alone the Lord and His incomprehended lofty works, but the human in the process of its union with the divine, through redemption and atonement." The first act, with its varied scenes of country, castle, garden, galleries, and halls, answers to the two prologues of the first part; the second act introduces us again to Faust's study and his familiar Wagner. The classical Walpurgis Night has its prototype in the first part. The third act is devoted to Helena, who is the heroine of the second part as Gretchen is of the first. The marriage of Faust and Helena typifies the union of the classical and romantic schools, and their child is Euphorion, who is symbolical of Byron. In the fourth act Faust is raised instead of being degraded by his union with Helena. He wishes for a sphere of beneficent activity, and obtains it by war. The fifth act is devoted to the complete regeneration of the soul of Faust. Even the sight of all that he has accomplished does not satisfy him. It is not until he is blind to outward objects that one moment of divine rapture reveals to him the continuance of his work in coming generations, and convinces him that he has not lived in vain. In this one moment of supreme happiness he dies. The struggle for the possession of Faust's soul, indicated in the first part, is fully elaborated in the second. Mephistopheles is shown to have worked out the good in spite of himself, and Margaret appears transfigured as the revelation to man of the divine love.

With the completion of Faust, Goethe felt that the work of his life was accomplished. He still continued to work with regularity. He ordered and arranged his writings, he laboured at his *Tages- und Jahresheften*, an autobiographical journal of his life. He bated not one jot of heart or hope, and took the liveliest interest in every movement of literature and science. When the news of the July Revolution of 1830 reached Weimar, Goethe was excited beyond his wont, not on account of the triumph of liberal principles, but because the controversy between Cuvier and Geoffrey St Hilaire had been decided in favour of the latter. Still he had much to darken his latter days. His old friends were falling fast around him. His wife had died in 1816, after a union of thirty years. He felt her loss bitterly. The duchess Amalia had died eight years before, not long after the death of his own mother. He now had to undergo bitterer experiences when he was less able to bear them. Frau von Stein, with whom he had renewed his friendship if not his love, died in January 1827; and in June 1828 he lost the companion of his youth, the grand-duke Karl August, who died suddenly, away from Weimar, on his return from a journey. Goethe received the news with outward calmness, but said forebodingly, "Now it is all over," and went to mourn and labour at the castle of Dornburg, where everything reminded him of the days of their early friendship. The duchess Louise survived her husband till February 1830. When Goethe died in 1832 none of the old Weimar set were left except Knebel, who lived two years longer. A greater blow than these was the death of his only son, whom, in spite of his moral weakness, his father deeply loved.

He died at Rome in October 1830, and is buried close by the pyramid of Caius Cestius, where Goethe himself once desired to be laid. We have a full account of the last nine years of Goethe's life from the writings of Eckermann, who became his secretary in 1823, lived with him till his death, and has noted down his conversations and his habits with the minuteness and fidelity of a Boswell.

We must pass on to the closing scene. On Thursday, March 15, 1832, he spent his last cheerful and happy day. He was visited by the grand-duchess and other friends. He awoke the next morning with a chill. From this he gradually recovered, and on Monday was so much better that he designed to begin his regular work on the next day. But in the middle of the night he woke up with a deathly coldness, which extended from his hands over his body, and which it took many hours to subdue. It then appeared that the lungs were attacked, and that there was no hope of his recovery. Goethe did not anticipate death. He sat fully clothed in his arm-chair, made attempts to reach his study, spoke confidently of his recovery, and of the walks he would take in the fine April days. His daughter-in-law Ottilie tended him faithfully. On the morning of the 22d his strength gradually left him. He sat slumbering in his arm-chair holding Ottilie's hand. Her name was constantly on his lips. His mind occasionally wandered, at one time to his beloved Schiller, at another to a fair female head with black curls, some passion of his youth. His last words were an order to his servant to open the second shutter to let in more light. After this he traced with his forefinger letters in the air. At half-past eleven in the day he drew himself, without any sign of pain, into the left corner of his arm-chair, and went so peacefully to sleep that it was long before the watchers knew that his spirit was really gone. He is buried in the grand-ducal vault, where the bones of Schiller are also laid.

Goethe differs from all other great writers, except perhaps Milton, in this respect, that his works cannot be understood without a knowledge of his life, and that his life is in itself a work of art, greater than any work which it created. This renders a long and circumstantial biography a necessity to all who would study the poet seriously. At the same time he is so great that we are even now scarcely sufficiently removed from him to be able to form a correct judgment of his place in literary history. He is not only the greatest poet of Germany; he is one of the greatest poets of all ages. Posterity must decide his exact precedence in that small and chosen company which contains the names of Homer, Dante, and Shakespeare. He was the apostle of self-culture. Always striving after objective truth, and sometimes attaining to it, he exhibited to the world every phase of his plastic mind in turn, and taught both by precept and example the husbandry of the soul. The charge of selfishness so often brought against him cannot be maintained. His nature responded to every influence of passing emotion. Like a delicate harp, it was silent if not touched, and yet gave its music to every wooing of the wilful wind. The charge of unsympathetic coldness roused the deep indignation of those who knew him best. He learned by sad experience that the lesson of life is to renounce. Rather than cavil at his statuesque repose, we should learn to admire the self-conflict and self-command which moulded the exuberance of his impulsive nature into monumental symmetry and proportion. His autobiography has done him wrong. It is the story not of his life, but of his recollections. He needs no defence, nothing but sympathetic study. As Homer concentrated in himself the spirit of antiquity, Dante of the Middle Ages, and Shakespeare of the Renaissance, so Goethe is the representative of the modern spirit, the prophet of mankind under new circumstances and new conditions, the appointed teacher of ages yet unborn.

*Bibliography.*—A complete bibliography of Goethe literature would fill a very large space. We must content ourselves with an indication of the principal sources from which a knowledge of his life may be derived. The most important source of all is his own works. The *Dichtung und Wahrheit*, the *Italienische Reise*, the *Campagne am Rhein*, and the *Tages- und Jahresheften* have an especial autobiographical value. Next to these come the poems, and lastly the letters. Many of these are lost for ever, many remain unpublished. For the first period of his life *Der Junge Goethe*, in three volumes, published by Hirzel, with an introduction by Michael Bernays, is indispensable. It contains his letters and poems in chronological order. A commentary on this work by Wilhelm Scherer, entitled *Aus Goethes Frühzeit* was published in 1879. Otto Jahn published *Goethes Briefe an seiner Leipziger Freunde*. Schöll and A. Hober have collected the letters of the Strasburg period. Goethe's correspondence with Schiller and with Zelter was published during his lifetime. Besides these we have his letters to Herder, Merck, Kestner and Lotte, Lavater, Knebel, Countess Stolberg, Jacobi, Karl August, and Frau von Stein. Lately have appeared his letters to Marianne von Willemer, and some of those addressed to J. G. Schlosser. We are without his letters to Behrisch, Lersse, and Zimmermann; and we have only a few of those addressed to Horn and Sophie La Roche. Goethe's real letters to Bettina von Arnim are in the main unpublished; those which bear the name have been largely falsified, but have a substratum of truth. We have also a few volumes of Goethe's scientific correspondence, published by his descendants. Help to the understanding of his poetry is given by the letters of Wieland, Caroline Flachsland, and his Weimar friends. The letters addressed to him by Frau von Stein exist, but have not been made public. The first life of Goethe was published by Döring in 1828, of which a second enlarged edition appeared after the poet's death in 1833. Then followed Viehoff in 4 volumes, 1847-1853. The best life of Goethe is that of Schäfer, which appeared first in 1851, and the third edition of which dates from 1877. It is contained in two volumes of moderate size, and is written with scarcely a superfluous word. The account of Goethe and Schiller by Karl Goedeke in his *Grundriss der Deutschen Dichtung* is admirable, and so is the little book *Goethes Leben und Schriften*,

published by him in 1874. The life of Goethe has been popularized in England by G. H. Lewes, in a work which is as much read in German as in English. A complete biography of Goethe cannot be written until the archives of the Goethe Haus at Weimar are thrown open for consultation. The knowledge of Goethe's works in England is due as much as anything else to the writings of Thomas Carlyle. The commentaries on Goethe's works are endless in number. The most active labourer in this field has been H. Düntze, who has left no side of Goethe's activity and no period of his life unexplored. We must also mention the brilliant lectures on Goethe by Hermann Grimm (Berlin, 1877), and the excellent sketch of his life and works published by W. Hayward in 1878. The following works deserve particular mention:—

*Aus Goethes Knabenzeit 1757-59*, *Mittheilungen aus einem Originalmanuscript der Frankfurter Stadtbibliothek*, erläutert und herausgegeben von Dr H. Weismann, Frankfurt, 1846; *Briefe an J. H. Merck von Goethe, Herder, Wieland, und andern bedeutenden Zeitgenossen*, hrsg. von K. Wagner, Darmstadt, 1835; *Briefe aus dem Freundeskreise von Goethe, Herder, Höpfer, und Merck*, hrsg. von Dr K. Wagner, Leipzig, 1847; *Briefe Goethes an Frau von Stein aus den Jahren 1776-1826*, hrsg. durch A. Schöll, 3 vols., Weimar, 1848-1851; *Briefe Goethes an die Gräfin Auguste zu Stolberg*, Leipzig, 1839; *Briefe Goethes an Lavater, aus den Jahren 1774-83*, hrsg. von Heinr. Herzel, Leipzig, 1833; *Briefe Goethes an Leipziger Freunde*, hrsg. von O. Jahn, Leipzig, 1849; *Briefe Goethes in den Jahren 1768-1832*, hrsg. von H. Döring, Leipzig, 1836; *Briefwechsel d. Groscherzogs Karl August v. Sachsen-Weimar-Eisenach mit Goethe in den Jahren von 1775 bis 1828*, 2 vols., Weimar und Leipzig, 1863; *Briefwechsel zwischen Goethe u. F. H. Jacobi*, hrsg. v. Max Jacobi, Leipzig, 1847; *Briefwechsel zwischen Goethe und Zelter in den Jahren 1796-1832*, hrsg. von Fr. W. Riemer, 8 parts, Berlin, 1833-34-36; *Briefwechsel zwischen Goethe u. Marianne von Willemer (Suleika)*, hrsg. mit Lebensnachrichten, &c., von Th. Creizenach, Stuttgart, 1877; H. Döring, *Goethes Leben*, Weimar, 1828, 2d ed., Jena, 1833; and Goedeke, *Goethes Leben u. Schriften*, Stuttgart, 1874, *Goethes Sammlungen*, 3 parts, Jena, Leipzig, 1848, 1849; Dr Karl Mendelssohn-Bartholdy, *Goethe u. Felix Mendelssohn Bartholdy*, Leipzig, 1871; *Neue Mittheilungen aus Johann Wolfgang von Goethes handschriftlichem Nachlasse*, 8 parts, Leipzig, 1874-76; Dr J. W. Schäfer, *Goethes Leben*, 2 vols., 8th ed., Leipzig, 1877; H. Viehoff, *Goethes Leben*, 3 parts, Stuttgart, 1847-49; Franz Wegele, *Goethe als Historiker*, 1876; Zelleneck, *Die Beziehungen Goethes zu Spinoza*, 1878; Edmund Hofer, *Goethe und Charlotte von Stein*, Stuttgart, 1878; *Briefe Goethes an Sophie la Roche und Bettina Brentano*, hrsg. von C. Loeper, Berlin, 1879 (a most valuable little book); Graf Ferdinand von Dürkheim, *Lit's Bild geschichtlich entworfen*, 1879; C. A. H. Burkhardt, *Goethe und der Componist Ph. Chr. Kayser*, Leipzig, 1879; Vinc. Prükl, *Goethe in Eger*, Vienna, 1879. (O. B.)

GOETZ, HERMANN (1840-1876), a musical composer, presents one of those instances, too frequent in the history of art, of success long sought for, and cut short by death when achieved at last. He was born at Königsburg in Prussia in 1840, and began his regular musical studies at the comparatively advanced age of seventeen. He entered the music-school of Professor Stern at Berlin, and studied composition chiefly under Ulrich and Hans von Bülow. In 1863 he was appointed organist at Winterthur in Switzerland, where he lived in obscurity for a number of years, occupying himself with composition during his leisure hours. One of his works was an opera, *The Taming of the Shrew*, the libretto skilfully adapted from Shakespeare's play. After much delay it was produced at Mannheim (October 1874), and its success was as instantaneous as it has up to the present proved lasting. It rapidly made the round of the great German theatres, and spread its composer's fame over all the land. But Goetz did not live to enjoy this happy result for long. In December 1876 he died at Zurich from overwork. A second opera, *Francesca da Rimini*, on which he was engaged at the time of his death, remained a fragment; but it has since been finished according to his directions by a friend.

and was performed for the first time at Mannheim a few months after the composer's death. Besides his dramatic work, Goetz also wrote various compositions for chamber-music, of which a trio (Op. 1) and a quintet (Op. 16) have been given with great success at the London Monday Popular Concerts. Still more important is the *Symphony in F*, on which the composer's great reputation in England is mainly founded. As a composer of comic opera Goetz lacks the sprightliness and artistic *savoir faire* so rarely found amongst Germanic nations. His was essentially a serious nature, and passion and pathos were to him more congenial than humour. The more serious sides of the subject are therefore insisted upon more successfully than Katherine's ravings and Petruccio's eccentricities. There are, however, very graceful passages, e.g., the singing lesson Bianca receives from her disguised lover. Goetz's style, although influenced by Wagner and other masters, shows signs of a distinct individuality. The design of his music is essentially of a polyphonic character, and the working out and interweaving of his themes betray the musician of high scholarship. But breadth and beautiful flow of melody also were his, as is seen in the symphony, and perhaps still more in the quintet for pianoforte and strings above

referred to. The most important of Goetz's posthumous works are a setting of the 137th Psalm for soprano solo, chorus, and orchestra, a "Spring" overture (Op. 15), and a pianoforte sonata for four hands (Op. 17).

GOG (גִּי) occurs in two passages of Scripture (Ezek. xxxviii.—xxxix., and Rev. xx.) as the name of a great anti-theocratic power destined to manifest itself in the world immediately before the final dispensation is ushered in. In the later passage, Gog and Magog are spoken of as co-ordinate; in the earlier, Gog is given as the name of the person or people, and Magog as that of the land of its origin. Notwithstanding this discrepancy, it is obvious that the passages are intimately related, and that both depend upon Gen. x. 2, where, however, Magog alone is mentioned. Here he is the second son of Japhet, and, on the assumption that a geographical order underlies these ethnographical tables, his locality is to be sought between Gomer and Madai or Media. According to Josephus, who is followed by Jerome, the Scythians were primarily intended by this designation; and this opinion has been almost universally accepted in modern times. The name *Σκίθαι*, it is to be observed, however, is often but a vague word for any or all of the numerous and but partially known tribes of the north; and any attempt to assign a more definite locality to Magog can only be very hesitatingly made. According to some, the Maiotes about the Palus Maotis are meant; according to others, the Massagetæ; according to Kiepert, the inhabitants of the northern and eastern parts of Armenia. In Ezekiel, Gog is regarded as a terrible ruler in the extreme north, being prince of Rosh, Mesech, and Tubal, as well as governor in the land of Magog, and having the support of Persia, Ethiopia, and Phut, as well as of Gomer and the house of Togarmah. It may be considered as certain that the imagery employed in this prophetic description was suggested by the Scythian invasion which about the time of Isaiah had devastated Asia (Herod. i. 103 ff.). As might have been expected from the prominence given to that description in the Old Testament, Gog figures largely in Jewish and Mahometan as well as Christian eschatology. In the district of Astrakhan a legend is still to be met with, to the effect that Gog and Magog were two great races, which Alexander the Great subdued and banished to the inmost recesses of the Caucasus, where they are meanwhile kept in by the terror of twelve trumpets blown by the winds, but whence they are destined ultimately to make their escape and destroy the world. The legends that attach themselves to the effigies of Gog and Magog which are at present to be seen in Guild Hall, London, are only remotely connected, if at all, with the statements of Scripture. According to the *Recuyell des Histoires de Troie*, Gog and Magog were the survivors of a race of giants descended from the thirty-three wicked daughters of Diocletian; after their brethren had been slain by Brute and his companions, Gog and Magog were brought to London (Troy-novant), and compelled to officiate as porters at the gate of the royal palace. It is known that effigies similar to the present existed in London as early as the time of Henry V.; but it is uncertain at what date this legend first began to attach to them. According to Geoffrey of Monmouth (*Chronicles*, i. 16), Goemot or Goemagot (either corrupted from or corrupted into "Gog and Magog") was a giant who, along with his brother Corineus, tyrannized in the western horn of England until slain by foreign invaders.

GOGO, or GHOGHĀ, a town in Ahmadābād district, Bombay, 193 miles north-west of Bombay. About three-quarters of a mile east of the town is an excellent anchorage, in some measure sheltered by the island of Perim, which lies still further east. The natives of this are reckoned the best sailors in India; and ships touching

here may procure water and supplies, or repair damages. It is a safe refuge during the south-west monsoon, or for vessels that have parted from their anchors in the Surat roads, the bottom being an entire bed of mud, three-quarters of a mile from the shore, and the water always smooth. Gogo has of late years lost its commercial importance. Its rival, Bhaunagar, is 8 miles nearer to the cotton districts. North of the town is a black salt marsh, extending to the Bhaunagar creek. On the other sides is undulating cultivated land, sloping to the range of hills 12 miles off. South of the town there is another salt marsh. The land in the neighbourhood is inundated at high spring tides, which renders it necessary to bring fresh water from a distance of 4 or 5 miles. The average annual value of the exports for five years ending 1871-72 was £56,227 and of the imports £103,083. Population (1872), 9571.

GOGOL, NIKOLAI VASILIEVICH (1809-1852), was born in the province of Poltava, in South Russia, March 31, 1809. Educated at the Niejin gymnasium, he there started a manuscript periodical, "The Star," and wrote several pieces including a tragedy, *The Brigands*. Having completed his course at Niejin, he went in 1829 to St Petersburg, where he tried the stage but failed. Next year he obtained a clerkship in the department of appanages, but he soon gave it up. In literature, however, he found his true vocation. In 1829 he published anonymously a poem called *Italy*, and, under the pseudonym of V. Atof, an idyll, *Hans Kuchel Garten*, which he had written while still at Niejin. The idyll was so ridiculed by a reviewer that its author bought up all the copies he could secure, and burnt them in a room which he hired for the purpose at an inn. Gogol then fell back upon South Russian popular literature, and especially the tales of Cossackdom on which his boyish fancy had been nursed, his father having occupied the post of "regimental secretary," one of the honorary officials, in the Zaporogian Cossack forces. In 1830 he published in a periodical the first of the stories which appeared next year under the title of *Evenings in a Farm near Dikanka: by Rudy Panko*. This work, containing a series of attractive pictures of that Little-Russian life which lends itself to romance more readily than does the monotony of "Great-Russian" existence, immediately obtained a great success,—its light and colour, its freshness and originality, being hailed with enthusiasm by the principal writers of the day in Russia. Whereupon Gogol planned, not only a history of Little-Russia, but also one of the Middle Ages, to be completed in eight or nine volumes. This plan he did not carry out, though it led to his being appointed to a professorship in the university of St Petersburg, a post in which he met with small success, and which he resigned in 1835. Meanwhile he had published his *Arabesques*, a collection of essays and stories; his *Taras Bulba*, the chief of the *Cossack Tales* translated into English by George Tolstoy; and a number of novelettes, which mark his transition from the romantic to the realistic school of fiction, such as the admirable sketch of the tranquil life led in a quiet country, house by two kindly specimens of *Old-world Gentlefolks*, or the description of the petty miseries endured by an ill-paid clerk in a Government office, the great object of whose life is to secure the "cloak" from which his story takes its name. To the same period belongs his celebrated comedy, the *Revizor*, or Government Inspector. His aim in writing it was to drag into light "all that was bad in Russia," and to hold it up to contempt. And he succeeded in rendering contemptible and ludicrous the official life of Russia, the corruption universally prevailing throughout the civil service, the alternate arrogance and servility of men in office. The plot of the comedy is very simple. A traveller who arrives with an empty purse at a provincial town is taken for an

inspector whose arrival is awaited with fear, and he receives all the attentions and bribes which are meant to propitiate the dreaded investigator of abuses. The play appeared on the stage in the spring of 1836, and achieved a full success, in spite of the opposition attempted by the official classes whose malpractices it exposed. The aim which Gogol had in view when writing the *Revizor* he afterwards fully attained in his great novel, *Mertviya Dushi*, or *Dead Souls*, the first part of which appeared in 1842. The hero of the story is an adventurer who goes about Russia making fictitious purchases of "dead souls," i.e., of serfs who have died since the last census, with the view of pledging his imaginary property to Government. But his adventures are merely an excuse for drawing a series of pictures, of an unfavourable kind, of Russian provincial life, and of introducing on the scene a number of types of Russian society. Of the force and truth with which these delineations are executed the universal consent of Russian critics in their favour may be taken as a measure. From the French version of the story a general idea of its merits may be formed, and some knowledge of its plot and its principal characters may be gathered from the English adaptation published in 1854, as an original work, under the title of *Home Life in Russia*. But no one seems to be able fully to appreciate Gogol's merits as a humorist, who is not intimate with the language in which he wrote as well as with the society which he depicted. In 1836 Gogol for the first time went abroad. Subsequently he spent a considerable amount of time out of Russia, chiefly in Italy, where much of his *Dead Souls* was written. His residence there, especially at Rome, made a deep impression on his mind, which, during his later years, turned towards mysticism. The last works which he published, his *Confession* and *Correspondence with Friends*, offer a painful contrast to the light, bright, vigorous, realistic, humorous writings which had gained and have retained for him his immense popularity in his native land. Asceticism and mystical exaltation had told upon his nervous system, and its feeble condition showed itself in his literary compositions. In 1848 he made a pilgrimage to Jerusalem, and on his return settled down at Moscow, where he died, March 3, 1852, not having quite completed his forty-third year.

GOITO, a large village of Italy, in the province of Mantua and district of Volta, situated on the right bank of the Mincio, about 14 miles from Castiglione, on the highway between Brescia and Mantua. Its position has made it figure from time to time in the records of Italian warfare. In 1701 it was taken by the allies, in 1706 by the prince of Hesse, and in 1796 by the French. It was the scene of a severe conflict between the French and the Austrians in 1814; and in 1848 it saw the defeat of the Austrians by the Piedmontese. The population of the commune in 1871 was 5274.

GOITRE (from *guttur*, the throat; synonyms, Bronchocele, Derbyshire Neck), a term in medicine applied to a swelling in the front of the neck caused by an enlargement of the thyroid gland. This structure, which lies between the skin and anterior surface of the windpipe, and in health is not large enough to give rise to any external prominence, is liable to occasional variations in size, more especially in females, a temporary enlargement of the gland being not uncommon at the catamenial periods, as well as during pregnancy. In the disease now under consideration, however, the swelling is well marked, and is not only unsightly, but may by its growth occasion much discomfort, and even give rise to serious symptoms from its encroachment on the windpipe and other important parts in the neck. The size to which goitrous growths may attain is extraordinary, Alibert recording cases of goitre where the tumour not only

enormously enlarged the neck but hung down over the breast, or even reached as low as the middle of the thigh.

In districts where the disease prevails the goitre usually appears in early life, often from the eighth to the twelfth year. Its growth is at first slow, but after several years of comparative quiescence a somewhat sudden increase is a not unfrequent occurrence. In the earlier stages of the disease the condition of the gland is simply an enlargement of its constituent parts, which retain their normal soft consistence; but in the course of time other changes supervene, and it may become the seat of cystic formations, or acquire hardness from increase of connective tissue or calcareous deposits. Occasionally the enlargement of the gland is uniform, but more commonly one of the lobes, generally the right, is the larger. In some rare instances the disease has been noticed to be limited almost entirely to the isthmus which connects the two lobes of the gland. The growth is unattended with pain, and is not inconsistent with a fair measure of health.

Goitre is a marked example of an endemic disease. There are few parts of the world where it is not found prevailing in certain localities, these being for the most part valleys and elevated plains in mountainous districts. The wide distribution of this disease has naturally led to extensive inquiry and to abundant speculation as to its origin. It is unnecessary to mention the numerous theories which have been advanced on the subject. Many of these have already been referred to under CRETINISM (*q.v.*). The most generally accepted view among physicians is that which ascribes the malady to the use of drinking water impregnated with the salts of lime and magnesia, in which ingredients the water of goitrous districts would appear always to abound. This theory alone, however, is inadequate, as is evident from the often-observed fact that in localities not far removed from those in which goitre prevails, and where the water is of the same chemical composition, the disease may be entirely unknown. Hence among the best authorities the tendency now is to regard goitre as the result of a combination of causes, among which local telluric or malarial influences concur in an important manner with those of the drinking water in developing the disease. It is noteworthy that goitre can often be cured by removal from the district where it prevails, as also that it is apt to be acquired by previously healthy persons who settle in goitrous localities; and it is only in such places that the disease exhibits any hereditary tendencies.

In the treatment of goitre the first step is the removal, if possible, of the patient from the affected locality, and attention to general hygienic rules. The employment of burnt sponge as a cure for goitre was in general use until Dr Coindet of Geneva showed that its acknowledged virtues were in all probability due to the iodine which it contained, and proposed as a substitute this latter agent in a pure state. Dr Coindet's views were amply borne out, and iodine and its preparations have been universally adopted as the most potent remedy in this disease, and have superseded all other medicines. Small and gradually increased doses of the drug, either in the form of iodide of potassium or what is known as Lugol's solution appear to be the best methods of administration. The external application of iodine to the goitre, in the form of liniment or ointment, is of scarcely less value than its internal employment, and would seem to be sometimes capable of effecting a cure alone, as is evident from the method of treatment adopted with singular success in India and originally proposed by the late Major Holmes. This consists in applying to the goitre, by means of a spatula, an ointment of biniodide of mercury for about ten minutes soon after sunrise, and placing the patient with his goitre exposed to rays of the sun for six or seven hours. Blister-

ing of the surface generally follows, a second application of the ointment is made, and the patient sent home. This is often found sufficient to effect the cure, but the treatment can, if necessary, be repeated.

The name "Exophthalmic Goitre" is applied to another form of the enlargement of the thyroid gland, differing entirely in its pathological connexions from that above described. In this affection the bronchocele is but one of three phenomena, which together constitute the typical characteristics of the disease, viz., palpitation of the heart and great vessels, enlargement of the thyroid gland, and protrusion of the eyeballs. This group of symptoms is generally known by the names of Graves's disease or Von Basedow's disease, in reference to the physicians by whom the malady was originally recognized and described. Although occasionally observed in men, this affection occurs much more commonly in females and in comparatively early life. It is generally preceded by ill health in some form, more particularly impoverishment of blood, and nervous or hysterical disorders, and is occasionally seen in cases of organic heart-disease. It has sometimes been suddenly developed as the effect of fright or violent mental emotion. The first of the symptoms to appear is usually the palpitation of the heart which is aggravated by the slightest exertion, and may be so severe as not only to shake the whole frame but even to be audible at some distance from the patient. An uncomfortable sensation of throbbing is felt throughout the body, and many of the larger blood-vessels are seen to pulsate strongly like the heart. The enlargement of the thyroid gland generally comes on gradually, and rarely increases to any great size, thus differing from true goitre, as originally noticed by Dr Graves. The enlarged gland is of soft consistence, and communicates a thrill to touch from its dilated and pulsating blood-vessels.

Accompanying the goitre a remarkable change is observed in the appearance of the eyes, which attract attention by their prominence and the startled expression thus given to the countenance. In extreme cases the eyes protrude from their sockets to such a degree that the eyelids cannot be closed, and injury may thus arise to the constantly exposed eyeballs. Apart from such risk, however, the vision is rarely affected in this disease. Much difference of opinion prevails as to the immediate cause of the protrusion of the eyes, but it is generally ascribed to the increase of the fatty tissue and distension of the blood-vessels of the orbits. It occasionally happens that in undoubted cases of the disease one or other of the three above-named phenomena is absent, generally either the goitre or the exophthalmos. The palpitation of the heart is the most constant symptom. Sleeplessness, irritability, disorders of digestion, diarrhoea, and uterine derangements are common accompaniments.

The pathology of exophthalmic goitre is still somewhat uncertain, but there are strong reasons to believe that it is

essentially a nervous ailment, and that the symptoms depend on a morbid state of the sympathetic nerve in the neck, which is well known to play an important part in the vaso-motor functions—that is, in controlling the action of the heart and regulating the calibre of the blood-vessels. In numerous instances of exophthalmic goitre a diseased state of this nerve has been found *post mortem*, although it must be admitted that in some cases no morbid change could be detected. The experiments of Bernard, Brown-Sequard, Schiff, and others upon the functions of the sympathetic nerve lend strong support to this view of the pathology of the disease. Exophthalmic goitre is not directly a fatal malady, but, on the other hand, complete recovery is a less frequent result than partial improvement, the patient continuing to suffer from chronic ill-health. The disturbed condition of the heart's action leads in some instances to permanent disease of that organ in the form of dilatation of its cavities. In the treatment of exophthalmic goitre the most successful results have been attained by the use of digitalis, which has the effect of giving tone to the heart and contracting the dilated blood-vessels. The tincture of digitalis, in doses of 5 to 10 drops twice or thrice daily, is perhaps the best form of administration. Where anæmia is present iron is indicated, and may be combined with the digitalis, although in some cases it is found to be unsuitable. In allaying the palpitation benefit is said to have frequently followed the application of ice to the cardiac region as well as to the thyroid gland. Iodine, which is so valuable in cases of true goitre, is generally admitted to be of no service in this disease, and is rather held to be injurious. (J. O. A.)

GOLCONDA, a fortress and ruined city, situated in the Nizám's Dominions, 7 miles west of Hyderabad city. In former times Golconda was a large and powerful kingdom of the Deccan, which arose on the downfall of the Bâhmâni dynasty, but was subdued by Aurungzebe in 1687, and annexed to the dominions of the Delhi empire. The fortress of Golconda, situated on a rocky ridge of granite, is extensive, and contains many enclosures. It is strong and in good repair, but is commanded by the summits of the enormous and massive mausolea of the ancient kings about 600 yards distant. These buildings, which are now the chief characteristics of the place, form a vast group, situated in an arid, rocky desert. They have suffered considerably from the ravages of time, but more from the hand of man, and nothing but the great solidity of their walls has preserved them from utter ruin. These tombs were erected at a great expense, some of them being said to have cost as much as £150,000. Golconda fort is now used as the nizám's treasury, and also as the state prison. The diamonds of Golconda have obtained great celebrity throughout the world; but they were merely cut and polished here, being generally found at Partial, near the south-eastern frontier of the nizám's territory.

## GOLD

THE colour, lustre, and power of resisting oxidation, which this metal possesses, have caused it to be valued from the earliest ages. Allusions to gold are frequent in the Old Testament, and the refining of the precious metals by cupellation seems to have been a favourite illustration with the Jewish poets.<sup>1</sup> Jewellery and vessels found in Egyptian tombs afford evidence of the perfection attained in working gold at a period earlier than the government of Joseph,<sup>2</sup> and drawings on tombs of about this epoch clearly indicate the method of conducting the operations of washing, fusing, and weighing the metal.

<sup>1</sup> Percy's *Metallurgy of Lead*, p. 177.

<sup>2</sup> Jacquemart, *History of Furniture*, translation, p. 331.

Excavations in Etruria have brought to light beautiful ornaments of gold, enriched with minute grains of the metal, the workmanship of which was unrivalled until Castellani studied and revived the methods employed by Etruscan artists.<sup>3</sup> The Greeks were familiar with natural alloys of silver and gold named *electrum*, rough nuggets of which were frequently stamped, and formed the earliest coins in Lydia.<sup>4</sup> The colour of this electrum is pale yellow to yellowish white, and it contains from 20 to 40 per cent. of silver.

<sup>3</sup> *Archæological Journal*, 1861, p. 365.

<sup>4</sup> "Notes on the Ancient Electrum Coins," by Barclay V. Head, *Nismismatic Chronicle*, part iv., 1875, p. 245.

With regard to the history of the metallurgy of gold, it may be mentioned that, according to Pliny, mercury was employed in his time both as a means of separating the precious metals and for the purposes of gilding. Vitruvius also gives a detailed account of the means of recovering gold, by amalgamation, from cloth into which it had been woven.

*Properties.*—Gold is the only metal of a yellow colour, which is, however, notably affected by small quantities of other metals; thus the tint is sensibly lowered by small quantities of silver, and heightened by copper. The surface colour of particles of gold is often apparently reddened by translucent films of brown iron ore. It is nearly as soft as lead. The *hardness* varies, however, with the composition. Crystallized specimens from Oregon and Fraser River, containing respectively 835 and 910 parts of gold in 1000, are slightly harder than calc spar but sensibly softer than fluor spar, or much harder than the pure metal. When pure, gold is the most *malleable* of all metals. One grain may be beaten into leaves which cover a surface of 56 square inches, and are only  $\frac{1}{25000}$ th of an inch thick. Faraday has shown that the thickness of gold leaves may be still further reduced by floating them on a dilute solution of cyanide of potassium. When very thin, leaf gold appears yellow by reflected and green by transmitted light. If, however, certain gold films are heated, the light transmitted is ruby red; the pressure of a hard substance on the film so changes its state of aggregation that green light is again transmitted.<sup>1</sup> The metal is extremely *ductile*; a single grain may be drawn into a wire 500 feet in length, and an ounce of gold covering a silver wire is capable of being extended more than 1300 miles. Gold can readily be welded cold, and thus the finely divided metal, in the state in which it is precipitated from solution, may be compressed between dies into discs or medals. According to G. Rose,<sup>2</sup> the *specific gravity* of gold in the finely divided state in which it is precipitated from solution by oxalic acid is 19.49. The specific gravity of cast gold varies from 18.29 to 19.37, and by compression<sup>3</sup> between dies the specific gravity may be raised from 19.37 to 19.41; by annealing, however, the previous density is to some extent recovered, as it then is found to be 19.40. Its *atomic weight* is variously given as follows:—196.67 (Berzelius), 196.3 (Levol), 196.5 (Wurtz), 196.0 (Watts). The number adopted in this work (CHEMISTRY, vol. v. p. 428) is 196.2. Different observers have given the following temperatures as its *melting point*:—1425° C. (Daniell), 1200° C. (Pouillet), 1380° C. (Guyton de Morveau). Riemsdijk,<sup>4</sup> after comparing the several results, concludes that it may be considered to be 1240° C. The *electric conductivity* is given by Matthiessen as 73.99 at 15.1° C., pure silver being 100; this depends greatly on its degree of purity,—the presence of a few thousandths of silver lowering its conductivity by 10 per cent. The *specific resistance* of the metal in electromagnetic measure, according to the centimetre-gramme-second system of units, is 2154. Its *conductivity for heat* is 53.2 (Wiedemann and Franz), pure silver being 100. Its *specific heat* is 0.324 (Regnault). Its *coefficient of expansion* for each degree between 0° and 100° C. is 0.000014661, or for gold which has been annealed 0.000015136 (Laplace and Lavoisier). The *specific magnetism* of the metal is 3.47 (Becquerel). Details as to its *tenacity* and *rigidity* are given in the article ELASTICITY. With regard to its *volatility*, Gasto Claveus<sup>5</sup> states that he placed an ounce of pure gold in an earthen

<sup>1</sup> *Phil. Trans.*, 1857, p. 145.

<sup>2</sup> *Pogg. Ann.*, vol. lxxiii. p. 1, and lxxv. p. 408.

<sup>3</sup> *Eighth Ann. Report of Deputy Master of the Mint*, 1877, p. 41.

<sup>4</sup> *Archives Néerlandaises*, t. iii., 1868.

<sup>5</sup> Quoted by Dr T. Thomson, *System of Chemistry*, 5th edition, 1817, vol. i. p. 434.

vessel in that part of a glass-house where the glass is kept constantly melted, and retained it in a state of fusion for two months without the loss of the smallest portion of its weight. Kunkel describes a similar experiment, which was attended with the same result. Homberg,<sup>6</sup> however, observed that when a small portion of gold is kept at a violent heat, part of it is volatilized. Both Macquer and Lavoisier showed that when gold is strongly heated, fumes arise which gild a piece of silver held in them. Its volatility has also been studied by Elsher, and, in the presence of other metals by Napier.<sup>7</sup> Helot affirms that when an alloy of 7 parts of zinc and 1 part of gold is heated in air, the whole of the gold rises in the fumes of oxide of zinc which are produced. Gold is dissipated by sending a powerful charge of electricity through it when in the form of leaf or thin wire. In the gold spectrum Huggins has observed twenty-three lines, and the wave lengths of the three most important of these are 5231, 5835, and 6276 respectively. Some preliminary observations on the spectrum of the vapour at the temperature of the oxy-hydrogen flame, made by Lockyer and Roberts,<sup>8</sup> showed that there was a distinct absorption both at the blue and at the red end.

The solvents for gold are given in the article CHEMISTRY, vol. v. p. 529. It may be added that finely-divided gold dissolves when heated with strong sulphuric acid and a little nitric acid. Dilution with water, however, precipitates the metal as a violet or brown powder from the solution so obtained. Gold is also attacked when strong sulphuric acid is submitted to electrolysis with a gold positive pole.<sup>9</sup> W. Skey has shown<sup>10</sup> that in substances which contain small quantities of gold, the precious metal may be removed by the solvent action of a tincture of iodine or bromine in water. Filter paper soaked with the clear solution is burnt, and the presence of gold is indicated by the colour of the ash.

*Occlusion of Gas by Gold.*—Graham has shown<sup>11</sup> that gold is capable of occluding 0.48 of its volume of hydrogen, and 0.20 of its volume of nitrogen. Varrentrapp has also pointed out that "cornets" from the assay of gold may retain gas if they are not strongly heated. Artificial crystals of gold may be formed when the molten metal is slowly cooled.

*Occurrence and Distribution.*—Gold is found in nature chiefly in the metallic state, or as native gold, and less frequently in combination with tellurium, lead, and silver, forming a peculiar group of minerals confined to a few localities in Europe and America. These are the only certain examples of natural combinations of the metal,—the minute although economically valuable quantity often found in pyrites and other sulphides being probably only present in mechanical suspension, although for practical purposes it may be spoken of as combined. The native metal occurs tolerably frequently in crystals belonging to the cubic system, the octahedron being the commonest form, but other and complex combinations have been observed. Owing to the softness of the metal, large crystals are rarely well defined, the points being commonly rounded. In the irregular crystalline aggregates branching and moss-like forms are most common, and in Transylvania thin plates or sheets with diagonal structures are characteristic. These have recently been shown by Vom Rath to be repeated combinations of distorted tetrahedra. During the preparation of a mass of pure gold in the Mint at London, some fine crystals which appear to be aggregations of octahedra were obtained; and dendritic crystals of gold,

<sup>6</sup> *Mem. Paris Academy*, 1702, p. 147.

<sup>7</sup> *Chem. Soc. Journ.*, vol. x. p. 229, vol. xi. p. 168.

<sup>8</sup> *Proc. Roy. Soc.*, 1875, p. 344. <sup>9</sup> Spiller, *Chem. News*, x. 173.

<sup>10</sup> *Ibid.*, xxii. 245. <sup>11</sup> *Phil. Trans.*, 1866, 433.