

stances permit, to enjoin confinement to a warm room or removal to a more genial climate during the winter months.

When expectoration is attended with difficulty, such remedies as squill in combination with ammonia may prove useful. When, on the other hand, bronchorrhœa exists, astringents are called for. The inhalation of vapour containing iodine or turpentine is often followed with marked benefit in this way. Where breathlessness accompanies the disease, besides the use of ethereal preparations, marked relief is often derived from large doses of iodide of potassium. Counter-irritation to the chest with turpentine, mustard, or croton oil is generally attended with good results. In aged and weak persons stimulants are an indispensable part of the treatment. Acute exacerbations of the disease, which are so apt to arise in the chronic form, must be dealt with on the principles already indicated in treating of acute bronchitis.

(J. O. A.)

BRÖNDSTED, PETER OLUF, archæologist, was the son of a Danish clergyman, and was born at Horsens in Jutland on 17th November 1781. He received his academical education at the university of Copenhagen; and in 1802 he visited Paris in company with his friend Koes. After remaining there two years, they went together to Italy. Both were zealously attached to the study of antiquities; and congeniality of tastes and pursuits induced them both, in 1810, to join Baron Stackelberg, Von Haller, and Linckh of Stuttgart, in an expedition to Greece, where they examined with attention the interesting remains of ancient art, and engaged with ardour in excavations among the ruins, which were carried on, especially by Bröndsted and Stackelberg, with very interesting results. The discoveries Bröndsted made were made public in several works, which show learning and sagacity such as have seldom been applied to the elucidation of antiquity with happier results. After three years of active researches in Greece, Bröndsted returned to Copenhagen, where, as a reward for his labours, he was appointed professor of Greek in the university. He now began to arrange and prepare for publication the vast materials he had collected during his travels; but finding that Copenhagen did not afford him the desired facilities, he exchanged his professorship for the office of Danish envoy at the papal court in 1818, and took up his abode at Rome. He also, in 1820 and 1821, went to Sicily and the Ionian Isles to collect additional materials for his great work; and when the artistic illustrations were completed, he obtained leave to visit Paris to superintend the publication. In 1826, he came over to London, chiefly with a view to study the Elgin marbles and other remains of antiquity in the British Museum, and became acquainted with the principal archæologists of England.

He returned to Copenhagen in 1832, when he immediately received the appointment of director of the royal museum of antiquities, and the professorship of archæology and philology. His merits were ten years afterwards further rewarded with the honourable office of rector of the university; but an unlucky fall from his horse caused the death of this eminent man on the 26th June 1842. His principal work was the *Travels and Archæological Researches in Greece*, published in German and French, 1826-30. His dissertations on points of ancient art are very numerous.

BRONGNIART, ALEXANDRE, a distinguished French mineralogist, was the son of the eminent architect who designed the Bourse and other public buildings of Paris, and was born in that city in 1770. At an early age he joined the army of the Pyrenees; but having committed some slight political offence, he was thrown into prison, and detained there for some time. On his release he was appointed professor of natural history in the Collège des Quatre Nations, and soon after succeeded Haüy as professor in the school of mines. In 1800 he was made director of

the Sèvres porcelain factory, in which he revived the almost forgotten art of painting on glass. He did not confine himself entirely to mineralogy, for it is to him that we owe the division of Reptiles into the four orders of Saurians, Batrachians, Chelonians, and Ophidians. In 1816 he was elected into the Academy; and in the following year he visited the Alps of Switzerland and Italy, and afterwards Sweden and Norway. The result of his researches he published from time to time in the *Journal des Mines* and *Dictionnaire des Sciences Naturelles*. He died at Paris, October 7, 1847.

His principal works are—*Traité élémentaire de minéralogie appliquée aux Arts*; the *Tableau des terrains qui composent l'écorce du globe*, ou *Essai sur la structure de la partie connue de la terre*; and the *Traité des Arts céramiques* 1845. Brongniart was also the coadjutor of Cuvier in the admirable *Essai sur la géographie minéralogique des environs de Paris*.

BRONTE, a city of Sicily in the intendency of Catania. It stands in a healthy situation at the western foot of Mount Etna, on the river Giaretta, near a celebrated waterfall. It has considerable manufactures of linen and woollen cloths, and some paper-mills. Good wine is produced in the neighbourhood. Bronte is of comparatively modern origin, having all been built since the 16th century. It gave the title of duke to Lord Nelson. Population, 14,589.

BRONTE, CHARLOTTE, modern English novelist, was born on the 21st April 1816. Her father, the Rev. Patrick Bronte, was a native of county Down, Ireland; her mother, Maria Branwell, was of Cornish family. At the date of his marriage, in 1812, Mr Bronte held the living of Hartshead in Yorkshire, and there his two eldest daughters, Maria and Elizabeth, were born. In 1815 he removed to Thornton, in the parish of Bradford, where Charlotte, her brother Patrick Branwell, and her younger sisters, Emily and Anne, were born. In 1820 he was presented to the living of Haworth, and removed in that year to the parsonage, a bleak and solitary house, standing close by the churchyard and backed by a wide expanse of moorland. Mrs Bronte died soon after their removal, and the little family of young children were left to educate and train themselves. They saw little of their father, whose health was bad, and who seems to have been eccentric in his modes of thinking and acting. The charge of the little flock devolved upon the eldest daughter, a girl of between seven and eight when her mother died; and, under the peculiar circumstances of their life, the children's intellectual powers and sympathies developed with rapidity. Utterly deprived of all companions of their own age, with none of the usual outlets for their pent-up energies, they lived in a little world of their own. The harsh realities around them, the bleak scenery, the coarse and rugged natures of the few inhabitants with whom they came in contact, only impelled them to construct for themselves an ideal world, modelled after their own strange and untrained imaginations, in which they found satisfaction and reality. By the time Charlotte Bronte was thirteen years of age, it had become her constant habit, and one of her few pleasures, to weave imaginary tales, idealizing her favourite historical heroes, and bodying forth in narrative form her own thoughts and feelings. Nor was she alone in this curious occupation; all the family took part in the composition of juvenile stories and magazine articles. It was a strange training for a child, boding little good for her future happiness when thrown into the ordinary routine of life.

An event which made a deep impression on this strange family circle was the entering of the two eldest girls, in 1824, at a school recently opened at Cowan's Bridge, near Haworth, and intended for daughters of clergymen. A vivid picture of this school, and one which Miss Bronte always maintained was not over-coloured, is presented in *Jane Eyre*, for the Lowood of that story is Cowan's Bridge.

Of all pupils the Brontes were the least likely to fall in well with the requirements of their new mode of life. Everything was novel and repulsive to them; their peculiar natures were repressed and stunted; their intellectual sympathies found no food. Charlotte and Emily became pupils later in the same year, but it was soon found necessary to remove Maria. Her health had given way completely, and she died a few days after her return to Haworth in the spring of 1825. But a few months later and Elizabeth followed her sister to the grave. The younger girls were removed in the autumn of 1825; and Charlotte, as the eldest of the household, took upon herself the duties that Maria had formerly discharged. For six years she remained at home leading the usual quiet, isolated life, and indulging to the full her rare faculty of composition. She then spent one of her happiest years in a school at Roe Head, and some of the acquaintances made there became life-long friends. To this school she returned in 1835 in the capacity of teacher, and for a time her sisters were with her as pupils. After three years her health, always delicate, gave way alarmingly, and she had to be withdrawn to Haworth. Two short experiences as governess in a family having shown her how little such a life was suited to her, she turned her thoughts towards taking a school, a plan which would have had the special advantage of keeping together the three devoted sisters. Some money was advanced for this scheme by their aunt, and it was resolved that, as a preliminary step, Charlotte and Emily should study French upon the Continent. In 1842, accordingly, they found themselves in Brussels, and a new world, a new experience, was opened up to Miss Bronte's vigorous and imaginative mind, a world to be afterwards reproduced in living characters. She studied hard, and before her return to England in January 1844 had acquired a very thorough knowledge of French.

She came back to a home into which a fresh element of unhappiness had been introduced. Her brother Patrick, a youth of fine talents, had fallen into habits of dissipation, which rapidly rendered him a hopeless drunkard. For some years the sisters had the misery of seeing daily before them the spectacle of a wasted life, of powers thrown away, and of opportunities despised. The details of his unfortunate story may well rest in obscurity. He lingered on till September 1848.

Meanwhile, amid their distress, the sisters, who found refuge in their habits of composition, had made their first literary venture. During their separation, while Charlotte was in Brussels, and Anne in a situation as governess, they had been quietly pursuing their favourite occupation; and in 1845 they made the discovery of each other's poetical efforts. After some correspondence with publishers they resolved to print a small volume of poems, assuming the *noms de plume* of Currer, Ellis, and Acton Bell. The book appeared in the spring of 1846, was barely noticed by the reviews, and attracted no public attention. The authors, however, were encouraged to make a further trial, and each began to prepare a prose tale. Charlotte's was *The Professor*; Emily's, *Wuthering Heights*; Anne's, *Agnes Grey*. *The Professor* was refused on all hands; the other two were accepted, but their publication was delayed for some time. Nothing daunted by her want of success, Charlotte devoted herself heart and soul to a new tale, *Jane Eyre*, which she completed in August 1847. The MS. was accepted by Messrs Smith and Elder; the book appeared with the name of Currer Bell on the title page in October 1847, and at once achieved a decided success.

Few works of an unknown author have been received with such sudden and general acclamation. The utter and even paradoxical disregard for the conventional which the book displayed, the masculine vigour and glowing energy

with which the main characters were drawn, and its intense realism, at once seized and secured the popular favour, and showed the literary world that a new and powerful competitor for its honours was in the field. Its success was not so much the result of the favourable verdicts of trained judges, for these came but slowly, as of its own intrinsic force. The delineation of the harsh and rugged but powerful northern character was the revelation of a new world, and the intensest interest was excited as to the true name and abode of the unknown author. Numerous were the conjectures as to Currer Bell, but the secret was well kept. Even the publishers were unaware of the truth, till the disclosure had to be made to them in consequence of the publication of *Wuthering Heights* and *Agnes Grey*, and of the announcement of *The Tenant of Wildfell Hall*. The public, however, remained in the dark till after the appearance of the second work by the unknown, when a shrewd Yorkshireman, who knew Haworth, divined the secret and published his discovery.

Shirley, this second work, fully sustained the author's high reputation. Yet it was written under melancholy circumstances. The death of Patrick Bronte, in September 1848, was followed by the deaths of Emily and Anne in quick succession. Emily died on the 19th December 1848; Anne on the 28th May 1849. *Shirley* was published in October 1849. The disclosure of Miss Bronte's name as the writer at once introduced her to the great literary society of London. She met all the most prominent men of letters of the time; yet, though she was in the world, she was not of it. Her previous life and her peculiarly sensitive and retiring disposition made notoriety and attention painful to her, and she gladly escaped to the quiet of Haworth parsonage. Slowly, and with long interruptions from failing health, her last work proceeded to completion. *Villette* was published in 1853, and was hailed with universal delight. It is in some respects the most pleasing of her works, while it at the same time exhibits some of her gravest faults. The description of the life at the foreign pension, and the whole delineation of the principal characters, are reflexes of her own experience, and impress one with their vivid reality and truth. The plot, however, is unskillfully constructed, and the interest seems to shift from one set of characters to another in the progress of the story.

In June 1854 Miss Bronte was married to her father's curate, the Rev. Mr Nicholls, and for a brief period she tasted the strange new happiness of domestic life. But the seeds of decay were in her constitution; the same malady that had carried off her sisters, worked its way with fatal facility in her enfeebled frame. She died on the 31st March 1855. After her death *The Professor*, her first luckless tale, was published from her MSS.

A comparison has sometimes been made between Miss Bronte and Miss Austen. The points of contrast are certainly more apparent than the points of similarity; and it is a fact not without significance that Miss Bronte could never thoroughly appreciate the merits of her great predecessor. Both were consummate masters of literary expression, and both finished their work with the utmost care and precision. Miss Austen is distinctly superior in skilful evolution of plot and in the nice adjustment of character and incident. But her figures are tame and lifeless when compared with those of Miss Bronte, and what she chiefly lacked, the fierce glow and fire of imagination, and the perception of depths in human nature only revealed through suffering experience, the other possessed to an almost unrivalled extent. Miss Bronte's experience was, indeed, narrow, but it was of a rare kind, such as was peculiarly adapted to her strong and yet sensitive spirit. She had too what Goethe calls the true secret of poetic genius,

penetration to the individual and real; what she had herself known and felt, the deep impressions made on her mind by wild scenery, and by rugged yet genuine human natures, that she mirrored forth with living truth and fiery vehemence. Doubtless her strength at times approaches too near to coarseness, the situations become almost melodramatic, and the result may be charged with sensationalism, but the pervading sense of intense reality is more than sufficient to carry off these defects.

Of her three great works *Jane Eyre* will always be the one which occurs most readily in connection with her name; it has all the vigour and individuality of a first-born work of genius. *Shirley*, one of the sweetest love-stories in the range of English fiction, abounds in rich humour, but wants the perfection of artistic unity. *Villette* contains, perhaps, more of the author's personality than either of the others. The character of the heroine is in truth that of Miss Bronte herself, and the analysis of it is at times morbidly acute. *The Professor* has never gained much popularity, though the main conception is one of great beauty and is skillfully handled.

Of EMILY BRONTE'S works it is somewhat difficult to speak. Hers was a strange nature, not easily understood; and it had but little time to develop. Some of her poems are singularly powerful, and show uncommon abilities. *Wuthering Heights* is a literary curiosity. Unmistakably the work of a strong mind, into which the wild scenery of the north had sunk deeply, it shows absolutely no comprehension of human character. We are transplanted to a dreamland, enveloped in a lurid thunderous atmosphere, through which stalk fantastic giant beings, gloomy and devilish in their utter wickedness. It is the production of a powerful imagination, but of an imagination unrestrained by any experience of the real, and regulated by no considerations of artistic beauty and proportion.

ANNE BRONTE'S was a mind of weaker calibre. *Agnes Grey* is a gentle, gracefully written tale, founded on the writer's own experiences of a governess's life; but it manifested little power or promise. *The Tenant of Wildfell Hall* has much greater force and vigour; but the main conception is an unpleasant one over which the writer had brooded until she had been seized with a morbid craving to give it shape and substance. It is a painful story, inartistically told.

Charlotte Bronte's friend, Mrs Gaskell, has narrated her life, as only a woman of kindred genius could. Of Emily and Anne, incomparably the best notice is that prefixed by Charlotte Bronte to the second edition of *Wuthering Heights* and *Agnes Grey*. A new and uniform edition of the whole works of the three sisters, with Mrs Gaskell's *Life* (which first appeared in 1875), illustrated by engravings of the principal places mentioned, is at present (1876) in course of publication.

BRONZE is an alloy formed wholly or chiefly of copper and tin, in variable proportions. It has been used from a very early period. Archaeologists distinguish a *bronze age* in prehistoric times in Western Europe (intermediate between those of stone and iron), characterized by a general use of the alloy for cutting instruments and other objects. The "brass" of the Bible was probably of the nature of bronze. The use of bronze in early times is noticed more particularly below.

The addition of tin to copper gives rise to a product more fusible than copper, and thus better suited for casting. The alloy is also harder and less malleable. The proportions in which copper and tin are combined to make bronze vary according to the object for which the alloy is designed. With about 7 parts copper to 1 part tin, bronze is very hard, brittle, and sonorous. Soft bronze, again, which bears drifting, rolling, and drawing, is generally composed of 16 copper to 1 tin; while a flexible tenacious alloy, good for nails and bolts, is made of 20 copper to 1 tin. In preparing bronze for statues, bas-reliefs, &c., the qualities chiefly looked

at are fusibility and hardness, also readiness to acquire a fine patina on exposure; though it appears this may be acquired by bronzes differing widely in composition. A common statue bronze is formed of copper 80, tin 20. Bell-metal, for large bells, is generally made with about 3 parts copper to 1 part tin; for house bells, 4 copper to 1 tin. The bronze of bells (as of various other objects) sometimes contains a little zinc, lead, &c., in addition to the primary ingredients. The Chinese *tam tams* or *gongs*, are made of bronze forged by the hammer; they contain about 20 per cent. tin, the rest copper only. The secret of their manufacture seems to have been revealed by MM. Julien and Champion, who find that a bronze of this nature, though at the common temperature brittle as glass, may, at a dull red heat, be forged and beaten out as easily as soft tin. The speculum metal employed in telescopes is of 2 copper to 1 tin; and on the other hand, with larger proportions of copper, we have an alloy suitable for machinery bearings, and also for medals, 8 copper to 1 tin; another for brass ordnance or bronze cannon, 9 copper to 1 tin; another for mathematical instruments, 12 copper to 1 tin, &c. The hardness and resistance to oxidation of bronze fit it admirably for coins, and many ancient bronze coins have come to us but little deteriorated, though buried for ages in damp soil, or immersed in water. The composition of the present bronze British coinage is (in 100 parts) 95 copper, 4 tin, 1 zinc.

A few years ago some very beautiful Chinese and Japanese bronzes were exhibited in Paris, remarkable chiefly for the dead black colour of their patina. From analyses by M. Morin it appeared that they contained a large proportion of lead, the average composition being copper 80 parts, lead 10, tin 4, zinc 2, and the remaining four parts consisting of iron, nickel, arsenic, silver, and gold. According to M. Christoffe, lead is not essential for production of a fine black patina; and it renders the alloy brittle. Bronze can be covered with a black, red, brown, or green patina, as desired, by suitable oxidation or sulphurization.

Some important researches on bronze for field-guns have lately been made by Colonel Uchatius of Vienna; and the *steel bronze* he produces is said to be quite equal to steel in hardness, homogeneity, resistance, and other qualities; while it is less affected by atmospheric agency, and less costly. He casts the bronze (which contains 8 per cent. tin, the rest copper) in a cast-iron ingot mould, with a core of wrought-copper 50 mm. in diameter. Then after boring out the hollow ingot to a diameter of 80 mm. he forces through it a series of six conical pistons of hardened steel, slightly larger in diameter than the bore. The interior is then excessively hard and ready for rifling. The hardness, elasticity, and solidity diminish from within outwards. These new bronze guns have been found to bear several hundred discharges successively without the slightest apparent deformation or other injury.

It is only of late years that the changes produced in bronze by addition of phosphorus have been scientifically investigated; and from experiments by Messrs Montefiore, Künzel, Kirkaldy, and others, *phosphor bronze* is proved to have great superiority to ordinary bronze in tenacity, elasticity, and tensile strength (being to it much what steel is to wrought iron). The presence of oxides in ordinary bronze accounts for its possessing these qualities in less degree, and phosphorus increases them by reduction of the metal. Phosphor bronze is further greatly improved in tensile strength by being drawn into wire or rolled into sheets; and it resists the action of sea-water much better than copper. Such a substance cannot fail to find many important applications, military, industrial, and domestic. In virtue of its reducing properties, we may add, phosphor bronze can be platinized better than any other metal.

The alloy known as *aluminium bronze* is one endowed with great strength, malleability, and ductility. It is formed of 10 parts aluminium and 90 of copper.

In the melting of ordinary bronze, reverberatory furnaces have long been used, as rapid fusion is desirable in order to prevent loss of tin, zinc, or lead by oxidation. Bellfounders often use dome-topped furnaces, as their alloy does not require so intense a heat for fusion; but there is some waste of material with these. The copper is melted first, and covered with small charcoal or coke; and the tin is rapidly thrust down to the bottom of the melted mass. After stirring, the alloy is poured into the moulds, in which the cooling should be as rapid as possible. Sometimes pressure is applied during cooling, in order to make the cast free from pores.

In the old method of bronze-casting, known as the *cire perdue*, wax is first used for the thickness of the statue (between core and mould, which are of baked clay), and is melted and run off before the metal is poured in,—the core and mould being held apart by stays of iron wire. In the present day large works are never cast in one piece, but in several, which are afterwards united by heating and application of fused metal. A model is made in plaster, and a piece mould of Caen sand, about 1½ or 2 inches thick, made round it, the sizes of the pieces being determined by the shape and character of the portions they occupy. These pieces are backed with plaster of Paris to about a foot in thickness, with indentations cut in their horizontal thickness, into which the succeeding portion of the mould fits. The mould is then taken to pieces, dried, and rebuilt in the casting-pit. It is then filled with core-composition in a liquid state, and when this is sufficiently hardened, again taken to pieces. The core thus obtained is thoroughly dried, and reduced in size by scraping away as much of the material as would represent the thickness of the metal to be cast. This done, the mould is again built up over the core, and the pit filled, &c., as in the other process. The statue is completed after its removal from the mould by cutting off the jets, removing roughnesses where they occur, and giving greater sharpness to the details when necessary.

Statues and various ornamental objects may also be manufactured by the process of electro-deposition from a metallic solution; and some excellent results have been obtained in this way by Oudry, Christoffe, Elkington, and others. While the method offers some advantages in regard to cheapness, lightness, &c., of the products, the bronzes thus produced are not so hard and durable as those got by casting, and are thus less suited for exposure.

Bronzing is the process by which a bronze-like surface is produced on objects made of metal, plaster, wood, or other material. It may be done variously. The green bronze colour is sometimes produced on metal with vinegar alone, or dilute nitric acid, or sal-ammoniac. To give an antique appearance to newly made articles of bronze or brass, it is recommended to dissolve three-quarters of an ounce of sal-ammoniac and a drachm and a half of bin-oxalate of potash (salt of sorrel) in a quart of vinegar, moisten a soft rag or brush with the solution, and rub over the clean bright metal till its surface becomes quite dry through the friction. This process should be repeated several times, and the object should be kept a little warm. With a solution of chloride of platinum (which is, however, an expensive liquid) almost any colour can be imparted to copper, brass, iron, or new bronze, according to the degree of dilution and number of applications. The following solution is suitable for bronzing coins and medals:—Two parts of verdigris and one part of sal-ammoniac are dissolved in vinegar, the solution is boiled, skimmed, and diluted with water till it has only a weak metallic taste,

and on further dilution lets fall no precipitate. This solution is made to boil briskly and poured on the objects. These are well washed with clean water and then lacquered.

Objects of cast-iron may be made to assume a fine bronze appearance by being coated with a very thin layer of vegetable oil, and then placed in a drying oven, the temperature being such that oxidation of the iron and decomposition of the oil take place simultaneously. Another mode of bronzing iron (lately recommended by Weiskopf) is with a solution of one part sylvate of silver in twenty parts of oil of lavender. The object is lightly coated with this, and warmed rapidly up to 302° C. For bronzing tin or white metal a solution may be used consisting of 1 oz. sal-ammoniac, ½ oz. alum, and ½ oz. arsenic, dissolved in 1 pint of strong vinegar.

A good method of bronzing wood, porcelain, stoneware, composition picture and looking-glass frames, &c., is first to coat the article with a thin solution of water glass, using a soft brush. Bronze powder is then dusted on, and any excess not adherent is knocked off by a few gentle taps. The article is next heated to dry the silicate, and the bronze becomes firmly attached. Bronze powders are prepared of many different shades. In Messrs Brandeis's process the alloy used (generally copper-zinc) is laminated into very fine leaves, which are then ground. The powder is washed out and dried, and by revolving in a box, which contains some mineral varnish, the particles receive a coating of the varnish. Bronze powders are also prepared from leaf gold ground with honey on a stone, mosaic gold ground with bone ashes, compounds of tungsten and soda, and in other ways.

As regards cleansing of bronze statues that have become coated with dirt in large towns, it has been found that a dilute solution of caustic alkalies removes the overlying dirt and allows the green patina to become visible. Where the metal was not originally oxidized, the alkali simply cleanses it, and does not promote any formation of green rust. An occasional rubbing with oil (all excess being carefully removed) is also found to preserve a fine bronze surface. The shining brown colour of gun barrels or other arms, is sometimes imparted by first producing a very thin uniform film of oxide or rust on the iron, *e.g.*, with vapour of muriatic acid, and giving a gloss to the surface by rubbing wax over it, or coating it with a shellac varnish. But the most common material for bronzing is the butter or chloride of antimony, sometimes called *bronzing-salt*. It is mixed with olive oil and rubbed on the iron, which is slightly heated. A little aquafortis is then rubbed on to quicken the operation; the barrel is then cleaned, washed with water, dried and polished, either with a steel burnisher, or by rubbing with white wax, or is varnished with a very weak solution of shellac and spirit of wine. (See *Ure's Dictionary of Arts, &c.*)

Greek and Roman Bronze.

The bronze (Greek, χαλκός; Latin, *æs*) of classical antiquity consisted chiefly of copper, with an alloy of one or more of the following metals, zinc, tin, lead, and silver, the quantity and the character of the alloy changing as times changed, or as was required for different purposes. Among existing bronze remains the copper is found to vary from 67 to 95 per cent. At present the only valuable results which we possess are derived from the analysis of coins (Von Bibra, *Die Bronzen und Kupferlegirungen der alten und ältesten Völker*, Erlangen, 1869), from which it appears that for their bronze coins the Greeks adhered to an alloy of copper and tin till 400 B.C., after which time they used also lead with increasing frequency. Silver is rare in their bronze coins. The Romans also used lead as an alloy in their bronze coins, but gradually reduced the