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000; 1780, 26,000,000; 1792, 24,800,000; 1816, 25,600,000; 1846, 26,900,000. To these figures about two millions should be added for the *samurai*, nobles, Ainos, *eta*, and *hi-nin* (not human) not reckoned in the census as "the people." Prof. Droppers gave vivid accounts from eye-witnesses of several of the very severe famines in old times, when dogs and rats were eaten and human flesh became human food. The writer of this note has heard similar testimony, and vividly remembers the long, wide, and high heaps near the cremation-houses containing the ashes of the thousands of victims of famine. The corpses were quickly cremated to prevent pestilence. Fear, anxiety, and insufficient nourishment also attended upon the steps of famine to swell the list of the deaths. Under these circumstances, the temper of the Japanese people became that of submission to the inevitable. Shortsightedness in commercial matters, an eye to immediate rather than remote gain, and excessive timidity and conservatism, are charged to the Japanese by foreigners. It is manifest, however, that the spirit of the Japanese is now becoming more resolute, and that happiness as well as courage in every-day affairs is on the increase on a national scale. It is a fascinating question, but one not to be discussed here, whether Buddhism, which has so long dominated the Japanese popular mind, can hold its own under the changed conditions.

ALCHEMY AND CHEMISTRY.

The Alchemical Essence and the Chemical Element: An Episode in the Quest of the Unchanging. By M. M. Pattison Muir. Longmans. 1894.

Law and Theory in Chemistry: A Companion Book for Students. By Douglas Carnegie, sometime Scholar and Demonstrator in Chemistry of Gonville and Caius College, Cambridge. Longmans. 1894.

Two very eminent chemists have devoted a considerable part of their lives to the elucidation of alchemy, Kopp and Berthelot. Their genius and skill as chemists do not at all come into play in this undertaking, although, of course, some proficiency in chemistry is requisite even to read alchemical treatises, not to speak of appreciating them. Kopp's is a solid compendium of two octavo volumes, mostly of fine print, which gives the titles of an enormous number of writings, and a good deal of general information, but really little about the inside of alchemical treatises. It dwells particularly on the alchemy that just preceded modern chemistry. It was published in 1886. Berthelot's labors, mostly more recent, are of a totally different and higher kind, consisting in the transcription, translation, and elucidation of a number of Greek papyri about as old as the Christian era, together with a few mediæval manuscripts which throw some light on the papyri. He has thus completely opened up to us the Egyptian alchemy, while leaving that of western Europe untouched. We have, besides, a work which is one of the greatest psychological curiosities of literature. Its date is 1869. It is considerably longer than Green's 'Short History of the English People.' Its peculiarity is that its author, Dr. Gottlieb Latz, professes himself to be a believer in the doctrine. There would be nothing surprising about that were it not that the tone is decidedly critical and even sceptical. He drops such expressions as, "Alchemy is not an inquiry but a speculation." What he calls "the gold-making swindle," and by other contemptuous designations, is suggested as the explanation of every boast of the adept. He sees in alchemy a general mystical doctrine with applications to man, to plants, to metals. It has had, he tells us, various forms, but all are interpretations of the Smaragdine Table. This is certainly in part true, and Latz makes the mediæval alchemists more intelligible to us than anybody else has done, even if we do not believe the Smaragdine Table has played the part he attributes to it. But it is astounding to find a medical man, able to throw light on a difficult problem, who yet attributes wonderful powers to seven "arcana," which are, (1) sulphuric acid, (2) iron, (3) carbonate of soda, (4) Chili saltpetre, (5) solution of sulphide of ammonium, (6) *Pulver solaris ruber, i. e.*, a mixture of red oxide of mercury with pentasulphide of antimony, (7) *Pulver solaris niger, i. e.*, a mixture of red oxide of mercury with tersulphide of antimony. We mention the work because it is not very well known.

But all three books hardly afford us a living mental portraiture of the mediæval alchemist. Of the externals of the man we have several contemporary pictures; of modern psychological studies perhaps those of Dumas and Balzac are not quite worthless; but as to the state of the mediæval alchemist's intellect we have had no popular delineation before this sketch by Mr. Pattison Muir, and this is very true to nature. But more we cannot say for his work.

Mr. Carnegie's is a little volume of two hundred and odd pages of small octavo about the history and philosophy of chemistry, from the alchemists to this day. It is not intended for beginners, but to "recapitulate and coördinate the more important principles of the science, before proceeding to more detailed and advanced works." Certainly so small a volume must be inadequate to the needs of adult and serious students; but there are a good many practical chemists who are too negligent of the marvellous progress that chemical dynamics has made of late years, and of its growing practical importance, and this volume will serve to show them that they must lose no time in studying Ostwald's 'Allgemeines Lehrbuch,' from which a large part of Mr. Carnegie's volume has been abridged, and which, by the way, ought to be translated entire. Moreover, there are others, bright students, even boys, and a few general readers, to whom, if they know how to read a book they cannot entirely comprehend, this volume may lift a veil, and display, if only confusedly to those not well acquainted with chemistry, what a vast field is being worked and with what success.

Alchemy is treated by Mr. Carnegie in the slight, we had almost said the facetious, vein which is inevitable when history is made subservient to doctrine. Indeed, the whole first chapter, which carries us to phlogiston, is of small accuracy. Thus, having finished with the alchemists, the first sentence following is: "With the Benedictine monk, Basil Valentine, begins the period of iatrochemistry, . . . during which transmutation was in abeyance." It is true that the author of the 'Triumph-Wagen' calls himself "Basilius Valentinus, ein Bruder des geschwornen Ordens S. Benedicti." But this cannot be true, because the Emperor Maximilian instituted inquiries in 1515 to find out who Basil Valentine was, and completely failed. Now the general catalogue of the order, kept at Rome, was open to him, and therefore it is impossible there ever should have been a Benedictine of that name. The author of the books was in all probability living in 1515. Dr. Latz will not admit that any of the other writings which pass under the name of Basil Valentine are by the author of the 'Triumph-Wagen,' because they do not accord with the cryptic interpretation which he traces out for this; but to ordinary men they seem wonderfully like that in style, and certainly in strong contrast with earlier alchemical works, so that they must at any rate be classed with the works of the "spagiros," as they call themselves.* Now these writings have much to do with transmutation. Mr. Carnegie's next sentence states that "heretofore the apothecaries had prescribed purely vegetable preparations only, but now we find mineral specifics contesting the field with them and partially replacing them." This is a mistake. To give no other refutation of it, Avicenna had been translated by Gherardus Cremonensis in the twelfth century, and that translation still in use, with all the corrections noted, gives as medicaments antimonium, ammoniacum, alaunoc et alahabar (*i. e.*, graphite, or possibly MoS_2), asius, alæ, argentum vivum, atrimentum, arsenicum, azul, ambra, aranea, argentum, alumen, adeps, acetum, aurum, etc.

Van Helmont is passed by with bare mention in a footnote, albeit he did much toward causing gases to be conceived as corporeal substances, and invoked the balance to decide a chemical question, a stupendous idea had he only not unfortunately overlooked the possibility that substance concreted from gases might weigh something. Coming down to Robert Boyle, Mr. Carnegie speaks of his style as "language which knows nothing of the mystic and rococo style of alchemistical literature." Now it is true that alchemists are all mystics, and that the iatrochemists are often bombastic; but to say that the style of the mediæval alchemists is rococo, or florid, is exactly like making the same accusation against the Cook's Own Book. Their writings are as dry as possible. Everybody knows what Boyle's style is, because Swift's 'Meditation on a Broomstick' imitates it to perfection, except in one particular, his quite inimitable long-windedness.

The second chapter is devoted to the Phlogistic Period. In the third, the historical arrangement is abandoned, and the treatment of mixtures is considered in a manner which fails to leave a very definite impression on the reader's mind. In the fourth, on the Atomic Theory, there is a return to the first method, and a most interesting, though not quite full, narrative is given of the various waves of opinion which swept over the chemical world from Dalton to Williamson. Mr. Carnegie says it seems as if Berzelius were *lucky* about his atomic weights. *Luck* is a self-contradictory idea; but there is perhaps a sagacity whose reasoning is too subtle and nice for its possessor ever to give a satisfactory account of it. Dalton and others seem to have been possessed by such inspiration-like insight when they accepted the Atomic Theory. It is now eighty-six years since men to be listened to have been very clearly and very pertinently asking those who hold that the facts of chemistry support the atomic theory, why it is that 1,234,567 atoms of hydrogen might not form a saturated compound with 617,283 atoms of oxygen, unless by virtue of a special law which would give rise to simple compounds though there were no atoms? And this question, incessantly asked, has never been answered. By this time facts non-chemical have caused almost all physicists to believe in atoms. But it would aid the chemical philosophy, and perhaps throw much light on it, if the secret reasons which led chemists to accept the theory before the physical proofs were known could be ascertained. This chapter ends with a discussion of molecules which is hardly in continuity with the first part, but is worthy of attention by itself.

The remainder of the volume sketches rather too slightly the most modern theories by which chemists are laying siege to their great problem. That problem is this: The periodic law makes all the properties of the elements to be dependent upon their atomic weights alone. It is required, then, to produce an hypothesis from which may be deduced from the atomic weights all the physical and chemical properties with mathematical strictness. It is also requisite that this hypothesis should explain why the atomic weights are precisely what they are—that of oxygen, for instance, 15.94 instead of 16, etc. A few years ago the idea of setting up such an aim, even as a remote one, would have seemed chimerical, and it may seem so to-day to many chemists; but in a few years more it will be in full sight of all as the Alp which our army has to mount.

One question which it is very desirable to settle as early as possible is, whether the forces existing between atoms are polar or not. At first blush, it seems as if they must be so, because of the fact of saturation. But Van't Hoff suggests that the surfaces of atoms are level surfaces, with points of maximum attraction. In that case, saturation consists in having all the places where atoms would be strongly attracted occupied. This theory seems to involve the conception that an atom has a surface and a size. Yet the Boscovitchian idea may be true just the same, for that theory virtually gives to the atom a surface, namely, the surface of the space within which the central force is repulsive, while outside of that it is attractive. Prof. Mayer made some years ago a very beautiful experiment by which little objects floating on water were made to repel one another if very near together, but attract (or rather, all were attracted towards a common centre, which is the same in effect) when at greater distances. The result was that they arranged themselves in regular clusters strongly suggestive of chemical molecules. If we add the hypothesis of their being in constant motion without resistance, we seem to have all the elements requisite for a foundation for chemical dynamics without polarity in the forces. Prout's law would also be accounted for in this way; for if two Boscovitchian atoms have attractions which increase inversely as a high power of the distance with no repulsion for smaller distances, one may easily encounter another in such a way as to move in narrowing spirals around it for ever; and nothing would be likely ever to separate them. The inexactitude of Prout's law is a fact calling for a distinct hypothesis.

The manner in which Mr. Carnegie has set forth the tridimensional graphs of Wislicenus, Le Bel, Van't Hoff, and Guye, and Horstmann's application of thermodynamics to chemical processes, is extremely clear, and calculated to set the student to work to learn more of these matters. The author is thoroughly versed in all the modern ideas, thinks with rare clearness, and writes with peculiar simplicity, grace, and charm.

*The 'Century Dictionary' attributes the word "Spagiric" to Paracelsus; but it is certainly older.

NEWTON'S RUN THROUGH RUSSIA.

A Run through Russia: The Story of a Visit to Count Tolstoi. By W. W. Newton. Hartford: The Student Publishing Company.

After all the books, articles, and reviews, all more or less competent, which have been written about Count L. N. Tolstoi, admiration must needs be of the most enthusiastic character to induce a man to write a volume of more than fifty thousand words on the subject, when his personal knowledge of it is limited to half-a-dozen hours' intercourse, at the most, with the famous author. The actual conversation is contained in the brief space of four short pages, and imparts no information which the world has not already received direct from Count Tolstoi in his own books. This is not Mr. Newton's fault; his will to ask questions was of the best. But the Count is not communicative to entire strangers, and he has had nothing really new to say for a long time past in his books, which are of much later date than those here reported in the spring of 1889, all being, substantially, only extreme statements of opinions long ago shadowed forth or announced in less detail.

We speak advisedly of this book as consisting of a certain number of words. It certainly was a singular idea to make such a compilation from Count Tolstoi's own works, from the books and magazine articles of other writers, from stray newspaper reviews and paragraphs (all duly credited, we are glad to see), under the title, "The Story of a Visit to Count Tolstoi," since all these quotations, with the possible exception of the newspaper articles, have long been familiar to the public. The writer's laudations of Count Tolstoi as a philosophical and theological thinker, and the grounds stated for his enthusiasm over the great Russian author, seem singular on the part of an Episcopal clergyman, who, presumably, has been trained to logical thinking in those lines. On p. 87 he ranks John the Baptist, Buddha, Tolstoi, George Fox, William Penn, and Christ as equal gods, and on p. 119 he says of Tolstoi's discourses called 'The Spirit of Christ's Teachings,' that they "reveal a depth of spiritual insight and an originality of exegesis in the study of the Bible which remind us of the fearless common sense of John Bunyan in his 'Pilgrim's Progress,' or Sir Thomas Browne in his 'Religio Medici,' and prepare for that original interpretation of the Scriptures which marks the pages of his later theological work, 'My Religion.'" Not many of Mr. Newton's brethren in the Episcopal Church are likely to agree with him here, nor are many laymen likely to be converted. The plain truth of the matter is, that Count Tolstoi is a great genius for novel-writing, in his earlier style, but that he has neither a philosophical nor a theological mind; nor has he the training which might have rendered his deficiencies less apparent.

Mr. Newton must be credited with one very startling novelty, namely, his description of Count Tolstoi as "a diminutive, sensitive-looking man"! In general, it must be said of his powers of observation, that they are far from acute or accurate. As his entire stay in the country, including the railway journeys of entrance and exit, was limited, apparently, to ten days, it could hardly be expected from him that he should be infallible on fundamental questions of politics and religion; but we might look for correct reports of ordinary occurrences which fell under his eye. It is worth while to call attention to a few of his errors, because, while he records his observations with great positiveness, they by no means always agree among themselves.

We ought not to expect correct transliteration of Russian words, so we may pass over that point, merely remarking that a three-horse sledge is a troika, but not a tritska nor a troitska; that *Gospodi pomilou* (Lord, have mercy!) is the proper form of the refrain in the Liturgy, not "Gospidi pomilon." But surely the author and the three men to whom he acknowledges indebtedness in the preface should have been able, by their combined efforts and a little consultation of the guide-books and other works quoted, to avoid such errors as "Quarenghi" for Guarenghi, "Arvazovsky" for Aivazovsky, "St. John Nevski" for St. Alexander Nevski; the assertions that the river Neva flows from the non-existent "Lake Olga" instead of Lake Ladoga; that the Czars are always crowned, and that all the Romanoff princes have been buried, in the Cathedral of the Annunciation, Moscow; and that Ivan the Terrible's tomb is built as an annex just outside the church. The Czars are all crowned in the Cathedral of the Assumption; in the olden times they were baptized and married in the Cathedral of the Annunciation; down to the time of Peter the Great they were buried in the Cathedral of St. Michael Archangel, since which they have all been buried in St. Petersburg, though the author overlooks it in his description of the Fortress of Sts. Peter and Paul. Ivan the Terrible's tomb stands in a chapel near the altar of St. Michael's, and it is the tomb of Vasily Shuisky which stands in a separate chapel, adjoining the cathedral, because he was a usurper.

The author quotes Murray to the effect that the word Kremlin cannot be traced to any certain source; whereas the Russian form *kreml* is well known to be a Tatar word meaning fortress. He saw peasants gathering pussy-willows along the riverside, "with which they would then proceed to the different shrines and icons within the Kremlin walls, there to dedicate them to their favorite saint and patron." Had he inquired, he would have discovered that these willow branches were for use on Palm Sunday, in the character of palms, as the only green thing to be had at that season, and that they are never put up over the images in church; that custom being restricted to the holy pictures in private dwellings.

On page 24 Mr. Newton says: "We regret to state that the custom in vogue whereby the drozhky driver was to consider himself rejected was the familiar American method of spitting on the rejected candidate." We should like to inquire where, in America, this "familiar method" is in use, and to remark that it certainly is not in vogue in St. Petersburg. It would have required a good deal of saliva to spit on each one of the army of candidates for custom which he describes. What happened was, simply, that, seeing the party emerge from an expensive hotel, the cabman asked an exorbitant price, as is generally the case in Russia, and their guide went through the form, common among the Russian lower classes, of spitting aside, not on them, to signify his scorn of their extortionate demands. That guide evidently understood what was expected of him, and earned his wages with extravagant stories which a little inquiry would have disproved. He trusted to the party's innocence and lack of acquaintance to believe in him, and they justified his opinion of them. For example, the author and a friend had been calling at the Winter Palace, where they shared in the afternoon tea of a court lady's weekly reception, evidently mistaking it for a "lunch" given for them, since it is so stated, where the hostess was working on an altar