### Analysis of Feldspar.

On comparing the results of the analysis of feldspar by Vauquelin and Chenevix, both of them chemists of acknowledged ability and scrupulous accuracy, it is impossible not to be struck with surprise at the remarkable difference that appears between them. That potash should appear in one analysis and not in the other is no extraordinary circumstance, because without a particular examination for this very object the potash would remain undetected and its amount would be transferred to the general account of loss; the loss, therefore, in Mr. Chenevix's analysis ought to be equal both to the loss and potash in Vauquelin's; but the amount set down as loss in both cases is nearly equal, therefore the difference between the earthy and metallic products of the two analyses amounts to 13 per cent, being the proportion of potash as ascertained by Vauquelin. In order to obtain some clew to account for the difference, the methods of analysis pursued by these chemists have been compared and examined, but without obtaining much satisfaction.

Mr. Chenevix, after finely pulverizing his feldspar, treated it with caustic potash in a silver crucible, and the whole was then brought to a limpid solution by muriatic acid. 1. The liquor was evaporated to dryness, and the saline residue digested in a slight excess of muriatic acid; a white powder remained insoluble, which was silex. 2. The muriatic liquor with the washings of the silex was then mixed with ammonia, and a copious precipitate was obtained. 3. This precipitate was then dissolved in muriatic acid, and afterward boiled with an excess of potash, by which the iron was deposited; and the addition of muriate of ammonia then threw down the alumina. 4. The ammoniacal liquor No. 2 was treated with carbonate of potash, by which carbonate of lime was procured. This method of analysis appears quite unexceptionable as far as the earthy and metallic contents are concerned, and, if carefully performed, there appears no reason why its results should not be considered as giving the true proportions and quantities of the earths and oxides of iron contained in feldspar, proper allowance being first made for the inevitable errors to which the most accurate analysis is necessarily subject.

The method employed by Vauquelin was the following: Having fused the feldspar with caustic potash, he dissolved the mass in dilute muriatic acid, and evaporated the whole to dryness. 1. The saline residue being drenched with water and filtered, the silex remained behind as a white insoluble powder. 2. The clear liquor being treated with ammonia, produced a copious white precipitate. 3. This precipitate was digested in caustic potash and left behind the iron; muriatic acid was then added to saturation, and afterward carbonate of potash threw down the alumina. 4. The liquor No. 2 gave no precipitate with carbonated potash or sulphuric acid, but oxalic acid occasioned a precipitate of oxalate of lime, which, when calcined, was considered as carbonate of lime, whence the amount of lime was estimated according to the usual proportions. The only exceptionable part of this analysis relates to the method of procuring the lime, and this on two accounts. In the first place, oxalic acid would not separate the whole of the lime from the liquor, which consisted of the muriates of lime, potash, and ammonia; and in the second place, the oxalate of lime which was precipitated ought by no means, after having undergone calcination, to be considered as carbonate of lime, but as lime in a semi-caustic state. It is further a singular circumstance, and contrary to general experience, that carbonate of potash should have been unable to throw down the lime from the solution which was decomposable by oxalic acid. But even if we allow the utmost possible weight to these objections, and in consequence raise the amount of lime in Vauquelin's analysis to an equality with that of Chenevix's, there still remains a difference of 11 per cent unaccounted for. That potash is really contained in the Siberian feldspar appears also from a subsequent analysis by Vauquelin, in which he used caustic soda as the primary solvent, and afterward obtained crystals of alum by the addition of sulphuric acid. It is, however, worthy of notice that the account of Vauquelin's experiments is not written by this eminent chemist himself, but is contained in a paper read at the *Societe Philomathique* by Le Lievre, and in consequence is not in the most authentic form.

With regard to the opposite analyses of adularia by the above mentioned chemists, it is difficult to form any satisfactory opinion, as the details of Vauquelin's analysis are not published. It may, however, be remarked that in the amount of silex they actually correspond, and that the proportion of alumina as determined by Vauquelin approaches much nearer to the statement of Chenevix than in the former instance. The chief difference is the proportion of lime, but if, as is probable, the same method was used by Vauquelin on this occasion as was practiced by him on the former one it may be suspected that Chenevix's estimate approached nearer to the truth. The water of crystallization, amounting to 1·75 according to Chenevix, is wholly neglected by Vauquelin; and it is obvious that the proportion of potash as given by this chemist is from mere estimation, and is reckoned at 14, because just so much was wanted to complete the original 100 parts that he operated on. The iron obtained by Chenevix is perhaps only a casual ingredient of adularia, so that making the requisite allowances for each analysis, the quantity of potash can hardly be estimated at more than 6 per cent. It is greatly to be regretted that Klaproth or Hatchett did not undertake anew the full analysis of this important mineral in all its varieties and subspecies.

Some further interesting particulars respecting feldspar are contained in a memoir by M. Gerhard. Common feldspar when heated to incandescence loses 1 per cent (probably water). After being calcined it is readily acted on by sulphuric acid, and the product is a little selenite and much alum, the silex remaining unaltered by the acid. From an analysis conducted in this manner M. Gerhard states the constituent parts of feldspar at, silex 64, lime 6, alumina 30, total 100.

Here it is worthy of remark that the presence of potash in this mineral is fully ascertained by the copious production of alum when it is treated after calcination with sulphuric acid, and this is the less liable to suspicion as the memoir was published long before the necessity of potash to the crystallization of alum was suspected. Consequently we find in M. Gerhard's analysis no mention of potash, and perhaps it is somewhat in favor of the reduction which we have made in the proportion of alkali as given by Vauquelin, that this reduced proportion, namely, 6 per cent, added to the quantity of alumina found in common feldspar by Chenevix, namely, 24 per cent, exactly corresponds with the amount of alumina as stated by Gerhard. In the proportion of silex he also agrees precisely with Chenevix, and in the quantity of lime differs only in the ratio of 6·25 to 6.

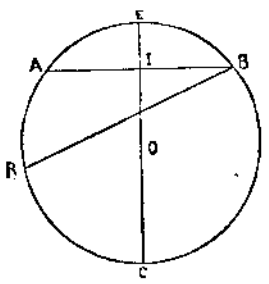
Common feldspar inclosed in a crucible and exposed to a full melting heat, is converted to a milk white semi-transparent mass resembling quartz. The addition of silex diminishes its fusibility and renders the mass more opaque. Four parts of feldspar and one of chalk form a clear, transparent glass of a slight yellowish green color; but a much more beautiful glass may be obtained by calcining separately one part of sand, four of feldspar, and two of chalk, and then fusing them together; this glass is however harder and more difficult to anneal than common glass, and the metallic oxides only communicate to it dull, muddy tinges of red and brown, except cobalt, which gives it a purer blue than common glass is capable of acquiring.—*Glassware Reporter.*

### FROM PARIS TO RIO JANEIRO IN 42 MINUTES AND 11 SECONDS.

Mr. E. Colligan, in a paper read before the French Association for the Advancement of Science, discusses the possibility, were the thing practicable, of reaching any point whatever of the earth's surface in 42 minutes and 11 seconds. This would be effected by means of a perfectly straight tunnel connecting the two termini of the line.

Supposing such a tunnel to have been excavated, "lay the rails," says the author, "do away with the locomotive, lubricate the journals, and let go. That is all! Whatever be the points of the globe that you join in this way by a tunnel, you will go from one end of the line to the other in 42 minutes and 11 seconds.

"Should such a tunnel traverse the sphere from one side to the other, in passing through its center, things would occur just the same.




"Excavate such a tunnel to as great a length as it would be possible to make it in a straight line; throw yourself with confidence into this tube, and you will arrive, without shock, and with the slowness with which you departed, at the south of New Zealand, if the mouth were at Paris, and always in 42 minutes and 11 seconds.

"It would be well to throw yourself in head foremost, so as not to reach the terminal station feet upward. It would be well, too, to have a friend there to hold you. . . .

"These facts, which are absolutely true, are based upon theories analogous to those that rule the oscillations of the pendulum. We know, in fact, that if a mass attracted to the extremity of a thread is oscillating in space, the duration of such oscillations will be the same, whatever be their extent, if the arcs do not exceed a few degrees.

"Clockmakers have reaped great advantage from this principle, and it is due to it that a clock remains none the less well regulated although the pendulum in motion varies from double to simple.

"Were it possible to attach a pendulum at such a height that an arc described between Paris and Versailles, or Paris and Saint Cloud, did not perceptibly differ from a cycloid in form, these two distances would be traversed in the same time, and, an impulse once given, it would only be necessary to keep up this immense tic-tac in its extent.

"But let us draw a figure like the one annexed, where the circle, A B C, represents the circumference of the earth; B, Paris; A, Rio Janeiro; and A B, a tunnel joining them.

"If a train be left to itself at B, it will descend slowly toward I, but will soon acquire a velocity that will reach its maximum at the latter point. This velocity, of which the sum of 42 minutes will give some idea, changes gradually and returns to zero when the train touches the extremity of the tunnel at A.

"The only question now is that of locking the wheels on arrival, in order to prevent the whole from making a second descent before landing the passengers. If the train were left to itself without such a precaution, it would go on indefinitely from A to B, and from B to A, and always in 42 minutes and 11 seconds.

"From B to R, as well as from E to C, things would occur just the same."

But the reader may raise objections. There are many, it is true, and one especially that outweighs all others, and that is, that if such a supposed tunnel were excavated, the traveler once under way would have to undergo pressures whose immensity may be seen from the following figures:

"Thus, supposing that the point, I, were situated at the fifth part of the terrestrial radius, E O, the pressure there would be 34,547 atmospheres multiplied by 10 raised to the 58th power. It would take 63 figures to represent such a quantity.

"Were E I one and I O four, we should have, for pressure at I, 168,600 atmospheres multiplied by 10 raised to the 71st power—an amount composed of 78 figures. Were I at the center of the earth's radius, the pressure would be 194,240 atmospheres multiplied by 10 raised to the 175th power (132 figures); and, finally, at the center of the earth, the pressure would become 320,000 multiplied by 10 raised to the 169th power, or 175 figures. This is formidable!

"If we reduced the question to a pressure of three atmospheres, the greatest that man can support, we should scarcely be able to go further than from Marseilles to Calais by such a method, making, be it understood, no account of the resistance of the air, which, moreover, would prove an obstacle to a realization of such a project.

"But why excavate a tunnel? asks an enthusiast. Tangent to the surface of the globe let a bridge be built, whose termini shall be at the same altitude, and we shall no longer have to support so enormous pressures. It would take longer to make the trip, that is all. We might go thus from the Canigou to the Yungfrau, which are at the same altitude.

"Such an improvement, we answer, might cause a rise in the stock, but it would also raise the traveler to disagreeable altitudes, and the stations would not be within reach of everybody."—*La Nature.*

### Mutuality Between Employer and Employe.

An article recently published editorially in the New York *Times* suggests one of the ready, or at least feasible, means of uniting the workman and his employer, and suggests also the fact that the more and the closer these ties, the less need there will be of autocratic trades unions and similar defensive combinations. The article refers to an association among the employes of the Baltimore and Ohio Railroad Company, which is "a mutual insurance association, to whose fund the company itself made a substantial contribution, and which is kept up by a monthly payment by each member proportioned to the salary or wages he is receiving. The benefit to be received holds a corresponding proportion to the payments. Out of this fund each member receives a stipulated sum per day during any sickness or disability while in the service of the company, and in case of death his family receives a substantial benefit. It is an absolutely safe form of mutual insurance against sickness, injury, or death, and one in which there is no expense for management. To this plan the Baltimore and Ohio Company has added the feature of a savings fund, on which 4 per cent interest is paid to depositors, and from which they may borrow for building purposes at 6 per cent."

Except the savings fund department, the Pratt & Whitney Company, of Hartford, Conn., has had in operation, for ten years, a similar mutual benefit association, and the officers and board of directors are chosen both from the "office" and the "shop." Mr. F. A. Pratt, the President of the Pratt & Whitney Company, says, in relation to the *Times* article: "I think the savings fund feature a good one. I would also add a reading room and library, in which the men could assemble evenings, read, talk, and hear a lecture occasionally. My ambition is to have all this, and we have drawings of an office building, that may be built before a great while, that will embrace such improvements. I believe that in our class of work it will not only be a help to us, but has almost become an absolute necessity."

### Subaqueous Troubles in Lake Michigan.

In Grand Traverse Bay recently, at some distance out in deep water, between Traverse City and Marion Island, the water began to boil and surge, and presently rose in vast jets to the height of from 10 to 20 feet. Being observed from the shore no details could be given on account of the distance; but the same thing has taken place years before, and some two years ago, according to an account given by the *Herald* at that time, parties in a boat were so nearly on the spot that they were obliged to hasten out of the way. They described the water as apparently boiling up from the very bottom of the bay, which in that place was nearly or quite one hundred feet deep, bringing up with it vast quantities of mud and other substances and emitting an intensely unpleasant sulphurous smell. The area of the eruption, if it may be so called, was about twenty feet in diameter and the time about half an hour. At intervals the water would subside into calmness and then the commotion would begin again. It is said by old settlers that the same thing has occurred in other years.—*Grand Traverse Herald.*