right angles to the axis of the lens, and are expressed as fractions of the focal length.

The abscissæ are the inclinations (in degrees) of the pencils to the axis.

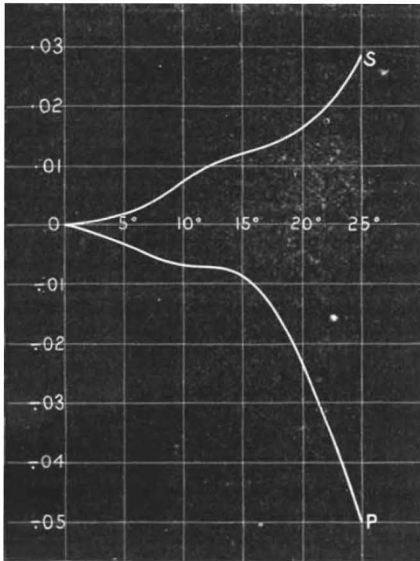Suppose, now, that the plate is placed at a distance e behind

FIG. 8.—Rapid Rectilinear.

the principal focus, e being half the distance between the foci for direct pencils of the nearest and distant objects.

The worst defined point in the centre of the picture will then be represented as having a width $\frac{A}{F} e$ nearly, while at the obliquity θ this width becomes $\frac{A}{F} \frac{e \pm y}{\cos \theta}$ nearly, according to whether the
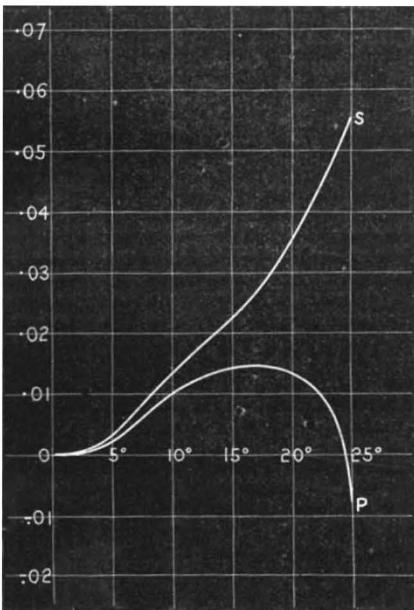

FIG. 9.—Triplet.

image under consideration is that of the most distant or the nearest point.

Hence, unless y is small compared with e, the definition for rays of obliquity θ will be sensibly worse than in the centre of the plate, and a reference to the curves for y_p and y_s shows at a glance that this must be the case even at 10° for all the lenses

unless the general standard of the definition is lowered by a large value of e.

As an example of the use of the curves, let us take the rapid rectilinear No. 6, and compare the definition at 20° obliquity with that at the centre, supposing that the nearest object is at a distance of 25F.

This gives $e = \cdot 02$F nearly, and at 20° $y_p = - \cdot 023$F, $y_s = + \cdot 016$ F, hence we have as follows :—

| | At 20° from axis | | |
	due to primary focus.	due to secondary focus.	At centre.
Width of image of nearest point... $\dfrac{A}{F \cos \theta} \times$ ...	$\cdot 043$	$\cdot 004$	$\cdot 02$
Distant do.	$\cdot 003$	$\cdot 036$	$\cdot 02$

This shows that while the nearest points at this obliquity are represented by long ovals placed as if radiating from the axis, the most distant points become similar but rather smaller ovals with their long axes at right angles to the former, and that the length of the ovals is about twice the diameter of the image formed by the direct pencils.

In the same way the definition, as far as it depends on astigmatism and curvature of field, at any obliquity may be found for any lens for which y_p and y_s are known.

Lauriston Hall, September 9. 　　　A. MALLOCK.

(*To be continued.*)

THE KOH-I-NUR—A CRITICISM.

THE true history of the Koh-i-Nur diamond, if it could be written, would be a singularly interesting one. But the historian would have a difficult task. The pages that I purpose writing will be devoted to the criticism, possibly the refuting, of some fallacies that hang round the subject ; but they will not deal with some other historical difficulties that I have not space even to indicate, but which do not belong to those portions of the history for criticism on which the following pages are designed.

The period in the history of the Koh-i-Nur that has attracted the notice of all modern writers on the diamond, and to a degree, I think, somewhat beyond its importance, is the five or ten minutes during which the French diamond-dealer, Tavernier, held in his hand the most important of the Crown jewels of the Emperor Aurungzebe. It was a great diamond, and the record Tavernier has handed down in his " Voyages," of its weight, its form, and its history, will have to be critically dealt with.

It may be at once stated that the disputable point regarding this diamond is whether it was a certain ancient diamond of fame in India, or one much larger than this ancient stone, that had been found not very long before Tavernier was present at the Court of Aurungzebe. For the larger stone I shall retain the name of " the Great Mogul " ; for the older and more famous one the title of the Koh-i-Nur. Some hold that Tavernier saw and handled the Koh-i-Nur ; others that his own story is correct, and that it was the Great Mogul that he described. And I should add that some, in addition to this latter view, believe the Great Mogul ought to be called the Koh-i-Nur.

In order to clear the ground, I may say that while attaching no very great importance to the question as to which of the two first views is the correct one—and I must add also, valuing at a somewhat low estimate the historical or technical accuracy of Tavernier's statements on this and many other matters—I, some thirty-five years ago, came to the conclusion that the diamond Tavernier saw was probably the Koh-i-Nur, and that he muddled its history with the other and larger diamond that I showed to have been probably at the time in the keeping of Shah Jahan, the captive father of Aurungzebe. The merits of the question will be discussed in their proper place ; but while holding myself open to conviction if any new arguments can be brought forward against my view, I may state that none yet announced have shaken that opinion.

Until the fifteenth century there appears to have been one and only one very large diamond known in India or in the world. I might have said until the sixteenth century but that there is a record of two and an unauthenticated rumour of a third during that century, the largest of which, however, was

very likely the Koh-i-Nur. But that one large diamond of the earlier time had been a famous stone for centuries. Legends had gathered round it, and tradition had linked the legends with authentic history in the dawn of the fourteenth century. The tale was told briefly by Prof. H. H. Wilson in the sketch of the Koh-i-Nur which he contributed to the official catalogue of the Exhibition of 1851. No more competent person could have performed the task than the great Orientalist and Sanscrit scholar, with his large experience of Hindoo customs and modes of thought. And he wrote the notice with the statements before him that had been collected in the bazaars of India by order of the Company at the time when the Koh-i-Nur became a Crown jewel of the Queen.

The latest historian of the Koh-i-Nur, however, dismisses this curious tradition and its distinguished narrator by the somewhat flippant remark that "it has afforded sundry imaginative writers a subject for highly characteristic paragraphs."

The gentleman who writes in this tone of the eminent custodian of the East India Company's Library cannot be expected to treat Mr. King or any other man of learning less contemptuously; but his qualifications for dealing with the subject at all from a wider point of view than that of the old French diamond-dealer will, perhaps, be fairly called in question by the readers of the following pages.

Yet Dr. Ball, of the Science and Art Department in Dublin, has had Indian experience on the Geological Survey, an office that ranks deservedly high even among the great departments of the Indian public service. He has, furthermore, recently thought the Indian part of Tavernier's "Voyages" worthy of a fresh translation, which he has effected with judgment and with notes, the topographic part of which, at least, appears to be of considerable value and interest; and he has otherwise been an author on subjects that came before him in India as a geologist and a sojourner.

It is probably a sort of loyalty to the author whom he has deemed worthy of so much of his time and industry that blinds him in his advocacy of Tavernier's statements, notwithstanding their manifold inconsistencies and absence of scholarlike quality. I hope, while criticizing his hypotheses and statements regarding the Koh-i-Nur, I may not in any respect quit a judicial attitude to appear in that of a partisan.

The great diamond to which allusion has been made emerges in history in the first years of the fourteenth century. It was in 1300 A.D. in the hands of the Rajahs of Malwa, an ancient Ráj that had at one time spread over Hindostan, and in all the vicissitudes of a thousand years had never bent to a Muhammadan conqueror, until the generals of the Delhi Emperor Alá-ud-dín Muhammad Shah overran its rich territory, and carried away the accumulated treasure of Ujjein in the first decad of the fourteenth century.

The date of 1304 is that given by Ferishtá for this conquest, and then it was that the great diamond takes its place in history. In 1526 the invasion of India by Babar was crowned by his victory on the famous battle-field of Panaput. Babar himself—in those memoirs that rank only after the "Commentaries" of Cæsar as the most interesting records penned by a great conqueror—describes the reception by his son Humayún of the great diamond among the treasures which he was sent forward to secure at the strong fortress at Agra. Babar gives the weight of the diamond as being computed at 8 mishkals, and in another place he compares the Muhammadan weights with those of the Hindoo system, putting the mishkal as equivalent to 40 of the little Hindoo units of weight, the rati. The diamond, then, weighed near about 320 of these ratis. There are several lines of investigation for determining the weight of the mishkal; and without here entering on a long but interesting discussion of this weight, it will suffice to say that the most important of them converge on a value of from 73 to 74 troy grains. If the mishkal weighed 73·636 troy grains, 8 such mishkals would be 589·088 grains. The weight of the Koh-i-Nur diamond in the Exhibition of 1851 was 589·52 troy grains. It may be added that this latter weight is equivalent to $186\frac{1}{15}$ English carats of 3·1682 troy grains, and would require, to make up the 320 ratis, a rati of the value of 1·8425 troy grains.

It is very remarkable how numbers closely corresponding to one or other of these values for the weight of a great diamond, in carats or ratis, will recur in the subsequent discussion. Thus Anselm de Boot, in commenting in the early years of the seventeenth century upon some observations on Indian diamonds

made in the previous century by Garcias de Orto (a Portuguese physician at the Viceregal Court of Goa), states the largest diamond Garcias had seen to have weighed $187\frac{1}{2}$ carats. Garcias puts its weight at 140 mangelins. His translator (into Latin), Le Cluze, interprets the 140 mangelins as equivalent to 700 grains (apparently French grains of the old poids de marc). But De Boot evidently either had some separate authority for his statement that the largest diamond Garcias had seen weighed $187\frac{1}{2}$ carats, or had the means of reckoning more correctly than Le Cluze the value in Dutch or in Portuguese carats of the 140 mangelins of Garcias. Garcias was in India for thirty years in the reign of Akbar, a reign that, commencing three years earlier and ending three years later, covered "the spacious times of great Elizabeth"; and if any European of the many visiting India at that time would have had special opportunity of seeing the great diamond in the treasury of Babar's grandson, it would have been the body-physician of the Portuguese Viceroy. Dr. Ball has got into a hopeless mess in an endeavour to discredit observations of mine, and of my late learned friend Mr. King, regarding this allusion of De Boot's to a diamond weighing $187\frac{1}{2}$ carats. Dr. Ball is quite mistaken in supposing that he is the first person who had an acquaintance with De Boot's sources of information, with Le Cluze's translation of Garcias into excellent Latin, and with the commentators who edited De Boot and largely plagiarized from Le Cluze. In his "Natural History of Precious Stones," Mr. King gave, in 1866, an account of all these persons and their writings, but that accomplished scholar would certainly never have fallen into so absurd an error as Dr. Ball has rushed into in connection with De Boot's allusion to a $187\frac{1}{2}$-carat diamond.

Garcias, like Le Cluze, was a botanist, and his treatise was on Indian botany. He, however, devoted a few pages to the precious stones in vogue in India, and one short chapter is given to the diamond. De Boot transcribed, with omissions, these chapters of Garcias, and with misprints that probably arose from the statements he made, and even the pages he incorporated, being in the form of notes culled by him from a great variety of sources, of which Garcias was only one. Among the misprints or misapprehensions in De Boot's very remarkable book on stones and gems, is that by which he always substitutes the name of Monardes, a writer on the botany of the New World, in lieu of that of Garcias, an error the source of which Mr. King explained in the treatise above alluded to. Upon the passage in which De Boot refers to the great diamond, and which runs thus: "Nunquam tamen majorem (adamantem) illo qui pendebat $187\frac{1}{2}$ ceratia, cujus mentionem facit Monardes, inventum fuisse puto," Adrian Tull, a Belgian physician who edited the treatise of Anselm de Boot, adds a note to the chapter, correcting the name Monardes for that of Garcias, and then quoting from Le Cluze another note introduced at the end of his translation of the chapter, to the effect that he, Le Cluze, had never himself seen a larger diamond *in Belgium* than one which weighed 190 *grains*. Dr. Ball quotes this note in the Latin of Le Cluze to show that De Boot did not know what he was writing about, and still less that Mr. King and, of course, myself did, inasmuch as we had fastened upon De Boot's singular statement without due study of our authors. It is the writer of the "true history" of the Koh-i-Nur who has not gone to the authorities. Had he done so, he would have found in the 1605 edition three notes on this passage by Le Cluze. In the first he analyzes Garcias's 140 mangelins into "septingenta grana, sive unciam unam, drachmam unam, scriptula duo, grana quatuor. Nam mangelis, ut ante dixit noster auctor, quinque grana pendit, et septuaginta duobas granis dragma constat." His next note alludes to the diamonds he had seen himself in Belgium; and the third is upon certain crystals known as Bristol diamonds, found three miles from that city.

Passing from this curious aberration of Dr. Ball's, we may ask, What did De Boot mean by alluding in a second passage to the diamond Garcias had seen in India as weighing $187\frac{1}{2}$ carats? As I have said, it is barely possible he had means external to Garcias's statement in his book of knowing the weight of this diamond. The weights summed together by Le Cluze were apothecary weights, varying somewhat in different localities in Western Europe from the corresponding divisions of the French ounce of 576 French grains, equivalent to 472·1875 troy grains. The weight of the diamond on the French system would be 573·776 grains troy according to Le Cluze's reckoning, In terms of the old Netherlands ounce of 474·75 grains, current

in Antwerp, it would be 576·95 troy grains. But none of these are carat grains. De Boot, on the other hand, in estimating the 140 mangelins as 187½ carats, took the mangelin not at the 5 carat grains of Garcias, but at 5·3568 such grains, taking probably 1⅓ carat as the measure of the mangelin instead of 1¼ carat, the former being one among the several values which this variable unit had in different places.

The 187½ carats of De Boot would, on the value of the Amsterdam carat, 7½ of which equal an engle, which was the sixteenth part of the Dutch troy mark, give a weight for the diamond in question of 593·437 troy grains : the weight of the Koh-i-Nur having been 589·5 troy grains. It is very difficult to ascertain with accuracy the values of the different units—marks, ounces, carats—in the different countries and cities in the seventeenth century; but it is probable that even the mere 4 grains, or little more than a carat, difference between De Boot's estimate of the 140 mangelins and the traditional weight of the Koh-i-Nur would disappear if we possessed these data in a more complete form. There can be little doubt that Le Cluze was in error in taking the apothecary weight instead of carat weight in translating the grains of Garcias.

It may be asked, Why devote so much consideration to this casual statement of De Boot's? The answer is twofold. The astronomer has patiently searched in the records of early observations for any that might indicate the position at a former epoch of a new-found planet; and so, where the silence about an object of historical interest has been scarcely broken through two or three centuries, one tests any observation of the casual wayfarer in the domain of literature that may perhaps shed a ray of light on it. The other reason is that, if not disposed to resent, one is at least desirous to refute, attack on those who can no longer give their own answer to assailants of a new generation, who perhaps may not bring to an investigation the learning or the patient temper of those who have gone from us, and carried great stores of scholarly learning into the unknown. Whether I am right or wrong in the explanation I have offered of De Boot's conversion of Garcias's 140 mangelins into 187½ carats, I trust that at any rate I have shown cause for the statement by Mr. King that "it seems as if he (De Boot) had heard of the Koh-i-Nur; it being scarcely probable that two stones should be co-existent of that extraordinary weight."

In dealing with another of those coincidences in weight to which allusion was made, and one example of which has just been discussed, we get on the delicate ground of the degree of confidence to be placed in Tavernier's facts and figures, and the not less delicate ground of a theory about the Koh-i-Nur, started by Dr. Ball, before which the other strange vicissitudes and hairbreadth escapes of that old talisman pale into insignificance.

We have made sufficient acquaintance with the historic Indian diamond to leave it for a while, in order to introduce that other greater stone which we have designated as the "Great Mogul."

Bernier, from personal contact with whom Tavernier no doubt derived much of what had an historical character in his volumes, describes the gift by Emir Jumla, a Persian adventurer of great ability in the service of the King of Golconda, of a large diamond to the Emperor Shah Jahan, "ce grand diamant que l'on estime sans pareil." It was an appeal to his cupidity, and to a real connoisseur's passion for precious stones, at a time when the Emir was effecting a change in his allegiance from Golconda to Delhi—in fact, appealing to a new master to induce him to assail the old one.

In 1665, Tavernier, who was no less a courtier than a dealer, was invited by Aurungzebe to present himself at his Court to inspect his jewels.

The Emperor, seated on the peacock throne, could see the ceremony that was conducted in a small apartment at the end of the hall. Tavernier describes the patient circumspection with which he was shown the various stones and jewels by a Persian custodian. First and foremost among them was the great diamond, "qui est une rose (a rose-cut stone) ronde (rounded but not necessarily circular in form) fort haute d'un côté." There was a small crack at the edge below, and a little flaw within. It was of fine water, and weighed 319½ ratis, which Tavernier states to be equivalent to "280 de nos carats," the rati being ⅞ of a carat, which, however, would give 279·58 carats. Such was the only great diamond that he saw, and as he first described it.

He proceeds to give his version of its history. It was the stone given by the Emir Jumla to Shah Jahan; but he adds that,

whereas it had then a weight of 900 ratis or 787½ carats, it was worked down by a Venetian diamond-cutter, Hortensio Borgis, till it had only the 280 carats weight above noted. The word *égrisée* is that used; Dr. Ball interprets it as entirely *ground* down. But, though this is the most rational meaning of this technical word, it would, as Mr. King has remarked, have taken more time than the few months which intervened between the gift and the eclipse of Shah Jahan for the mere grinding down to have been accomplished by the processes in use in the seventeenth century, and especially in India. Undoubtedly, therefore, Hortensio must have availed himself of the cleavage property of the diamond to aid him in his grinding process. Tavernier goes on to say, "Après avoir bien contemplé cette grande pierre, et l'avoir remise entre les mains d'Akel-Kan, il me fit voir un autre diamant," &c., &c.; and he then describes a number of stones and pearls, of which he gives the weights, some more or less approximately, some definitely, in ratis or in melscals (or mishkals). The melscal he also states as giving 6 to the ounce, which I think is probably a mistake for 6½ to the ounce. Finally, he says that he had held all the jewels in his hand, and considered them with sufficient attention and leisure to be able to assure the reader that his description of them is exact and trustworthy, as was that of the thrones which he previously had ample time to inspect. It will be noted he does not say he weighed any of the stones; nor does his doing so seem compatible with his description of the scene.

But in another chapter near the end of the same book he gives a brief enumeration of the finest precious stones he had, in his long travels, known. The diamond described in the earlier chapter is alluded to now with slight but immaterial variations or corrections as to weight; but Tavernier here states that he was allowed to weigh the stone, and he further adds that it had the form of an egg cut through the middle. Dr. Ball truly notes that this process may be performed in one of two ways—longitudinally, or transversely; and that the Koh-i-Nur in 1850 represented the longitudinally bisected demi-egg, but, he naïvely adds, "This difference of form, as I shall explain, was the result of the mutilation to which it was subject."

Tavernier's statement that the diamond was "fort haute d'un côté" seems, indeed, hardly to accord with any other than a longitudinal section of the egg.

But then, as if to make his description inexplicable, Tavernier appends to this later chapter—written or edited probably by another hand four or five years after the event of his handling the stone—a rude sketch of the great diamond that he saw. It may be conceived as an extremely inaccurate sketch from memory of a semi-egg-shaped stone seen "end on," or of a cross-cut half-egg seen from any point of view; but, except for the trace of a small undercut face in his projection, it has not any resemblance to the Koh-i-Nur. In width, his sketch is very slightly larger than the length of the Windsor diamond, but in no other dimension does it at all compare with that stone as it was in 1850.

Then there is the question of weight. Babar's diamond, we have seen, weighed about 8 mishkals, or, in Indian weights, about 320 ratis (gold ratis). This would correspond to 240 pearl ratis, or may be represented as 224 of the Deccan ratis of Ferishtá.

The diamond Tavernier saw weighed, he said (was he merely told so, or did he really weigh it?), 319½ ratis, only half a rati different from Babar's diamond. But Tavernier's ratis were not those which Babar reckoned by, and his carats (*nos carats*) must (*pace* Dr. Ball) have been French carats. Dr. Ball supposes he has contributed to the published data of this tangle of contradictions one new fact in a final determination of Tavernier's carat, and, by implication, of his rati also. Tavernier gives the weight in carats of the yellow diamond of the Grand Duke of Tuscany, now in the Schatzkammer at Vienna. The weight of this stone being accurately known, and being also given by Tavernier as 139½ carats, it is not difficult to determine the value of this particular carat to be 3·037 troy grains. This is in fact identical with the Florentine or Tuscan carat, as Dr. Ball points out.

That gentleman assumes from this that Tavernier always employed this carat in his calculations. Such, however, is quite incompatible with his expression on other occasions, when he speaks of "*nos carats*." It is clear that Tavernier took the weight of this Florentine diamond from some trustworthy Tuscan source, giving it in Florentine carats. In fact, it is an illustra-

tion of what seems to be indicated as his habit in many other instances. He gives the weights of stones he mentions in ratis or mangelins, or in mishkals, and proceeds to state the equivalent weights in terms of *nos carats*, *i.e.* of the Paris carat ; for no Frenchman would designate any carat other than one current in France by such a term.

It would be a tedious task to inflict on a reader the minute detail of calculation and reference to statistical authorities that would be involved in a critical study of Tavernier's assertions regarding Indian and other weights, or Dr. Ball's incursion into that study.

But one fundamental error must be alluded to, that vitiates the accuracy of Dr. Ball's calculations. He is possessed of the singular belief that, in the seventeenth century, Tavernier would have been familiar with the French ponderary system known as the *système transitoire* or *usuel*, which was introduced by the law of May 1812 into France, in temporary substitution for the old livre (*poids de marc*) of 9216 French grains, and its subdivisions.

It is quite unnecessary to follow the results of this error ; for the only interest as regards our inquiry concerns the significance of the 319·5 ratis which Tavernier states the great diamond of Aurungzebe to have weighed. 320 ratis was the Hindoo equivalent, in Babar's time, of the 8 mishkals of Baba's diamond, and the Koh-i-Nur in 1850 weighed those 8 mishkals.

Tavernier says that the 319·5 ratis correspond to 280 French carats (*nos carats*). Here, then, is a second of those marvellous coincidences in numbers to which we have already made allusion—I may call them impossible coincidences, unless they apply to one and the same diamond.

Dr. Ball sees, apparently, no difficulty in the recurrence of any number of these identical figures as representing the weights of huge diamonds. For his explanation of the matter is that the diamond Tavernier handled was, as the French merchant asserted, the stone that Bernier mentions as the gift of Emir Jumla to Shah Jahan ; that it did weigh 319½ ratis, but that these were ratis of Tavernier's standard, equivalent, in fact, to 0·875 of a carat, whereas Babar's ratis were only 0·578 of a carat. Dr. Ball's assertion, however, is that this great diamond is the Queen's Koh-i-Nur, but that after Nadir Shah's time it had become diminished by successive chippings performed on it by needy princes, who in succession owned it, and turned its severed fragments to account, until finally, and presumably before it fell into the hands of Runjit Singh, this great Mogul diamond had shrunk in magnitude from its asserted 280 carats to 186 carats—from the 319½ ratis of Tavernier's reckoning to the 320 ratis on Babar's reckoning ; in a word, it had become reduced by this astounding process to the precise 8 mishkals of the Koh-i-Nur in 1526. So here is a third coincidence that we are called on gravely to accept as serious history.

The only originality, however, involved in this singular view of history, and the way to write it, is the reason assigned for the whittling down of the diamond from the asserted 280 carats to 186 carats. Several ingenious persons have indulged before in speculations as to the synthesis of one big diamond to be called the Koh-i-nur from several smaller ones scattered about the world, with a fine scorn of shape and weight and "water" in the component fragments, and of any historical ground whatever for their hypotheses. The late Mr. Tennant, of the Strand, even engaged the services of the great Russian diamond in this mosaic, ignorant, apparently of the facts that, like the Koh-i-Nur, it is an Indian-cut stone of about 194 carats weight, and is of a brownish-yellow hue.

But the coincidences in weight of various phantom diamonds with that which Babar recorded do not come to an end even with this crowning wonder, as I shall presently show.

Perhaps some one may, in parenthesis, ask what evidence there is for the breaking up of a great diamond by owners who clung to the Koh-i-Nur with a tenacity second only to their own hold on life. To this the answer is very simple. Not one fact or plausible argument is adduced to support it. Dr. Ball's imagination is its argument ; and, indeed, I cannot find one single contribution of *fact* from that gentleman to the history of the Koh-i-Nur that has any novelty at all. There remains, however, a question that has to be answered, whether this mutilation theory be ever so wild or were ever so sane. If Tavernier saw the Great Mogul diamond, where was the old

Hindoo stone ? or if it was, as I have supposed, the Hindoo Koh-i-Nur that Tavernier handled, where was the Great Mogul ?

Tavernier saw no second diamond of the first rank in magnitude. But there were two great diamonds somewhere—Babar's and Mir Jumla's, or, as I have designated them, the Koh-i-Nur and the Great Mogul. One or other of these Tavernier has described : where was the one he did not see ?

It is now thirty-five years ago that I suggested the answer. Supposing, as I did and do, that Tavernier handled the Koh-i-Nur, I indicated the prison-palace of Shah Jahan as the repository of the Great Mogul. But, whichever diamond it may have been that the French traveller saw, the other was assuredly among those splendid stones that the old Emperor told the son who had usurped his throne that he would pound to dust if their surrender was insisted on. Anyone read in Indian history needs not to be told that the threat never had to be fulfilled ; that Aurungzebe, content with the realities of power, cared little for the splendours that environed it, and left his captive father in the enjoyment of the allurements and the external pomp and vanity of a sovereign's surroundings, including the collection of jewels and precious stones in which his soul delighted. On his death they were brought to Aurungzebe by his sister Jehanira, who had shared her father's captivity.

It matters nothing to the subsequent history of the Koh-i-Nur whether it or the Great Mogul was the stone that remained in the custody of the fallen Emperor. But I have maintained that it was more probable that Shah Jahan should have retained the diamond that may be styled his private property, as having been given him by the Emir Jumla ; and that therefore the stone seen in Aurungzebe's possession would in every probability have been the diamond of Babar, which, like the peacock throne and other gorgeous adornments of the presence chamber, would, as a Crown jewel, have remained in the imperial treasury.

Of course, this view of the matter involves great misgivings as regards Tavernier's accuracy. It involves his having applied to the only big diamond he saw the stories he had heard, from Bernier, no doubt, and from others, regarding that other great diamond given by the Emir Jumla to Shah Jahan. It further involves his having attempted to represent in a drawing a diamond he had seen several years before, but in a drawing so absolutely unlike the Koh-i-Nur as to be hardly recognizable as representing the Queen's diamond, and even less the diamond that he himself described, as he saw it, among the treasures of Aurungzebe.

The Great Mogul diamond had been cut by a European cutter. But, so far as it is of any value at all as evidence, Tavernier's drawing suggests a characteristically Indian-cut stone, much resembling in form and facetting the Russian diamond known as the "Orloff," which I have inspected, and can aver to be Indian in its cutting. The Koh-i-Nur, too, to which I personally gave careful attention in 1851, was no less unquestionably Indian in its facetting. Models in plaster-of-Paris made directly from the diamond confirm this ; and traces of the original faces of the diamond, besides two large octahedral faces, appear to have been worked into the design of the facetting. The rows of facets were obviously put on so as to humour the original form of the stone and diminish its weight as little as possible ; and notably they were thus skilfully arranged in regard to the upper edge of one of two large octahedral faces that has erroneously been described as a cleavage plane due to a fracture after the cutting had been performed. In fact, it and another large face, forming the base of the crystal, had not the lustre of cleavage surfaces, but wore the aspect of faces that had so far undergone attrition, probably in a river-bed, that the angle between them was no longer quite the true octahedral angle. The facets in general presented an imperfect adamantine lustre, and appeared slightly rounded, the result, probably, of the imperfect processes employed by the native Hindoo lapidary, especially in very early times.

Even Tavernier's drawing rudely indicates three rows of facets, put on in a manner that hardly consists with the fashion of a rose-cut diamond of European workmanship.

With my profound scepticism as to the critical value of Tavernier's arithmetic, I have ventured to think that the simplest explanation of all these instances of marvellous recurrence in various forms of the numbers representing the weight of the Koh-i-Nur is best explained by supposing that Akhil Khan gave Tavernier the traditional weight of the Babar diamond which he had placed in his hand, and that the French

merchant translated this weight into carats, not as from the old ratis of Babar's or even of Akbar's day, but from the pearl ratis, of one or other value, with which he had become acquainted in the bazaars of India. Tavernier's rati, as calculated from the Paris carat on the ratio of $\frac{4}{5}$, should have a value of 2·77088 troy grains, and as drawn from his various statements of equivalent weights it varies from 2·4066, in one case 2·750, to 2·797 troy grains. His mishkal also he puts at $\frac{1}{6}$ the French ounce, *i.e.* 78·7 troy grains; which should, however, probably have been 6$\frac{1}{2}$ ounces to the mishkal, and the rati of Tavernier is entirely dissimilar to any known rati of ancient or modern India.

The 319$\frac{1}{2}$ ratis is readily explained on this hypothesis; and it is really too large a demand on our credulity to believe that two of the largest diamonds in the world should be severally of 319$\frac{1}{2}$ ratis and 320 ratis, though of different units of value, when a simpler explanation is able to dispose of the anomaly.

I have said that the marvellous coincidences of weight imported into the Koh-i-Nur history do not come to an end with Babar's 8 mishkals, with Anselm de Boot's 187$\frac{1}{2}$ carats, with Tavernier's 319$\frac{1}{2}$ ratis, nor even with Dr. Ball's miraculous chipping process, resulting in a reduction of the Great Mogul diamond to the identical weight of the Koh-i-Nur in 1850. The original diamond of Babar had to be accounted for, and its ghost had to be laid. So another coincidence had to be imported into the narrative, or rather into the romance. Another diamond had to be found, also with the precise weight of the Koh-i-Nur, and this Dr. Ball has ready to hand. The Darya-i-Nur, or "Sea of Light," reposes in the treasury of the Shah. Sir J. Malcolm saw it, and casually stated its weight as given to him at 186 carats. Now Sir J. Malcolm, during his residence at the Court of the Shah, not only was acquainted with the marvellous treasures in jewels brought by Nadir from the palace of Delhi, but he was enabled to have *facsimile* drawings of them made.

By the kindness of his son, General Malcolm, I possess the tracings of this dazzling wealth of jewellery. The Darya-i-Nur is a large flat diamond with bevelled edges, and in the form of a long rectangle. When Malcolm knew it, it was set in a glorious galaxy of mighty rubies. He could therefore have only known its weight from hearsay evidence, and the recorded carats were most likely the echo of those associated with the fame of the Koh-i-Nur. Now, I have no hesitation in asserting this Darya-i-Nur to be an old acquaintance of those familiar with Tavernier's pages. Unless two diamonds, flat, bevelled, and of identical dimensions, can be shown to co-exist, of above 200 carats weight, the stone known as the Golconda diamond or the Table diamond is no other than the Darya-i-Nur.

It happens fortunately to be one of the few stones described by Tavernier to the form and weight of which, as given by him, we can attach complete confidence. He had a lead model made from it in order to negotiate its sale: and he gives its weight as 176$\frac{1}{8}$ mangelins, or 242$\frac{5}{16}$ "de nos carats." This gives its weight at 767·42 troy grains, or 240 English carats, this particular mangelin being, on Tavernier's estimate of 1$\frac{3}{8}$ of a carat, about 4·357 troy grains. Tavernier having had a lead model made of this remarkable flat diamond, he figures it no doubt with much exactitude. A copy of his figure and of the tracing of the Darya-i-Nur is subjoined, in which it will be seen that if the unsymmetrical end be cut off and the sides more accurately squared, so as to make the diamond a symmetrical rectangle, the figures of the two stones become identical in form and dimension. A card cut to represent the "Golconda" diamond, and the parts of it as described, gave the ratio of

the Golconda : the Darya-i-Nur = 10 : 8·5,

that is to say, the portion trimmed away was about 15 per cent. The remaining stone would thus have a weight of about 214 English carats, and if 4 carats be allowed for the bevelling and squaring of the stone, the present weight of the Darya-i-Nur should be about 210 English carats.

I trust I have thus laid this last phantom raised by the author of the "true history." But the final problem as to the Great Mogul diamond still remains.

If the Queen's proud trophy of the final conquest of India is indeed the great Koh-i-Nur, the old Malwa diamond descending to Her Majesty from the possession of Patan and Mogul dynasties of Delhi; carried off to Persia and named by Nadir; seized as the potent talisman of empire by Ahmed Shah, and held by his Durani descendants till it came back to India,

the companion of the exile of Shah Sujah, and then torn from him by the grim Lion of Lahore—true to its destiny as "the possession, ever, of him that was the strongest,"—if this be indeed the stone that, from early times to 1850, preserved its form and weight of 8 mishkals, where was, and where is now, the Great Mogul diamond that Bernier told of? The answer is, I believe, the simplest and the most natural : It is, where the historian would look for it, in the treasury of Teheran. One large diamond, standing high upon an elliptic base, is there, or was there, in Sir John Malcolm's day. Its long diameter is much larger, and its shorter diameter smaller, than that of the diamond figured by Tavernier.

I do not assert it to be the Great Mogul. I assert merely that it probably is that great diamond ; and I hope that in what has
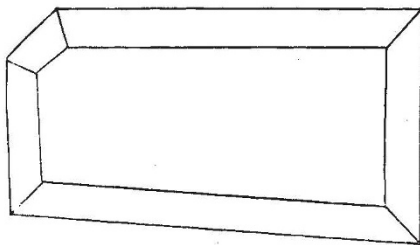
Golconda Table Diamond.
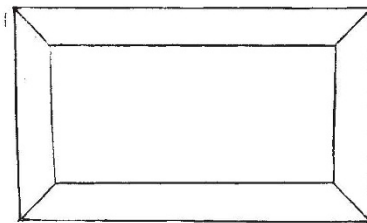
Darya i-Nur.

been said in the criticisms I have here offered upon the writers on the Koh-i-Nur I have averred nothing that does not rest on proof ; that I have offered no conjecture that is not supported by reasonable probability ; and that I have made no assault on any theory or fact asserted to be such by others, without at least offering some justification for my criticism in the reasons and facts I have been able to adduce.

A true history of the Koh-i-Nur has still to be written. I hope I have, in these criticisms, done something to clear the way for the writer of it. Other avocations and duties may prevent my undertaking the interesting task. At any rate, if it should ever be mine to perform it, I trust the result will at least bear some verisimilitude to a true history.

N. STORY-MASKELYNE.

SCIENTIFIC SERIALS.

A LARGE portion of the number of the *Botanical Gazette* for July is occupied by an instalment of Mr. John Donnell Smith's "Undescribed Plants from Guatemala" ; several of the new species are figured. New parasitic or saprophytic Fungi—Hyphomycetes and Uredineæ—are described in this number by Mr. R. Thaxter, and in that for August by Mr. J. C. Arthur. In the latter, Mr. T. Holm continues his study of some anatomical characters of North American Gramineæ, and Mr. F. Lamson Scribner contributes a sketch of the flora of Orono, Maine.

THE numbers of the *Journal of Botany* for August and September contain the conclusion of Mr. G. Murray's important paper on the Algæ of the Clyde sea-area, accompanied by a map showing the various depths. This paper has now been issued separately. In his notes on Mycetozoa, Mr. A. Lister describes species found in various herbaria not included in Dr. Cooke's "Myxomycetes of Great Britain"—three of them new