with the personal incentive derived from the fact of the authoress's having been a pupil of Miss Mitchell at Vassar College, led to her undertaking a new determination.

Starting from Rümker's elements all the observations are compared with them, using star places derived from all available sources including the unpublished zones of the Astron. Gesellschaft, and taking into consideration as far as possible the systematic errors of the various authorities. The perturbations by Venus, the Earth, Mars and Jupiter are applied to the normal places which are obtained by using places of the sun from Leverrier's tables. The differential coefficients for the 6 normal places are computed by Schönfeld's formula and the normal equations are solved both for a parabola and an indeterminate conic section. In this latter case the eccentricity comes out = 1·0001727, indicating a hyperbolic character of the orbit. The reduction of the sums of the squares of the residuals from 702·11 for the parabola to 171·87 for the hyperbola makes the conclusion seem well warranted that the observational data require this latter curve for their satisfactory representation, thus confirming Rümker's similar conclusion.

2. *Schreiner's Spectral-Analyse Der Gestirne.*—It is announced that a translation by Prof. E. B. Frost of Dartmouth College, of Dr. Schreiner's well known work, is to be issued in the autumn of 1893. Subscriptions ($5) are solicited by the publishers, Messrs. Ginn & Co., Boston.

V. Miscellaneous Scientific Intelligence.

1. *Observations in the West Indies;* by Alexander Agassiz. (In a letter to J. D. Dana, dated Steam Yacht "Wild Duck," Nassau, March, 1893).—Here we are back at Nassau for the third time, and thinking you might be interested to hear of my cruises, I send you a short sketch of our trip. The first time we left Nassau we entered the Bahama Bank at Douglass Channel and crossed the Bank to North Eleuthera, where we examined the "Glass Window" and the northern extremity of Eleuthera, we then sailed along the west shore of the island close enough to get a good view of its characteristics as far as Rock Harbor at the southern end. We steamed out into Exuma Sound through the Beach Channel and round the southern end of Eleuthera to little San Salvador, and the northwest end of Cat Island, where are the highest hills of the Bahamas. We then skirted Cat Island along its western face, rounded the southern extremity and made for Riding Rocks on the western side of Watling's Island. We circumnavigated Watling, passed over to Rum Cay, then to northern part of Long Island, visiting Clarence Harbor; next we crossed to Fortune Island, and passed to the east side near the northern end of the island on the Crooked Island Bank. From there we crossed to Caicos Bank, crossing that bank from French Cay to Long Island, passed by Cuklum Harbor and ended our

eastern route at Turk Island; from there we shaped our course to Santiago de Cuba to coal and provision the yacht. We were fortunate enough to strike Cape Maysi a short time after daylight, and I thus had a capital chance to observe the magnificent elevated terraces (coral reef) which skirt the whole of the southern shore of Cuba from Cape Maysi to Cape Cruz and make so prominent a part of the landscape as seen from the sea. We were never more than 3 miles from shore and had ample opportunity to trace the course of some of the terraces as far as Santiago, and to note the great changes in the aspect of the shores as we passed westward due to the greater denudation and erosion of the limestone hills and terraces to the west of Cape Maysi, which seems to be the only point where five terraces are distinctly to be seen. The height of the hills back of Pt. Canete where the terraces are most clearly defined, I should estimate at 900 to 1000 feet; though the hills behind the terraces, which judging from their faces are also limestone, reach a somewhat greater height, perhaps 1100–1200 feet.

After coaling at Santiago de Cuba we visited Freayna, and next steamed to Hogstey Reef, a regular horseshoe-shaped atoll with two small Keys at the western entrance. There we passed three days studying the atoll. This to me was an entirely novel experience; to be at anchor in 3 fathoms of water 45 miles from any land with water 900 fathoms within 3 miles outside, surrounded by a wall of heavy breakers pounding upon the narrow annular reef which sheltered us. I made some soundings of the lagoon and of the slope of reef outside. From there we returned to Crooked Island Bank to the westward of which I also made some soundings to determine the slope of the Bank. We next again visited Long Island, taking in the southern and northern ends which I had not examined. From there we passed to Great Exuma, stopping at Great Exuma Harbor and sounding into deep water on our way out to Conch Cut when we sailed west crossing the Bank to Green Cay. From there we made the southward of New Providence, and before going in to Nassau Harbor made some trials in deep water in the Tongue of the Ocean with the "Tanner" deep-sea townet in 100 and 300 fathoms, depth being 700 fathoms—after which we returned to Nassau. I had on board a Tanner sounding machine kindly loaned me for this trip by Col. McDonald of the Fish Commission, and some deep-sea thermometers were also kindly supplied by him and by Professor Mendenhall, the superintendent of the U. S. Coast Survey. I supplied myself with a number of Tanner deap-sea townets and with a supply of drops and of townets and carried on board a Yale and Towne patent winch for winding the wire rope which I used in my dredging and towing in deep water. The yacht was provided with a steam capstan and by increasing its diameter with logging we found no difficulty in hauling in our wire rope at the rate of 8 min. to a 100 fathoms. I carried 600 fathoms of steel wire dredging rope with me

of the same dimensions which I had used on the "Blake" and which has also been adopted on the "Albatross." During our second cruise we steamed from Nassau for Harvey Cay crossing the Bank from north to south to Flamingo Cay and then to Great Ragged Cay, from which we took our departure for Baracoa. At Baracoa I hoped to be able to ascend the Yomque; unfortunately I had to give up my trip owing to the desperate condition of the roads. From Baracoa we steamed close to the shores to the westward, touching at Port Banes, Port Padre, Cay Confiles, Sagua, Cay Frances, Cardenas, Matanzas, and finally ending at Havana. This trip was a continuation of the observations we made on the south coast of Cuba and enabled me to trace the gradual disappearance of the terraces from Baracoa to Neuvitas, and their reappearance from Matanzas to Havana, from the same causes which evidently influenced their state of preservation from Cape Maysi west. I also got a pretty clear idea of the mode of formation of the fine harbors found on the northern coast of Cuba to the eastward of Neuvitas, and of the mode of formation of the extensive system of cays reaching from Neuvitas to Cardenas and which find their parellel on the south coast of Cuba from Cape Cruz to Cape Corrientes. After refitting at Havana we left for Nassau. Both on going into Havana and on leaving we spent the greater part of a day in towing with Tanner net. I thought I could not select a better spot for finally settling the vertical distribution of pelagic life than off Havana which is in deep water—900 fathoms —close to land, on the track of a great oceanic current, the Gulf Stream, noted for the mass of pelagic life it carries along its course. We towed in 100, 150, 250, and 300 fathoms and on the surface at or near the same locality, and I have found nothing to cause me to change the views which I expressed in my Preliminary Reports of the "Albatross" expedition of 1891. Nowhere did I find anything which was not at some time found also at the surface. At 100 fathoms the amount of animal life was much less than in the belt from 100 fathoms to the surface. At 150 fathoms there was still less and at 250 fathoms and 300 fathoms the closed part of the Tanner contained *nothing*. At each one of these depths we towed fully as long as was required to bring the net to the surface again. Thus we insured before the messenger was sent to close the lower part of the bar as long a pull through water as the open part of the net would have to travel till it reached the surface, giving the fauna of a horizontal column of water at 100, 150, 250 and 300 fathoms of the same or greater length than the vertical column to the surface for comparison of their respective richness. From Havana we steamed to Cay Sal Bank, visited Cay Sal, Double headed Shot Cays, Anguila Islands, and then crossed over to the Great Bank to the west of Andros Island. The bottom of this bank is of a most uniform level, 3 and 3½ fathoms for miles and then very gradually sloping to the west shore of Andros, so that we had to anchor nearly six miles from the wide opening of the central part of Andros which we visited. The

bottom consists of a white marl, resembling when brought up in the dredge newly mixed plaster of Paris, and having about its consistency just as it begins to set. This same bottom extends to the shore; and the land itself, which is low where we went on shore not more than 10 to 15 inches above high water mark, is made up of the same material, which feels under foot as if one were treading upon a sheet of soft india rubber; of course on shore the marl is drier and has the consistency of very thick dough. It appears to be made up of the same material as the æolian rocks of the rest of the Bahamas, only that it has become thoroughly saturated with salt water and in that condition it crumbles readily and is then triturated into fine impalpable powder almost like deep sea ooze which covers the bottom of the immence bank to the west of Andros. After leaving Andros we crossed the Bank again to Orange Cay and followed the eastern edge of the Gulf Stream to see Riding Rocks, Guin Cay and the Beminis. We then passed to Great Isaac where we saw some huge masses of æolian rocks which had been thrown up along the slope of the cay about 80 fathoms from high water mark to a height of 20 feet. One of these masses was $15'6''\times11''\times6'$. We then kept on to Great Stirrup Cay coasting along the Berry Cays, crossed over to Morgan's Bluff, on eastward of Andros down to Mastic Point on the same Sound, and then returned to Nassau.

The islands of the Bahamas (as far as Turks Island) are all of aeolian origin. They were formed at a time when the Banks up to the 10-fathom line must have been practically one huge irregularly shaped mass of low land, from the beaches of which successive ranges of low hills, such as we still find in New Providence, must have originated. After the islands were thus raised there was an extensive gradual subsidence which can be estimated at about 300 feet, and during this subsidence the sea has little by little eaten away the æolian lands, leaving only here and there narrow strips of lands in the shape of the present islands. Inagua and Little Inagua are still in the original condition in which I imagine such banks as the Crooked Island Banks, Caicos Banks and other parts of the Bahamas to have been; while the process of disintegration going on at the western side of Andros shows still a broad island which will in time leave only the narrow eastern strip of higher land (æolian hills) on the western edge of the tongue of the ocean. Such is the structure also of Salt Cay Bank which owes its present shape to the same conditions as those which have given the Bahamas their present configuration. My reason for assigning a subsidence of 300 feet is the depth of some of the deep holes which I have surveyed on the Bank and which I take to be submarine blow holes or cañons in the aeolian limestone of the Bahama hills when they were at a greater elevation than now. This subsidence explains satisfactorily the cause of the present configuration of the Bahamas, but teaches us nothing in regard to the substratum upon which the Bahamas were built. The present reefs form indeed but an insignificant part of the to-

pography of the islands and have taken only a secondary part in filling here and there a bight or a cove with more modern reef rock, thrown up against the shores so as to form a coral reef beach such as we find in the Florida Reef. I have steamed now nearly 3,300 miles among the Bahamas, visiting all the more important points and have made an extensive collection of the rocks of the group.

I hoped to have made also a larger number of deep soundings than I have been able to take; unfortunately the trades were unusually heavy during the greater part of my visit to the Bahamas, greatly interfering with such work on a vessel no larger than the "Wild Duck"—127 feet on the water line. For the same reason the number of deep-water pelagic hauls was also much smaller than I hoped to make, as in a heavy sea the apparatus would have been greatly endangered. It is a very different thing to work at sea in a small yacht like the "Wild Duck," or in such vessels as the "Blake" and the "Albatross" of large size and fitted up with every possible requirement for deep sea work. The "Wild Duck," on the other hand, was admirably adapted for cruising on the Bahama Banks, her light draught enabling her to go to every point of interest and to cross and recross the Banks where a larger vessel could not follow. I am under the greatest obligations to my friend Mr. John M. Forbes for having so kindly placed his yacht at my disposal for this exploration, and I hope soon after my return to Cambridge to publish more in detail the results of this examination of the structure of the Bahamas.

2. *The Barrier Reef of Australia: Its Products and Potentialities;* by W. Saville-Kent. (W. H. Allen & Co., 13 Waterloo Place, London.)—The publishers announce that this important work is now about ready. The specimen copies of the plates furnished give a high idea of the unusual beauty of the illustrations.

3. *Logarithmic Tables,* by Prof. George William Jones of Cornell University. Fourth edition, 160 pp. 8vo. London (Macmillan & Co.) and Ithaca (George W. Jones).—There are many books of logarithmic tables, but this one is especially notable for its convenience and compactness of arrangement, clearness of typographical work and breadth of scope. Eighteen tables in all are given and the judicious selection and arrangement of these by the editor gives the student a much wider and more generous equipment for his work than can often be found within the limits of a small volume and one sold at the low price of seventy-five cents.

Obituary.

Nicolas Koksharov, the veteran and long honored Russian mineralogist, died on January 2, 1893, at an advanced age. His *Materialien zur Mineralogie Russlands,* of which the first volume was issued in 1853–54 and the tenth volume completed in 1891, is a monumental contribution to science and will always be a model of careful and accurate research.