

The Report of the Astronomical Society of India for the year ending 30th September 1912.

The Council beg to submit the following report on the progress and operation of the Astronomical Society of India for the Session 1911-12 which ended on 30th September 1912.

2. *Members.*—The Society has completed the second year of its existence. It entered into its second session with 239 members and 47 new members were elected during the year, giving a total of 286. Of these 10 members resigned with effect from the commencement of the current session, 7 resigned after paying their subscriptions for a full year, and 1 after paying his subscription for a half year. 2 other members died in the course of the year. 22 subscribers were struck off the rolls for non-payment of subscriptions for $1\frac{1}{2}$ years or more. The Society had thus 244 members on its rolls on the 1st October 1912.

3. *Meetings.*—The Council held 9 ordinary meetings and 1 special meeting for discussing the transactions of the Society. The large attendance in these meetings testifies to the interest taken by its members.

In the special meeting the Council decided the programme of work for the session and appointed a Scientific Sub-Committee, consisting of the Scientific Secretary and the different Directors of Sections, to direct the observational and educational work of the Council and to take steps to introduce practical work in order to create an interest on the subject of Astronomy among the members.

The ordinary monthly meetings of the Society were held generally on the last Tuesday of each month from October 1911 to July 1912 and were presided over by the President, except on one occasion when owing to an unfortunate accident he could not attend and his place was taken up by Mr. Simmons. Several papers on Astronomical subjects were read at those meetings and interesting debates were held on them.

4. *Quarters.*—The business of the Society was conducted in a room of the Imperial Secretariat Buildings and the Library is housed in a small room in the same building placed at disposal of the Society by the Comptroller General. The gratitude of the Society is due to the Comptroller General for his kindness.

5. *Library*.—Numerous additions were made to the Library during the session. The Maharaja Rana Bahadur Sir Bhawani Singh, K.C.S.I., F.R.A.S., gave a donation of Rs. 100 and with this money a set of the Monthly Notices of the Royal Astronomical Society back to 1867 were purchased. Several grants of books were also presented by other Members and the Library Committee were also able to purchase a considerable number in England from donations.

Several valuable presents in the shape of books, journals, etc., were also received during the session from Societies and Observatories of other countries. The Library has now more than 200 books, besides journals and other periodicals. The thanks of the Society are due to the respective donors who have thus helped to advance the cause of Astronomy in this country.

All possible facilities were given to the members who took out books from the Library.

The reading-room of the Library was kept open daily from 5 to 7 P.M., and from 3 to 5 P.M. on Saturdays except on holidays. The Assistant Librarian is in charge of the books and every facility is given to the members who go to the Library to make use of the books of reference and the periodicals and journals which are received from Foreign Societies and Observatories.

6. *Instruments*.—Dr. E. P. Harrison removed a want of the Society by presenting a telescope for the use of its members. The thanks of the Society are due to him for his valuable gift. A brief description of the instrument was given by Mr. Lee at one of the ordinary meetings of the Society. The telescope is in the Library and can be made use of by any member sending an intimation either to the President or the Secretary. It is hoped that it will be regularly used during the coming session.

An attempt was made to draw up a list of instruments in the possession of members with a view to organising practical observation. It is hoped that this will be pushed on during the coming session.

7. *Society's Publications*.—The JOURNALS of the Society were published as usual during the 9 working months of the session. They contained the proceedings of the monthly meetings in full, the Astronomical papers read at those meetings as well as extracts from important publications of similar kind. Several interesting photographs were also reproduced therein.

8. *Recognition of the Society.*—The following Societies and Observatories regularly sent in their publications in exchange for the Society's :—

1. Royal Astronomical Society, London.
2. British Astronomical Association, London.
3. Royal Astronomical Society of Canada.
4. Astronomical Society of Italy.
5. Astronomical Society of Barcelona.
6. Royal Observatory of Scotland.
7. Vatican Observatory.
8. Astronomer Royal, Greenwich.
9. Royal Observatory of Belgium.
10. Director of Indian Observatories, Alipore.
11. Director of Kodai Kanal Observatory.
12. Oxford University Observatory.
13. Radcliffe Observatory.
14. Astronomical Society of Leeds.
15. Paris Observatory.

The special thanks of the Society are due to Mr. Evershed, Director of the Kodai Kanal Observatory, for the assistance he has accorded in lending valuable slides from time to time for the meetings with his notes thereon.

At the beginning of the session letters were sent to the various Directors of Public Instruction and the Principals of Schools and Colleges, asking them to subscribe to the JOURNAL of the Society. The appeal was readily responded to by the authorities of the following Colleges :—

1. The Presidency College, Calcutta.
2. The Sanskrit College, Calcutta.
3. The Ravenshaw College, Cuttack.
4. The Hooghly College, Chinsurah.
5. The Krishnagar College.
6. The Patna College.
7. The Muir Central College, Allahabad.
8. The Elphinstone College, Bombay.

9. *Steps taken to popularise the Society.*—With a view to popularise the Society the Council in their special meeting decided that the following work should be taken up by the Society during the year :—

1. Public Lectures in Calcutta.
2. Indoor Classes for members who were beginners.
3. Practical Classes for members in Calcutta.
4. Observational work for those members who would embark on it.

During the session three Public Lectures were delivered at Calcutta, under the auspices of the Society. The first one was delivered by Colonel S. G. Burrard, R.E., F.R.S., C.S.I., on "The Earth as a Planet," under the presidency of Sir James Meston, K.C.S.I., C.S.I., I.C.S., on 9th February 1912; the second by Mr. H. G. Tomkins, C.I.E., F.R.A.S., on the "Moon," under the presidency of Sir Harcourt Butler, K.C.S.I., C.I.E., I.C.S., on 1st March 1912; and the third by Dr. E. P. Harrison, PH.D., on "Mars," on 15th March 1912, under the presidency of His Honour Sir William Duke, K.C.I.E., C.S.I., I.C.S., the Lieutenant-Governor of Bengal. All these lectures were very largely attended by the public, who seemed to take great interest in them.

The lectures were delivered at the Town Hall, Calcutta, which was kindly placed at the disposal of the Society free of charge by the Calcutta Municipal Corporation, to whom the gratitude of the Society is due.

The lectures will be published shortly in one volume and supplied free to the members of the Society. For non-subscribers the price of each volume has been fixed at Rs. 3, and the Society hopes that it will be very popular and will command a good sale.

10. *Accounts.*—The accounts of the Society for the year under report are shown in the accompanying statements.

I. Revenue Account, Session 1911-12.

1. General Revenue Account for Session 1911-12.

EXPENDITURE.		RECEIPTS.	
To Establishment ...	Rs. A. P. 332 0 0	By Subscription— 239 members on 1-10-11 @ Rs. 8	Rs. A. P. 1,912 0 0
„ Cost of Stationery ...	9 12 9	Elected members— 38 @ Rs. 8	304 0 0
„ Postage and Telegram charges ...	193 15 6	9 @ Rs. 4	36 0 0
„ Office Expenses and Miscellaneous ...	91 0 6	<i>Deduct</i> — 22 members struck off	Rs. A. P. 2,252 0 0
„ Discount for cashing cheques ...	1 4 0	9 resigned @ Rs. 8.	72 0 0
„ Printing charges :—		1 resigned @ Rs. 4	4 0 0
„ Cost of blocks and photographs ...	238 12 0	Amount realised for Session 1911-12—	252 0 0
„ Cost of printing Journals ...	708 8 0	181 @ Rs. 8	1,448 0 0
„ Cost of miscellaneous printing ...	64 9 0	8 @ Rs. 4	32 0 0
„ Cost of Furniture ...	20 0 0	4 new @ Rs. 4	16 0 0
„ Undisposed-of Liabilities	1 @ Rs. 2	2 0 0
„ Depreciation in the Stock of Library Books ...	26 8 2	Deduct Amount realised in 1910-11 ...	28 0 0
„ Depreciation in Furniture ...	15 11 6	Amount in arrears— (21 names struck off, 10 resigned)	448 0 0
		56 @ Rs. 8	6 0 0
		1 @ Rs. 6	28 0 0
		7 @ Rs. 4 (1 resigned)	20 0 0
		5 new @ Rs. 4	20 0 0
	1,702 1 5		(a) 502 0 0

NOV. 1912.] REPORT OF THE ASTRONOMICAL SOCIETY.

11

Amount written off Suspense Account by debit to Revenue Account:—		Subscriptions realised in advance for 1912-13 and 1913-14—	
	Rs. A. P.		
Subscription	140 0 0	6 @ Rs. 8	48 0 0
Entrance Fee	12 0 0	3 @ Rs. 4	12 0 0
Quarters	10 0 0	1 @ Rs. 3	3 0 0
			63 0 0
		By Entrance Fee amount due	
		47 @ Rs. 4	188 0 0
		Realised in Session 1911-12—	
		41 @ Rs. 4	164 0 0
		Amount in arrears—4 @ Rs. 4	(b) 16 0 0
		(2 written off)	
		By sale of Journals	114 8 0
		By Advertisements	30 0 0
		By Miscellaneous	9 2 9
		Actual Receipts	1,850 10 9
		Add unrealised subscriptions as (a) by debit to Suspense Account	502 0 0
		Add unrealised Entrance Fee as (b) by debit to Suspense Account	16 0 0
			2,368 10 9
		Add opening balance of Revenue Account for 1910-11	47 11 10
			2,320 14 11
	Total	Total	2,320 14 11

U. L. BANERJEE,
Treasurer.

II. General Balance Sheet on 30th September 1912 as modified.

LIABILITIES.			ASSETS.		
	Rs.	A. P.		Rs.	A. P.
<i>Sundry Creditors—</i>			Block Account ...		
Undisposed of liabilities	Library Stock of Books ... 443 0 11		
			Additions in 1911-12 ... 87 2 3		
			530 3 2		
			<i>Deduct 5% depreciation charged to Revenue Account</i> 26 8 2		
<i>Revenue Account—</i>				503	11 0
Balance of Revenue Account ...	456	13 6	Value of Telescope (as assessed by the Director of Instruments) ...	150	0 0
			<i>Furniture—</i>		
<i>Library Account—</i>			Last year 137 3 1		
Balance of Library Account ...	45	9 5	Additions in 1911-12 20 0 0		
			157 3 1		
<i>Deposit Account—</i>			<i>Deduct 10% depreciation charged to Revenue Account</i> ... 15 11 6		
Balance of Deposit Account ...	40	0 0		141	7 7
			<i>Unsold Journals—</i>		
			1910-11 ... 1,942		
			1911-12 ... 2,122		
			4,064		
			@ As. 2 per copy ...	508	0 0
			<i>Sundry Drs.—</i>		
			(Unrealised assets as per Suspense Account 1911-12.)		
			Subscription ...	502	0 0
			Entrance fee ... (1910-11)	16	0 0
			Subscription ...	12	0 0
			Cash Balance in the Alliance Bank of Simla, Ltd. ...	81	12 11
			Cash with Treasurer	11	5 0
Excess of Assets over Liabilities ...	1,383	13 7			
	1,926	4 6		1,926	4 6

U. L. BANERJEE,
Treasurer.

Remarks by the Council.—The Council considered that the value of old JOURNALS might be taken at annas 2 per copy instead of annas 4 as in previous year, and that Mr. Woodhouse might be consulted as regards the value of the telescope. The Council also directed that the arrear subscriptions and entrance fees for the year 1910-11 and arrear donation amounting to Rs. 195 as well as the entrance fees of Rs. 8 due from two members should be written off the accounts. It was further ordered that the names of the 22 members who have not paid their subscription for $1\frac{1}{2}$ years or more should be removed from the list of subscribers.

S. C. GHOSE,

Offg. Secretary.

The President's Address.

October 1912.

The occasion of our Annual General Meeting has again come round when the Society to which we belong has to take stock of its proceedings, to review its operations of the past year, and to prepare for a new session. In my address last year I followed an example set by Societies in England, when the President once in a year is given the opportunity of speaking to members on matters not only connected with the internal economy of their own Society but on the progress of the science generally, as well as on some particular subject of his own which he may choose for the occasion. I propose to follow the same plan this year, and considering the affairs of our own Society first, I think we may congratulate ourselves on the satisfactory nature of the report which the Secretary and Treasurer have been able to present to us. When the Astronomical Society of India was founded a little over two years ago, I reminded those who were embarking on the venture that they would have to face times of difficulty in the undertaking, and that it was not to be expected that the energy and enthusiasm which appeared at the beginning would never flag. It is a common experience with all institutions of the kind that at the start, enthusiasm and perhaps I may say a somewhat unreal state of affairs should exist. Those who are wise do not build too much on this; they realise that a society like an Astronomical Society may at its inception attract many whose energy is not likely to last. Some join because of the novelty of the idea; others because they want to see what it is like, others are attracted by ideas which popularly often attach themselves to the subject, and again others join out of personal friendship for

those who are themselves interested. It is obvious of course that after a longer or shorter period most of these members will drop off. The solidity of the Society will then be proved, or the reverse, by the continued support it receives. For a few months the path is easy and the interest taken is great, but in a year or so the unreal part of this interest wanes and there is almost certain to be what is known as a slump in the affairs of the Society, and these slumps are apt to occur at intervals during many of the first 10 years of its existence. Ladies and Gentlemen, we must be on the look-out for these slumps in the case of our own Society also, and I specially mention this matter on the present occasion, because we have, as you have just heard from the report, passed through something of the kind for the first time. Forty of our members have during our second year dropped off or have been struck off owing to their subscriptions not having been paid—some not even for the first year. It is evident that in these members we have those to whom I have referred above, and it seems to me that those who mean business in this Society may well take heart from the fact that not only has it been able to drop some of its dead leaves, but in spite of it has begun its new session with rather more members than there were at this time last year. This is a very healthy sign which augurs well for the future, for it is by keeping up its strength in this way that eventually we shall have a Society of those who are interested at heart in this science in a way which will last. I think therefore we may say this year that we have not only slightly increased our membership but that we have advanced an important step towards the solidity of the Society. We have also made progress in another important direction—namely, our finances. Last year it will be remembered that our Council had to carry over to the new year liabilities to the extent of about Rs. 500 which could not be met out of that year's subscriptions, although they had exercised great economy in every branch of the work. Our Treasurer is now in the happy position of being able to say that not only have these liabilities been cleared off, but he has been able to close his accounts this year with a small cash balance and no liabilities. Although therefore we have not large sums to spare, we have paid our way, and we have all our assets to the good with which to go forward into the coming session. We also now possess a small telescope, thanks to the generosity of our Scientific Secretary Dr. Harrison, and we have a goodly number of books in our library, among them being a valuable set of the monthly notices of the Royal Astronomical Society which the Council were able to purchase from a generous donation of Rs. 100 from our Vice-President the Maharaj Rana of Jhalawar. Both as to membership

and finances therefore our position has improved and we stand more strongly on our feet than we did this time last year.

I will now turn to another question which affects our prosperity and will do so more as time goes on. I refer to the Astronomical work done by our members. In the matter of papers sent in to the Society, we have done better during the second year than we did in the first. Not only were the papers more numerous but they were full of interest, and several of them were from our members outside Calcutta. As regards observatorial work, however, there is room for the expenditure of more energy. In India we have to make our amateurs. Compared with other countries very few exist, and those that are found are often inclined to be of the arm-chair class. On looking through some old numbers of the notices of the Royal Astronomical Society, I came the other day on an address by one of the early Presidents in which he said a nation acquiring the "arts of civilization invariably commences with those which are fundamentally necessary for its support and extension. It first prescribes for the bodily sustenance, and for the social and political security of its subjects before it has leisure to attend to, or cultivation to appreciate, those arts and sciences which are ultimately as necessary to its well-being in its more refined state as were the rude arts by which its citizens were supplied with daily bread at the commencement."

It struck me how entirely true this was of India, and as we are all aware, the political stage mentioned by the speaker so many years ago has been reached. Interest in the political affairs of the country has grown by leaps and bounds, and with this indication that the country has emerged from its primary stage of civilisation, it behoves us to see that science is not left behind, for its scientific men bring esteem and respect to their country as well as knowledge. Now in scientific pursuit in England and many other countries amateurs have always taken a large share, and in the case of astronomy this is especially the case—in fact some of the most noted astronomers have been amateurs. To-day in England and other countries amateurs may be numbered by thousands, and when I use the term amateur I refer to the active amateur—the man who works at his science with the object of actually doing research work. Now in India amateurs of this class, particularly among Indians, are practically non-existent. It is certain, however, that if India waits for professional scientists to do all the work, scientific pursuits will not be common in this country for a very long time. In no country that I am aware of could professional scientists have made their country a scientific one without the growth of scientific tastes among the people, and the outward and visible sign of this growth is the

amateur. It is clear then that if India is to take its place among scientific countries of this world, this growth of scientific thought and interest must be cultivated, or—what is putting the same thing into practical form—amateurs must be made; and if they are to be of any use they must be practical amateurs; mere talkers will not carry us very far. Here, then, is the object of our Society—namely, by promoting an interest in astronomy as described in our Bye-Laws to encourage the growth of scientific knowledge. Now, ladies and gentlemen, we have reached a stage in the development of the Astronomical Society of India at which its members can and should put their principles into practise if they are really in earnest. One of the most startling things in the early publications of the Royal Astronomical Society is the large number of letters which appeared from the various members either giving the result of actual work done or discussing these results. Such letters are evidence of the fact that active work was in progress and that the members were alive and not merely an admiration society for the approval of the efforts of a few of its supporters at headquarters. This, then, must be the next move of the Society in India—active work and co-operation of members with each other by means of our JOURNALS. A number of our members now have telescopes (I may also mention that there is a firm in England which supplies telescopes very cheaply) and others have field glasses. Let those that have them, use them and give the Society the results. I propose to indicate how this can be done as a third part of my address this evening. Here I would only urge the need, after these two years spent in feeling our way, for members to begin to strike out for themselves and to make active contribution in however small a way to the knowledge which we are all seeking for. If a step onward in this direction can be taken during the coming session we ought by this time next year to be able to feel that we are members of a living, healthily growing Society which will stand the test of time. This, then, is the object I would now set before our members for the next session.

I will now briefly review some of the more important Astronomical events that have taken place during the session. Two total Eclipses of the Sun have occurred, one on the 17th April 1912 visible in France, and the other last month visible in South America. The efforts of astronomers to observe the latter were unfortunately frustrated by bad weather, thick clouds and pouring rain completely hiding the phenomenon. The Eclipse on April the 17th was, however, well seen and was notable owing to the fact that the dimensions of the distance

of the Moon were such as to only just render the Eclipse total. One of the principal results of the observations was a successful attempt to photograph the corona at the time of partial Eclipse, so that there is hope of obtaining such photographs on other occasions of partial Eclipses when the Sun's disc is nearly covered. The Eclipse was of the minimum type like that seen at Vavau in 1911.

A new Star in Gemini was discovered by Mr. Enebo in Norway on March the 12th, 1912. The Star was of about the 4th magnitude, but it varied in brightness considerably from night to night and by September had faded to the 8th magnitude. Its spectrum showed evidence of iron, titanium, chromium, manganese and nickel.

A very interesting minor planet was discovered by Dr. Palisa in October 1911. It was very small but the irregular nature of its motion led to the belief that it would be yet nearer to the Earth at certain points of its orbit than Eros which, as members are aware, was for that reason specially useful for the purpose of determining the value of the Solar parallax. Unfortunately cloudy weather occurred just after the discovery and when the planet was next looked for it could not be found. It was feared that the planet had disappeared for good, but fortunately positions had been secured on October 3rd and 4th and from them Messrs. Hayness and Pitman of Beckely, California, and Professor Franz, of Breslau, were able to complete an orbit for the body. With these positions it was possible to make a search among the photographic plates of Greenwich and three undoubted images were discovered of the planet. It is therefore once more within the ken of astronomers. Its period is about 2.6 years. Two rather noticeable comets have been found during the session, the first being detected by Brookes and proving a fine naked eye object at the end of last year with a tail 20° long. The second has lately been discovered by Gale in New South Wales on September 8th. This is still visible with moderate instrumental power in the constellation Serpens.

An event which must be noticed is the lunar exhibition which was held by the Astronomical Society of Barcelona in May this year. The undertaking was a great one for so young a society as that of Barcelona, but was a great success and led to the extension of the Society's work and the institution of a museum of astronomical objects of interest.

In conclusion must be mentioned the movement by Prof. Turner of Oxford to introduce photography into the process of observing the fundamental Stars in place of the instrumental method. Prof. Turner has placed proposals before astro-

nomers and is now putting them into practice. There are of course a good many difficulties in this use of the photographic plate, but there is no doubt that if they can be overcome as Prof. Turner hopes to do, the method will be an important advance on present practice.

I now come to that part of my address in which, as was explained last year, it is the privilege of the President to touch on some subject which he may select for the occasion. On this occasion, and especially at the present stage of evolution of our Society, I have thought it would be appropriate to draw your attention to the subject of amateur astronomy and what an amateur can do in the field of astronomical work. Firstly, then, let me say that the idea sometimes held by people that the word amateur implies something less than the best or stands, for playing at science or whatever the subject may be is very apt to give an altogether wrong impression of the matter—more especially in the science of astronomy. In England at any rate some of those workers who have contributed most to the knowledge we possess of the heavenly bodies have been amateurs. Such men were Dawes, Webb, Birt, and in our own day Elger, Molesworth, Saunder, Isaac Roberts, Derming and many others. The idea probably arises from the fact that an amateur usually is obliged to devote most of his time to the business of earning his living, and astronomy occupies what he can spare from this; also from the circumstance that he is not attached to a large observatory where large instruments are available and where the science reigns supreme. That this is a wholly erroneous idea is evident from the monthly notices of the Royal Astronomical Society alone where those who desire can read of the results of amateur labour. The fact is that astronomical work can very easily be divided into two classes—namely, that which is appropriate to professional observatories and that which is not. In the former class we have astronomical work in connection with time and with the position and movement of the Stars—that is to say, those phases of the subject which need systematic precision such as can only be attained in some observatory where these things are the daily work of the observers. It may probably be stated with fair accuracy that fifty or sixty years ago the above formed most of the work of an observatory. In more recent times the art of photography and the use of the spectroscope have largely extended their programmes; but in these respects an important matter to the amateurs must not be overlooked—namely, that professional operations are usually on a large scale. The instruments used are large, powerful and costly, and they are built for use and are used on objects altogether beyond those ordinarily at the command of amateurs. The

amateur, on the other hand in the early days of the science, devoted himself to the observations of the physical features of such of the heavenly bodies as he could reach, and it was by systematically observing details and drawing conclusions from them that he helped to add to our knowledge of the science in the remarkable way that we gather from the records of the various societies. An analogy will perhaps help us to understand the position better. In an army we have the artillery and we have also the rifle. Now, while a fortress would be beyond the power of the rifle to reduce, a rifle is eminently suitable for dealing with many other objects, and it would not pay to use artillery for purposes for which the rifle was amply sufficient. The case is precisely similar with the case of astronomical research. It does not pay to use the large and expensive instruments usually found in professional observatories on objects for which the much smaller appliances possessed by amateurs are adequate. This is a fact which the amateur astronomer of to-day does well to keep in mind, for the wonders of the large instruments of the world are apt to discourage him unless he can realise that after all they are intended for a different class of work from that on which he is likely to be engaged.

There is also another direction in which the amateur may be very easily discouraged. Is there anything left, after all the discoveries which have been made, for the amateur to find out, however zealous he may be? One is a little apt perhaps to be despondent and to think that very little remains. That this tendency is not confined to the present day, however, is evident from the following quotation from the Annual Address of the President of the Royal Astronomical Society in the year 1863. The President then said: "The times of Kepler and Newton of Lagrange and Bradley will not again return. Where they reaped the rich harvest of astronomical truth, we can but glean. We must rest content with the investigation of what has been well termed by Sir John Herschel 'Residual Phenomena.'" Evidently therefore nearly fifty years ago, despondency existed in much the same direction as it does now, and a tendency existed to consider that most that was worth having was discovered and little remained. Looking back over those 50 years, however, I do not think any one would say that such ideas were justified by the event, for I suppose few periods of astronomical history have seen such extraordinary progress or such a large number of new and important discoveries in science. The fact is that now, as then, to the man who will take the trouble to investigate it there is ample field for work and that if he seeks he will find. But he must seek. I read the other day in an article on English Athletics

a statement that nowadays in the case of some of our national games, the players were professionals and the nation were inclined to be "great watchers of the games." There is some danger of this being true of science in India. There is a tendency simply to read in the text-books, etc., about what others have done, "to be great watchers of the game" in fact instead of watchers of the heavens. On our members, then, I would urge the desirability of their taking a personal part in the work. Let them not be discouraged by the vastness of the subject or the numbers who are engaged on it. As in the year 1863, so now there is ample room for more work; as then, so now there is much to be learnt, for it is practically certain, I think, that we are very little nearer the stage of when no more remains to be known than we were then. I have shown also that there is no need for the amateur of moderate means to find himself in competition with the giant telescopes of professional observatories, but that there is a field of work and a wide one in which anyone who is inclined that way can spend his or her energies with a certainty of reaping results in due time. The motto is a simple one: "Take trouble and persevere." As an illustration of this I will give you just three instances out of many that could be named—all these amateurs. The first an amateur of very small means in Germany—Goldschmidt. This man in the fifties with nothing by way of an instrument except a 2-inch diameter telescope not made for astronomy at all, and a star atlas, discovered no less than 13 of the minor planets. He fixed his telescope to the window frame of his bedroom and there watched the heavens night after night, comparing what he saw with his atlas. Later on he was able to afford a 3½-inch telescope, but with his 2-inch he discovered planet after planet and altogether added 13 to the list out of about 60 which were known at that time. For his perseverance he received the gold medal of the Royal Astronomical Society. There was nothing difficult about this work: it was simply comparing what he saw with his atlas and thus searching for strangers. It was trouble and perseverance.

Secondly, I will mention Dr. Anderson for his discovery of new stars. His methods were even more simple than those of Goldschmidt. They consisted of spending a short time out of doors each evening and studying the heavens with a star atlas in his hands. These new stars were his reward, the last being the important one in Perseus which most of us doubtless remember.

As a third instance we have only the other day Gale in New South Wales discovering the comet which is at present in the Western sky. This is his second comet. All these

men were amateurs and all with small apparatus. Many others could be mentioned.

Now, having urged this activity on members, it will perhaps be a help to them if I point out some of the directions in which good work can be done. The class of work which an amateur can take up depends of course to a great extent on what instrumental equipment he possesses. I will suppose therefore, to begin with, that he has a telescope of say three inches aperture and that this is mounted on an ordinary tripod and not equatorially. With this, or even with a pair of field glasses, his most promising field of work would be among variable stars. Of these stars there are a large number the periods of which are still unknown, and the method of observation is easy, consisting simply of an estimation of the brightness of the star on successive dates by comparison with other stars of known magnitude near by. Members can, by applying to the Scientific Secretary, obtain a list of stars suitable for observation as well as charts of comparison stars, a very complete set of the latter having been presented to the Society by Colonel Lenox Conyningham for this purpose. From the estimations of brightness thus obtained it is then possible to follow the variability of the star in question from time to time. There is here a rich field for amateurs to work in and one which is well within the capacity of any one possessing ordinary intelligence and a small instrument. Similarly new stars and new variables can be searched for. This consists in comparing fields of stars from time to time with a star atlas and a catalogue containing known magnitudes of stars. This work is more difficult than the observation of the recognised variables and is also overlapped to a certain extent by photography. Still there is room for the search, and it was only a short time ago that an amateur (Espin) was rewarded with the discovery of a Nova in Locatu.

Perhaps the Moon is one of the most attractive bodies in the heavens to one with a small instrument. Here, in my opinion, the most useful work to be done is the observation of the positions and configuration of the greater cones and craterlets, and in the observation of the bright rays and white spots: also in the observation of the contour, position and direction of the ridges and undulations that appear on some of the large plains on the lunar surface. The object to be borne in mind should be not particularly to map these features—that has been already done—but to study the relations which they bear to other features of the Moon with a view if possible to obtaining some idea of the causes which have resulted in the formation of the surface as we see it. On a large scale some deductions have been drawn, but it seems to me that there is room

for much investigation in a more detailed way with a view to ascertaining the physical causes which have been at work. I shall be happy to help anyone with detailed instructions who would like to take up this work.

A 3-inch telescope is rather small for the search for comets, but at the same time they are not altogether out of reach. For the purpose, an eye-piece with a wide field is best, and the regions of the sky most likely to yield results are the East before sunrise and West before sunset. A comet may of course be found in other positions, but these are favourable because, as members are aware, these travellers come within our ken when they pass round the Sun in their orbits and they are also brighter at that time than at others. Examination of the constellations and comparison of suspected comets with an atlas is the method, and care must be taken not to mistake a nebula for a comet. The map will usually settle the point, but in any case the re-observation of the object on one or two subsequent dates will do so, for if it is a comet its movement among the stars will then be apparent. The surveying of constellations in this way is a very fascinating pastime and well worth the trouble of comparison with an atlas in any case and all parts of the sky. An eye should of course be kept open for *Norce*; and a fairly bright star not shown in a good atlas is worth paying attention to. Nor need those who have no instruments at all be hopeless. There is not only much of interest to be seen, but much in some directions to be done. In this country we have advantages in one respect not often enjoyed by those in Northern latitudes. I refer to the *Zodiacal Light*. Not much is known of this at present. It is frequently visible as a warm-tinted wedge-shaped light in the West after sunset and also in the East before sunrise. The configurations of this light require study and little has been done to ascertain them. Again, the excellent lunar photographs which are now available afford great scope for work on the Moon by those who have no instruments; and they have the advantage of being available in the daytime and not necessitating any special arrangements. I contributed a short paper on this matter last year which will be found in the *JOURNAL* of this Society, and I am sure that there is a field of work in the examination and cataloguing of the craterlets and crater cones which will yield results worth having. I shall be glad to help anyone who will communicate with me about this.

The above are some of the directions in which work can be done, and what I should like to point out is that this work can be undertaken with the expectation of getting results. It is disheartening to put labour into a thing the prospect of the

result of which is dim ; I do not think, however, if our members seriously get to work that they will have to complain of this for very long. On the other hand I think it is likely that we shall have the results of their labours for discussion at our meetings and in our JOURNALS.

This is the last address which I shall have the pleasure of making from this chair, and I have been glad of the opportunity to be able to present this matter to you. I trust that in the coming year my successor will have much of the work of members through his hands, thus making for the success and solid prosperity of the Society.

MALAKAND,
N.-W. F. P.,
10th August 1912.

To

THE EDITOR,

Journal of Astronomical Society of India.

SIR,

I see in the May number of the JOURNAL there is a question as to Mercury being the only twinkling planet. I would like to mention that on several occasions in December 1907 I saw Venus twinkling, when as much as 20° above the horizon. This was in Baluchistan—one of the driest countries in the world—and I am inclined to cite as the reason the intense radiation that takes place from the rocky soil after sunset. I may be wrong, but would be glad to know if any other members have observed a similar phenomenon.

Yours faithfully,
F. C. MOLESWORTH.

NOTE.—I have also seen the phenomenon described above, and if Capt. Molesworth refers to the rocky soil *on the Earth*, which I presume is the case, the cause given by him appears to me to be correct. I have also sometimes put down the twinkling to hot air currents arising from smoke, etc.—H. G. T.
