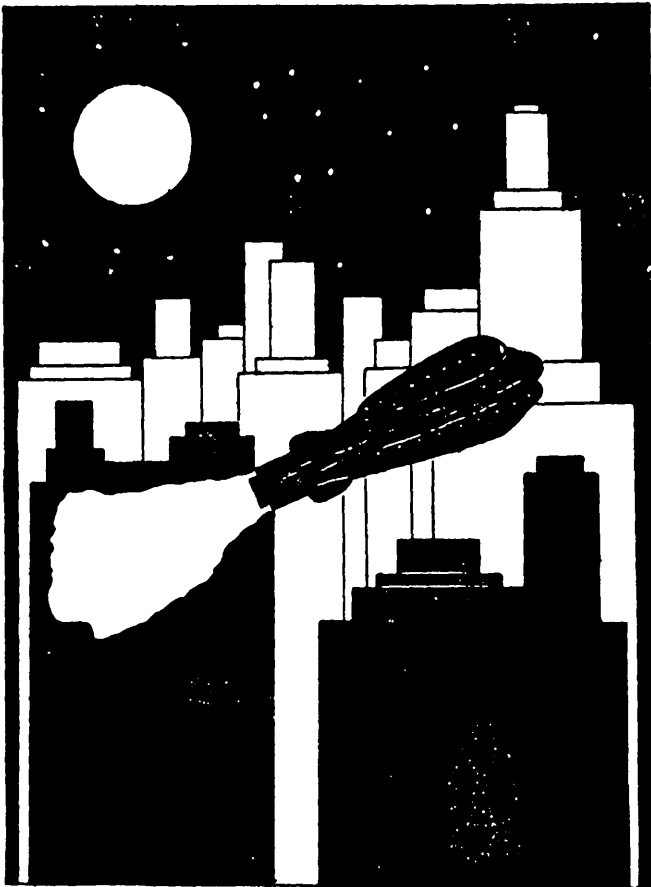


*Journal of the  
British Interplanetary Society*



JOURNAL OF THE  
**British Interplanetary Society**

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## ROCKETRY IN GERMANY

By *WILLY LEY.*

IT is not easy to trace the development of rocketry in Germany. Progress has resulted not from the efforts of a single person, or a single group of persons, but from the research of many experimenters working both individually and collectively. Moreover, the various groups, especially in the past, have not always been able to agree with each other. Even to-day, as will be seen, opinion is still divided over the important question of fuel. Perhaps the best method of approach will be to treat the subject from an historical point of view, though the "history" of rocketry in Germany does not go back much more than a quarter of a century.

The first disciple of the rocket, or rather, of space travel, in Germany, was a well known but unhappy inventor, Herr. Hermann Ganswindt. It is of interest to note that Herr. Ganswindt still lives. He resides in a suburban district of Berlin, and is now 76 years of age. He tells me that, as a young man many years ago, he stumbled across the fact that a reaction motor (such as a rocket) was quite as effective in the absence of air as in its presence. As a student of physics, he should have already known this, but apparently this important fact had previously escaped his memory. Incidentally, it is surprising, even to-day, the number of people who are obsessed with the fallacious idea that the exhaust gases of a rocket motor must have air to "push against."

As a result of his accidental "discovery," he reasoned that he had found a way to propel and control a vessel in outer space. Ganswindt actually constructed a real space ship, and many of its features were in advance of numerous designs which other workers produced later.

Unfortunately, Ganswindt was kept busy designing air-ships and helicopters, and he had but little time to devote to his rocket ship. At this period, too, he was touring the country delivering scientific lectures, and on many occasions he made reference to the possibilities of space travel in a rocket-driven vessel. In nearly every case his audience ridiculed the suggestion. He was deemed mad, and his reputation as an inventor in other spheres suffered accordingly. This was in the year 1891. Poor Ganswindt. He paid the price which the people of this world demand of every pioneer.

About twelve years later, a scientific theory of space travel was advanced by a Russian author, Konstantin Edouardovitch Ziolkowsky. Ziolkowsky's first book was followed by others, and eventually, after much interest had been aroused in Russia, his writings attracted attention in Germany.

Then came the world war, and in its wake, the years of hunger and monetary inflation which followed the armistice. Rocketry was temporarily forgotten. Revivication occurred with the publication of a booklet by Prof. Herman Oberth entitled "Die Rakete zu den Planetenraumen." Oberth had never heard of Ganswindt or Ziolkowsky. And strangely enough, no sooner had his book been published, than he

received from America a report of Dr. Goddard's invaluable researches. This was a paper entitled "A Method of Reaching Extreme Altitudes" (Washington, 1919). The science of rocketry was again attracting the attention of far-seeing investigators, and on this occasion it had come to stay!

The publication of Prof. Oberth's book was the real beginning of rocketry in Germany. It was immediately followed by many other publications from various sources, some of which were good, but the majority of which were not.

The first real advance occurred in 1927, when Max Valier, a pupil of Prof. Oberth, together with Ing. Johannes Winkler, founded the German Interplanetary Society. It was not long before all the pioneers of rocketry in Germany were members of this Society. A monthly bulletin, entitled "Die Rakete" (The Rocket) was published, but in 1929 it was stopped owing to lack of funds.

Practical work began in earnest in 1928, and it was then that various schools of thought arose. Valier successfully interested Fritz von Opel, the owner of a large motor car factory, in the possibilities of rocket-driven cars. As a result, several cars were produced. They were propelled by large powder rockets made in the factory of Ing. V. W. Sander. In the same year, the first rocket glider of the Rhon-Rossitten-Gesellschaft successfully flew for a distance of about one mile.

Then von Opel and Sander constructed rail-road cars, and Valier, working with another firm of rocket manufacturers, did the same. These experiments, however, were not attended with any marked success, nor were they viewed with favour by a certain section of the rocketeers. And for two reasons. First, rocket cars, due to the inefficiency of the rocket motor at the comparatively low speeds obtainable in the presence of an atmosphere, are not a commercial proposition. It was contended that better progress could be made by developing aerial rockets. And secondly, the use of powder fuel was severely criticised. I will explain why in a moment.

While this controversy was taking place between the opposing factions, a well known German authoress, Thea von Harbou, wrote a novel entitled "Frau im Mond" (The Girl in the Moon). The novel was based on Prof. Oberth's book, and also a book of mine entitled "Die Möglichkeit der Weltraumfahrt" (The Possibilities of Space Travel).

Fritz Lang, of the U.F.A. films, made the novel into a picture—it was the last great silent film of the Fritz Lang Productions. Prof. Oberth was called to Germany to supervise the scientific side of the production, and the U.F.A. announced that they were prepared to pay the cost of constructing a real altitude rocket. Oberth set to work. But no one can produce an invention in a limited time, and before he had completed his task, he was obliged to return to Rumania. So the large rocket, about which much had been written in the press, was not shot.

And now a few words about the fuel controversy. As I have already mentioned, the rocket cars of von Opel and Valier were propelled by

powder rockets, and this despite the fact that Oberth had shown in his book, as long back as 1923, that liquid fuels were not only more powerful, but much safer, too.

The power of a rocket motor is dependent more on the *velocity* of the exhaust gases than their quantity. Consider the following formula :

$$v=c. \log_{\text{nat.}} M_0/M_i$$

where

v=the velocity of the rocket.

c=the velocity of the exhaust gases

$M_0$ =the weight of the rocket before the fuel is burnt

$M_i$ =the weight of the rocket after the fuel is burnt.

It will be evident that the vital factor is to increase c. The following are the values obtained for c with four different fuels :

Ordinary powder	...	...	...	...	800 m/sec.
Gasoline and liquid oxygen	...	...	...	...	2,000 m/sec.
Alcohol and liquid oxygen	...	...	...	...	2,200 m/sec.
Liquid hydrogen and liquid oxygen	...	...	...	...	4,850 m/sec.

When the German Interplanetary Society started its experiments, it was agreed among the members that only liquid fuels should be used. The U.F.A. rocket had been designed for liquid fuel, and after Prof. Oberth's departure, the Society expressed a desire to carry on with the work. It soon became evident, however, that not only was the U.F.A. rocket too large to experiment with, but that the project was too ambitious from the point of view of cost. So, regretfully, the experiment was abandoned.

Then it was that the plan of constructing Miraks (literally, minimum rockets) became a feature of the German experiments. By this means—the construction of small compact models—it was found possible to carry out numerous experiments, using a variety of fuels, with a minimum of expense.

Just before the first Mirak was built a tragedy occurred. Max Valier, who had just begun experimenting with liquid fuels for a new rocket car he had built, was killed. His death occurred on May 17th 1930, and was caused by the explosion of one of the rocket tubes. Thus did the new science claim its first victim.

The Mirak programme of the Society proved very successful. Three models were built and tested, and each succeeding model showed a great improvement on its predecessor. I must explain that these Miraks did not ascend. The testing was carried out in a stand, specially constructed for the purpose, and in which, by means of suitable measuring instruments, the "lift" of the motor was measured.

Just when it had been decided to shoot the third Mirak, Herr. Riedel, one of the engineers of the Society, devised a new and much less complicated rocket—designed for liquid fuel, of course. The new plans were adopted, and I named the new rocker "Repulsor" in order to distinguish it from the powder rockets and the Miraks.

The first Repulsor was shot on May 7th 1931, at the Raketten-flugplatz (Rocket flying field), the testing grounds of the Society near Berlin. Further improvements in design quickly followed. Soon the Repulsors attained an altitude of one kilometre, and travelled a distance of  $3\frac{1}{2}$  kilometres, using only one kilogram of fuel.

Meanwhile, other experimenters had also been busy. Ing. Winkler shot his first rocket in March, 1931. He used methane and liquid oxygen for fuel. But his second shot, which took place in October of the following year, was not successful. The rocket exploded just after firing.

It was in 1931, also, that Ing. Reinhold Tiling introduced a new type of rocket. The body of the rocket was winged, and the machine glided safely to earth at the end of its upward flight. Tiling, however, used powder fuel, the inherent instability of which was tragically demonstrated last October, when Tiling himself, and Angelika Buddenbohmer and Friedrich Kuhr, his two assistants, were fatally injured as a result of the sudden detonation of not less than 18 kilograms of his fuel.

Ing. Fritz Schmiedl, an Austrian inventor has, however, turned powder propelled rockets to practical account. He actually conveys letters by means of a rocket postal service which he operates near Graz, Austria. The district is very mountainous, and the rockets travel from one town to another in as many minutes as it would take an ordinary postman hours to cover. It cannot be denied that in this instance, the powder rockets are a success, but this is because they are essentially a product of environment.

That, in brief, is an outline of the work that has been done up to date in Germany. Without doubt, the greatest advances have occurred during the last five years. The reader may think them little enough. Actually, the importance of these experiments cannot be over-estimated. We have learned many important things, not the least of which is the necessity for liquid propellents. We are convinced that it is in this direction, and in this direction only, that success lies. Moreover, the lessons we have learned from our small models have taught us many of the requirements of larger models. In this connection, however, there is still theoretical work to be done, and this is having our immediate attention. Soon we hope to recommence practical work, on a larger and a better scale than ever before.

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## EDITORIAL

By P. E. CLEATOR.

### *The New Journal.*

THE greatly increased size of the Journal should be a source of satisfaction to all members. In this connection, the Society is greatly indebted to Messrs. J. and C. Moores Publicity Limited, the Publishers, whose many suggestions and generous help have made this innovation possible.

Let me say quite frankly that our present membership does not warrant such a large publication at this. Quite brutally, we cannot afford it. Its appearance in its present form is by way of an experiment, conducted in the hope—and in the belief—that it will be of material aid in our constant efforts to increase membership. And as I am more or less responsible for this revolutionary and costly change, let me attempt to justify my action.

The tremendous importance of a substantial and interesting journal was brought home to me during my conversations with the German experimenters. In the year 1929, the old German rocket society, the Vereins für Raumschiffahrt E.V., ceased the publication of their journal, Die Rakete. The immediate result was the loss of over six hundred members! It happened like this: there came a time when the Society had to choose between publishing the Journal and carrying out certain important and costly experiments. Eventually, it was decided to sacrifice the Journal. Now the new programme was all very well for those members who happened to live in Berlin, for they could take part in, or witness, the experiments. But not so the majority of the members, who were scattered throughout the country. With the loss of the Journal, they were deprived of their only real link with the Society.

The moral is clear. The Journal of a Society constitutes a vital connecting link. The Germans, of course, fully realise this now. The Journal must come before experimental work. Re-organisation has now taken place, and the new Society, the E.V. Fortschrittliche Verkehrstechnik, has just begun the publication of another journal, Das Neue Fahrzeug.

The regular appearance of a Journal, even if it is only a quarterly one, like this publication, is of prime importance, and every effort will be made to maintain, and eventually better, this arrangement.

### *Among the German Experimenters.*

My tour of the rocket enthusiasts in Berlin and other parts of Germany in January last has proved very fruitful. Unfortunately, lack of space will not permit an account of my many meetings and conversations with them, or of my visit to the famous Raketenflugplatz (Rocket flying field) at Reinickendorf.

My outstanding recollection is the hospitality extended to me by Herr. Willy Ley. During the two days I was with him, we dined together, toured Berlin together, and all the time the conversation was centred round rockets and rocketry. And not only was I able to induce him to become a Fellow of the Society, but he promised to contribute to the Journal. Hence his article in this issue.

Herr. Ley is but twenty-seven years of age, having been born in Berlin on October 2nd, 1906. Yet he is an acknowledged and world-renowned authority on rocketry. He is the official German representative of no less than eleven foreign rocket societies. He knows, and has met, practically everybody of note in the rocketeering world, and he has an extensive knowledge of foreign languages.

Apart from taking an active part in the German rocket experiments, he is a prolific writer, and has several books, and countless articles on rocketry to his credit.

#### *An International Rocket Society?*

Thanks to Herr Ley, I was able to obtain introductions to many of the leading experimenters throughout the world. The result was very gratifying, many well-known rocket experts having since joined the Society. I find it difficult to express how greatly this interest is appreciated. Here are famous men freely devoting their valuable time to an immature foreign organisation, while our own countrymen, for the most part, have evinced not the slightest interest. Such generosity of action not only exemplifies the true international nature of the scientific spirit, but it shows a sympathetic understanding, born of bitter experience, of the difficulties of raising a spark of interest in the interplanetary idea.

And now from New York comes an invitation from Mr. G. Edward Pendray to join an international rocket society which he is organising. Needless to say, I have taken full advantage of this generous offer. And it is a generous offer, for we stand to gain much without yet being able to offer anything in return. It will mean a free exchange of vital information between the rocket societies of the world. Rocketry, as a whole, will benefit enormously.

#### *Experimental Work in England.*

No one is more eager than I am to organise and to begin our share of actual experimental work. But I have now become resigned to the fact that we cannot hope to do this until membership is greatly increased, or until we receive financial aid from some outside source. We are exploring both avenues. Everything that will increase membership is being done. Public lectures, written articles, newspaper interviews, and helpful comments in a variety of publications are all evidence of this. We have, I almost think, received more publicity than we deserve, yet the results are not exactly encouraging. The fact that we have just doubled our membership during the last three months does not amount to much when it is remembered that our initial



membership was fifteen ! But what has been done in Germany and America, to mention but two countries, can surely be done here. It is a question of time and, unfortunately, money.

*The Attitude of the Government.*

Our efforts to obtain outside help have, as might be expected, proved unavailing. The Government provides a typical example. The Air Ministry evinced not the slightest interest. The Under Secretary of State, while refusing to discuss the matter at all, made the following rather illuminating statement :

“ We follow with interest any work that is being done in other countries on jet propulsion, but scientific investigation into the possibilities has given no indication that this method can be a serious competitor to the airscrew-engine combination. We do not consider that we should be justified in spending any time or money on it ourselves.”

It is comforting to learn that rocketry is receiving some official notice, even though the eyes of officialdom appear to be staring anywhere but in the direction of England. But I am very curious as to the nature of the scientific investigation referred to. The great joke is that the rocket motor has never been portrayed as a competitor to the internal combustion engine and the propeller. The rocket motor only comes into its own in the vacuum of space, or in atmospheres of extreme tenuity, where the propeller is of no use at all. Apparently everybody is aware of this elementary fact except the Government, who, it would seem, have already spent time and money—the very act they deplore—in drawing a meaningless comparison between the two methods of propulsion. In the meantime, the Under Secretary of State refuses to discuss the matter. . .

While we are on the subject, let us go back twenty-six years. We find that in the year 1907 the Wright Bros. of America had produced an aeroplane of such advanced design that it could travel at forty miles an hour for a distance of over a hundred miles—an unheard of achievement in those days. They offered machines of this type to the authorities of this country. The War Office merely stated that they were not disposed to enter into negotiations with any manufacturer of aeroplanes. The First Lord of the Admiralty went one better. His reply to the Wright Bros. was as follows:—

“ I have consulted my expert advisors with regard to your suggestion as to the employment of aeroplanes and I regret to tell you, after the careful consideration of my Board, that the Admiralty, whilst thanking you for so kindly bringing the proposals to their notice, are of the opinion that they would not be of any practical use to the Naval Service.”

There can be no doubt about it; history does indeed repeat itself!

## INTERNATIONAL INTERPLANETARY NEWS

### AMERICA.

Mr. L. E. Manning, President of the American Interplanetary Society, writing from New York City on January 26th, announces the construction of two test rockets which it is hoped will be shot before the end of April.

Of these, the first (designated Experimental Rocket No. 3) is being constructed by Messrs. Bernard Smith, G. Edward Pendray, and Alfred Africano. This model, which, for the exception of the fittings, will be constructed entirely of aluminium, has several unique features. A special thrust augmentser, based on the calculations of Prof. Alexander Klemin, director of the Guggenheim School for Aeronautics, is included in the design.

The second model (designated Experimental Rocket No. 4) is being constructed by Mr. John Shesta, in collaboration with Messrs. Laurence Manning, Carl Ahrens, and Alfred Best. To quote from the official description, "It is a multi-nozzle tandem-tank rocket, with an ingenious landing gear resembling the four-bladed wing of an autogyro."

Yet a third model (No. 5) is being constructed. Designed by Messrs. H. Franklin Pierce and Nathan Carver, its unique construction has necessitated the building a new proving stand. It will probably be some months before this rocket is ready for actual shots.

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Mr. G. Edward Pendray, who did so much toward the formation of the American Interplanetary Society, is now proposing to organise an international rocket society. It will be remembered that the American and German groups signed a co-operative agreement in Berlin on April 12th, 1931, in order to facilitate the exchange of all information pertaining to rocket experiments. Mr. P. E. Cleator, on behalf of the British Interplanetary Society, has expressed a keen desire to participate in the new scheme, and full details are expected in the near future.

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At the forthcoming annual meeting of the American Interplanetary Society, which is to be held on April 6th, there is a possibility that the name of the Society will, by vote, be changed to "The American

Rocket Society." Should the change in name take place, it will be a change in name only. It will in no way imply that the interplanetary idea has been abandoned. The reason for the proposed alteration is that certain members are of the opinion that the term "Interplanetary" is unattractive to many potential members.

### AUSTRIA.

Herr. Ing. Guido Pirquet, of the Osterreichischen Gesellschaft fur Raketen-technik (Austrian Society for the technique of Rockets) is now a Fellow of the British Interplanetary Society.

Herr. Ing. Pirquet has kindly given permission for an interesting extract from his inaugural speech, delivered in Vienna on April 16th, 1931, on the occasion of the formation of the Austrian Society, to be published in the Journal. It will probably appear in the next issue, under the title "An Introduction to the Problems of Cosmonautics."

o o o o

Herr. Ing. Dr. Eugen Sanger, of Vienna, announces in a letter dated March 5th, that he is working on extremely fast aeroplanes, rocket driven. Full details of these experiments have been promised in due course.

### ENGLAND.

Mr. P. E. Cleator, President of the British Interplanetary Society, has been honoured by the E. V. Fortschrittliche Verkehrstechnik, the famous German group of rocket experimenters. Mr. Cleator has been made an official British representative.

o o o o

Mr. N. E. Moore Raymond, Founder Fellow of the British Interplanetary Society, has just left Manchester for London, where he will continue his duties as scientific correspondent for the *Daily Express*.

Arrangements are being made for his story, "Mutiny on the Moon" to appear in book form at an early date.

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Mr. F. Haydn Dimmock, Editor of *Scoops*, recently gave Mr. P. E. Cleator the opportunity of replying to an article decrying the interplanetary idea. The two articles, entitled "Shall we ever Travel to the Planets?" and "We *Shall* Travel to the Planets," appeared in *Scoops* for March 24th and March 31st respectively.

Efforts are being made to establish radio communication between members of the world's rocket societies. In this connection, the British Interplanetary Society is represented by Mr. C. H. L. Askham, Vice-president (G6TT) and Mr. J. Davies (G20A). Both work on 7074 kilocycles (40 metres) and 14148 kilocycles (20 metres). An announcement to this effect will be published in the next issue of the *Das Neue Fahrzeug*. Those interested, whether in this country or abroad, should communicate with the Secretary of the British Interplanetary Society.

### FRANCE.

Monsieur Robert Esnault-Pelterie, the famous French savant, and one of the pioneers of interplanetary travel, is now a Fellow of the British Interplanetary Society.

He sailed for America on March 7th on a visit to members of the American Interplanetary Society in New York. He has promised to contribute to the *Journal* on his return.

### GERMANY.

Herr. Willy Ley, Vice-President of the E.V. Fortschrittliche Verkehrstechnik, is now a Fellow of the British Interplanetary Society.

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*Das Neue Fahrzeug* is the name of the official *Journal* of the German Group, the publication of which has just commenced. The first issue, dated February 28th, contains an account of the formation of the British Interplanetary Society. At present, the *Journal* will appear every two months.

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Herr. Werner Brugel gave a broadcast on the subject of interplanetary travel from Frankfurt Station on February 14th. At the request of Mr. P. E. Cleator, he concluded his lecture with a message in English, which was as follows :—

“Ladies and gentlemen, dear friends : I am very glad to speak to you to-day regarding a problem which occupies us so much, and for the solution of which we are ready to do our best. We are at present at the beginning of a new era in the history of rocket navigation. It will be marked by effective co-operation of all those concerned with rocket research work.

“As to this, I am taking this opportunity of proposing the formation of an international union for space navigation. I

am sure that this proposal will have your full interest, and that it will in a considerable degree contribute to the success of the first voyage into space. Hoping that you have had a good reception of my lecture, I say good-bye, wishing you all the best for your coming work."

### U.S.S.R.

Dr. Jakow I. Perlmann, of Leningrad, is now a Fellow of the British Interplanetary Society. This distinguished scientist is a scientific collaborator at the Leningrad University Observatory.

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## THE PRESS :

### AN APPRECIATION—AND A PLEA

By P. E. CLEATOR.

**T**HERE is every indication that in the Press—and by the Press I mean not only the newspapers, but journals and magazines also—the British Interplanetary Society has a staunch and interested supporter.

It was my original intention to give a full list of the publications which have brought the Society to the notice of their readers, but I now find that the exigencies of space will not permit.

I trust that it will suffice, therefore, if I merely state how greatly these helpful comments are appreciated. They have resulted in numerous enquiries and not a few members.

The nature of the comments has varied widely. Particularly do I remember the inimitable (though kindly) humour of the Scribe in the *Autocar*. On the whole, the majority of the descriptions have been pleasingly accurate. But I am not likely to forget one or two examples which were not.

The fact is that a slight lapse—technically known, I believe, as journalistic licence—has occurred on more than one occasion in the newspaper world.

Without wishing to appear ungrateful, I feel constrained to assert that there is *not* a distinct possibility that Mars may be annexed to the British (or any other) Empire in the not too distant future.

Exaggerated statements of this sort do great harm. I appeal, therefore, for reports which are at least consistent with current progress. To those who have been revelling in fictitious accounts of impending Lunar voyages, the real facts will undoubtedly appear prosaic. But I do think that extravagant statements of the type I have just mentioned only serve to alienate potential support.

### NEW MEMBERS.

The following new members were elected during the months of January, February, and March of this year:—

#### *Fellows.*

ILSE KUHNEL ... ..	Dusseldorf.
WILLY LEY ... ..	Berlin.
ROBERT ESNAULT-PELTERIE ...	Boulogne-sur-Seine.
ING. GUIDO PIRQUET ... ..	Vienna.
Dr. JAKOW I. PERLMANN ...	Leningrad.

#### *Members.*

Captain B. H. C. COTTON, R.E.	West Bergholt and London.
K. M. GIBBS ... ..	Weston-super-Mare.

#### *Associate Members.*

WALTER DUNBAR ... ..	Birkenhead.
IAN JACK ... ..	Glasgow.
GEORGE A. DAY ... ..	Edgware.
SYDNEY KLEMANTASKI ... ..	London.
VICTOR JOHNSON ... ..	Liverpool.
JOSEPH LAFFON ... ..	Dublin.
JOHN WRIGHTON ... ..	Winnipeg.

The annual subscriptions for the three classes of membership are: Fellowship, £2 2s. 0d.; Membership, 10 6d.; Associate membership, 5 -.

All classes of membership are open to both sexes, and all members receive free copies of the *Journal of the Society*.

Ordinary meetings of the Society are held fortnightly in winter, and monthly in summer, at which time addresses on all phases of the activities of the Society are presented by members and invited speakers.

For full particulars and Membership Application Forms, address all enquiries to:—

THE SECRETARY,  
THE BRITISH INTERPLANETARY SOCIETY,  
34, OARSDRIVE,  
WALLASEY, CHESHIRE, ENGLAND,

*or to*

L. J. JOHNSON, Esq., *Secretary*,  
THE BRITISH INTERPLANETARY SOCIETY,  
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BY P. E. CLEATOR, A.M.I.R.E., A.M.I.E.T., F.R.S.A.,

*President of the British Interplanetary Society,*

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