

said. He must admit that when he entered on the office of President he did so with a great deal of diffidence; but, thanks to the kindly assistance of a good Council and of the standing officers of the Society—especially Capt. Jeffreys—he had managed to get through the year, he thought, fairly satisfactorily. Members had been kind and indulgent to him, had overlooked his faults, and he thought they could look back on the year that had passed with a certain amount of satisfaction. A large number of good papers had been read, and the Society generally had had a satisfactory year; but he disclaimed that he had had very much to do with it; he thought the Council had had far more to do with it than he. He wished to say, regarding the incoming Council, that he thought he could congratulate the Society also on having a strong Council for the coming year, headed by Mr. Woodburn. He thanked them very heartily. (Applause.)

HON. AUDITORS, LEGAL ADVISERS AND TRUSTEES.

The President pointed out that it was necessary to elect Hon. Auditors, etc., for the coming year. The Hon. Auditors at

present were Messrs. Alex. Aiken & Carter; also their Hon. Legal Advisers were Messrs. Van Hulsteyn, Feltham & Ford, and there were also the Trustees of the Research Endowment Fund—Messrs. Aiken and R. T. Ford. He thought they could safely leave the re-election of these gentlemen, and, at the same time, thank them for their services during the past year. He, therefore, had pleasure in moving the re-election of the Hon. Auditors, Hon. Legal Advisers, and of the Trustees of the Research Endowment Fund.

Mr. J. A. Woodburn seconded.

Declared carried unanimously.

ANNUAL DINNER.

The President said, before proceeding to further business on the agenda, he had an announcement to make regarding the Annual Dinner. It was proposed to hold this on the 25th August next, when the Minister of Mines expected to be present. They therefore trusted that a large number of members would apply for participation in this dinner, and that they would turn out in strong force on the occasion.

A NEW PLATINUM MINERAL IN THE RUSTENBURG NORITES.

By R. A. COOPER.

During the past year numerous research chemists have been experimenting with the platiniferous norites of the Rustenburg district of the Transvaal, and as reports of their work have been received, an outstanding feature has been the curious diversity of opinion as to the form in which the platinum metals exist in the ore.

When work commenced on this ore in the Rand Mines' Laboratory, only a minute quantity of the native platinum "metal" was available, and, after visual examination and determination of the fact that it was insoluble in aqua regia, it was assumed for the time that the material was the platinum arsenide "sperrylite."

It was then known definitely that in some similar ores from other districts, sperrylite is the predominating form of the platinum, and the possible presence of another similar compound was unsuspected.

A little later, however, information was received from three independent sources that

the "metal" had been separated and found to (a) contain no arsenic; (b) contain arsenic; (c) consist simply of metallic platinum. It, therefore, appeared certain that the various investigators had either succeeded in separating different materials, which was improbable, or else this "metallic" material offered peculiar difficulties in analysis.

Sperrylite is difficult to test, owing to its relative insolubility in acids, but if sufficiently finely ground, enough can be dissolved by aqua regia in a few hours to give entirely satisfactory qualitative tests. When flotation concentrates became available recently, a quantity was treated with dilute nitric acid to dissolve the base metal sulphides, and the insoluble gangue was carefully washed until a perfectly clean residue of "metal" was obtained.

This was found to have a brilliant metallic lustre, and to be very like sperrylite by ordinary observation under the microscope.

It was, however, distinctly more easily crushed than sperrylite, and even after being rubbed to impalpable powder, it was so nearly insoluble in concentrated aqua regia after many hours' treatment that only traces of platinum were found in solution.

No uncombined platinum could be found in this material. Small portions of the "metal" were fused with a little sodium peroxide, and the melt dissolved in dilute hydrochloric acid. The resulting solution was examined for base metals, but only a minute quantity of arsenic was found, quite insufficient to confirm that the material was sperrylite. It was noticed during these tests that some decomposition of the platinum compound took place on heating, and that gas was evolved before the small amount of peroxide used had commenced to fuse.

A fresh portion of compound was roasted in an oxidising atmosphere, and the residue found to be almost purely metallic, largely soluble in aqua regia, and the solution free from base metals. A quantitative determination was then carried out by igniting the substance in a hard glass tube with a stream of oxygen passing through, the exit gases being scrubbed with acidified bromine water.

By this means it was found that the evolved gases consisted of a mixture of the oxides of arsenic and sulphur. The characteristic smells which these gases have apart, are not obvious in the mixture.

It is probably due to the dissociation of the compound at a comparatively low temperature—below red heat—that such conflicting results have been obtained. After a very moderate application of heat the compound mostly converts to metallic platinum, and even in the original material, the arsenic forms only a small percentage. Analyses of material obtained as described above from flotation concentrates have now been confirmed on a considerable quantity of the same compound obtained by careful gravity concentration of $1\frac{1}{2}$ tons of ore. The compound is a sulpharsenide of platinum and contains:—

Platinum	64.2%
Palladium	9.4%
Sulphur	17.7%
Arsenic	7.7%

The platinum, sulphur and arsenic together conform to the formula $Pt. (S.As)_2$.

The proportion of palladium present in the two lots of material analysed was ap-

proximately constant, but this may be due to chance, as the total amount of palladium in the original ore greatly exceeds the proportion shown above.

It is known that the majority of the palladium exists entirely independently of the platinum, and that included in the above analysis is probably due to the difficulty of making a clean separation.

The form, or forms, in which the palladium is originally present, has not yet been finally determined, but it appears to be very unlikely that any of the antimonide found by Mr. Adam in the Potgietersrust district exists in the Rustenburg ore. No trace of antimony can be found in any material so far examined.

At the same time it is interesting to record that sperrylite crystals obtained from the Potgietersrust district were found to be entirely free from any trace of sulphur.

It has been possible, during the last few days, to confirm the existence of platinum sulpharsenides occurring in an entirely different mineral deposit and to obtain the analysis of this distinct variety. Mr. J. Craighead, of the Rand Mines' Laboratory Staff, noticed that the insoluble platinum in the output from the Onverwacht Dunite deposit had shown a decided increase as the workings decame deeper.

He has now investigated the composition of this insoluble platinum and found it to be also a sulpharsenide, of the following composition:—

Platinum	59.3%
Sulphur	3.7%
Arsenic	36.9%

This material approximates much more closely to normal sperrylite, but is nevertheless distinct.

During the working of the dunite pipe, the proportion of this mineral has increased from not more than traces at first, until at present it forms approximately 15% of the output of "fine crude platinum." (That is, of the platinum which will pass through a 30 mesh linear screen). The coarse grains of native platinum occlude very little of this sulpharsenide. As the percentage of arsenic in the mineral increases, it becomes increasingly difficult to decompose the compound by roasting, so that preliminary heat treatment alone cannot be relied upon to render the platinum completely soluble in acids.

Under the microscope sperrylite is characterised by its brilliant tin-white colour and remarkably perfect crystallisation in the cubic system, while the new sulpharsenide is of a more greyish steely colour, and is usually in irregular fragments or very complex crystal forms with occasional elongated rectangular rods.

In conclusion, I would like to acknowledge the help given by Mr. F. W. Watson in this work, and the constant encouragement of Mr. K. L. Graham, of the Central Mining/Rand Mines Group, by whose permission this note is published.

The President remarked that a paper of the character just read by Mr. Cooper, of course, admitted of very little discussion. It was new information to them regarding a new mineral, so he did not suppose the author was expecting much discussion on it; but they were, nevertheless, indebted to him for coming along and giving them information regarding this new mineral. No doubt many of them would remember the interest that was taken on the discovery of those very large crystals of sperrylite a couple of

years ago amongst the platinum minerals of the Bushveld rocks. It astonished the world that sperrylite should occur in such large and beautiful crystals. Now they had another mineral which had been discovered, and he had no doubt, in the course of time, there would be further discoveries of a similar character. He had no doubt also that papers on platinum would loom largely in future discussions before the Society—especially when it came to the question of the metallurgy of platinum. He had much pleasure in moving a hearty vote of thanks to Mr. Cooper for his paper.

Mr. Wartenweiller, in seconding the vote of thanks, expressed the Society's appreciation that Mr. Cooper had been enabled to give them particulars of this new platinum mineral. He thought it reflected distinctly to his credit, and he was to be congratulated. It had been suggested that as he had been the discoverer of the new mineral, it might be named, for instance, Cooperite. He was only offering it as a tentative suggestion.

EFFICIENCY IN HYDRAULIC CURRENT CLASSIFICATION OF FINELY-CRUSHED ORES.

By the LATE T. GRAHAM MARTYN. Edited by W. E. JOHN.

Mr. W. E. John: Mr. President and Gentlemen.—As you will have seen from the agenda, this is not my paper. Mr. Martyn, as you know, died some time ago after completing his almost life's work—his Classifier. I was overseas at the time, I believe, and when I came back recently Miss Martyn and some of Mr. Martyn's friends put his papers before me and asked me to collect his ideas from them so that his work should not be lost. With the permission of Miss Martyn, the sister of the author, and at the request of some of his friends, this paper is prepared. The bulk of the paper was found in very rough draft, but evidently written for publication. The result of my work is before you, after the most careful study of Mr. Martyn's notes and papers. I hope my interpretations of any obscurities are the correct ones. The original manuscript of the author has been followed as closely as possible. In bringing his notes together, Mr. Martyn described, first of all, what he meant by "hydraulic water," saying that it was rather an absurd expression

and that he would have preferred "pressure water." He then goes on to describe how he was led to take up the subject of classification. He was given, or handed, a device for washing foundry sweepings, and asked how that would do in Cornwall for separating out tin. He found the device very crude. I have tried to illustrate it in diagrammatic form.

This paper is divided into twelve sections:

- I. The Problem of Classification—Cornish Tin Slime.
- II. The Separation of Slime from Heavier Materials.
- III. Early Machines and Processes.
- IV. The Fall of Particles—Hindered and Unhindered—in Liquid.
- V. Concentrates made from Classified Products.
- VI. Slime Separation before Classification.
- VII. Separating Fine Particles first and the Heaviest Particles last.