

CHEMISTRY

Chromium and Uranium

"A Classic of Science"

One Was Named for the Beautiful Colors of its Salts,
The Other for the Newly Discovered Seventh Planet

Chromium

ANALYSIS OF THE RED LEAD OF SIBERIA; with Experiments on the new Metal it contains. By Citizen Vauquelin. (Memoir translated from the Journal des Mines, No. xxxiv). In Nicholson's Journal of Natural Philosophy, Chemistry and the Arts. Vol. II, London: 1798. This is an exact reprint of extracts from this original publication.

THE FOSSIL known by the name of red lead was discovered in 1770, by M. Pallas, in the gold-mine of Beresof, near Ecatherineburg in Siberia, in the form of four-sided prisms, with or without pyramidal terminations, of a beautiful orange red, commonly fixed in a quartzose matrix to which they so strongly adhere as not to be detached without difficulty.

All the specimens of this substance which are to be found in the several mineralogical cabinets in Europe were obtained from this gold-mine; which indicates, that it was formerly abundant; but it is said, that for some years past it has become very scarce, and that at present it is bought for its weight in gold, especially if pure and regularly formed. The specimens which do not possess the regular figure, or are broken into fragments, are appropriated to painting, in which art this substance is of high value for its beautiful orange yellow colour, its unchangeableness in the air, and the facility with which it can be levigated with oil. . . .

The beautiful red colour, transparency, and crystalline figure, of the Siberian red lead soon induced mineralogists and chemists to make enquiries into its nature. The place of its discovery, its specific gravity, and the lead ore which accompanies it, produced an immediate suspicion of the presence of that metal; but, as lead had never been found in possession of the characteristic properties of this Siberian ore, they

thought, with justice, that it was mineralized by some other substance; and Lehman, who first subjected it to chemical analysis, asserted, in a Latin dissertation printed at Petersburg in 1766 (I suppose 1786), that the mineralisers were arsenic and sulphur.

In 1789 Citizen Maquart undertook a long course of experiments, in which I had the advantage to participate, as he has been pleased to mention in the introduction to his work entitled *Essais de Mineralogie du Nord*. The object of these experiments was to determine the nature of the mineraliser of red lead. We sought in vain for the presence of arsenic; but, by an error, arising from the state of chemical knowledge at that time, we considered the red lead ore as a combination of super-oxygenated lead, iron and alumine.

Since that time Bindheim affirmed, that he had found it to contain molybdic acid, iron, nickel, cobalt, and copper.

From the consideration of these results, so diametrically opposite to each other, and under the encouraging consideration of the immense progress of chemical science since the renovation of its language and the rectification of its theory, and venturing likewise to place some dependance on the slight experience I have acquired in the art of essaying since I had the advantage of belonging to the establishment of mines, I thought proper to submit this substance to a new examination. My labours have not been without their recompense; and I hope to prove, in the following paragraphs, that all which has hitherto been asserted with regard to the mineraliser of the Siberian red lead is entirely destitute of foundation; that it contains neither arsenic, as Lehman pretended; nor the molybdic acid, and the three or four metals, announced by Bindheim; nor iron nor clay, as a Maquart and myself imagined; but a new metal, possessing properties entirely unlike those of any other metal. . . .

When an unknown substance is to

be examined, the only method to ascertain whether it has been better described, is to examine its properties, and compare them with those of other bodies; an operation which supposes a knowledge of all that has been before described in natural history. And when, after an accurate comparison of the properties of the body under examination with those of other bodies, it is found that none of these last exhibit the whole of those properties, a fair conclusion may be formed that the body is unknown, and consequently that it is new.

After this point is determined, it becomes necessary, in order to make it known to others, that its distinctive characters should be clearly ascertained, and a name given to it, for the purpose of brief designation, and of inscription in the catalogue of human knowledge.

This name may be derived from various sources;—the place whence it was obtained, the author who discovered it, or the specific properties it possesses, &c.: but it is easy to see that the two first sources are vicious. In fact, the name of the place seems to announce that the substance is to be found exclusively there; and it is very far from being known, at the early period of discovery, whether it may not be found elsewhere. The name of the author teaches nothing, except that such a man was the discoverer, a circumstance of little interest to science. But the name of a substance deduced from its leading properties is truly useful, because it brings to mind, and in some measure places the object before the eyes by a faithful sketch of its attributes.

From these considerations I have thought fit to adopt the name *chrome*, which was proposed to me by Cit. Haüy, to designate the new metal found in the native red lead. In truth, this name does not perfectly agree with the complete metal, because it has no very distinct colour; and because, even if it had one, this would not be a sufficient reason, since every metal has a more or less peculiar colour.

But it agrees wonderfully well with its combinations with oxygen, which afford a green oxide, or a red acid, ac-

ording to the proportions of that principle, and because each of its primary combinations communicates its colour to all the secondary combinations into which it enters; properties which belong to it almost exclusively.

This name appears to me to be so much the better founded, as this substance has not yet been discovered except in the state of acid or oxide, and because it may perhaps never be found in the native metallic state.

Nevertheless, as I am not disposed to consider the adoption of one name rather than another as of any importance, provided the name do express some remarkable or distinctive property of that which it denotes, I shall with pleasure, if a better name be found, consent to substitute it instead of *chrome*.

Uranium

CHEMISCHE UNTERSUCHUNG DES URANTS, einer neuentdeckten metallischen Substanz; vom. Hrn. Prof. Klaproth. Chemische Annalen für die Freunde der Naturlehre, Arznei-gelahrtheit, Haushaltungskunst und Manufacturen; von Lorenz Crell. IX. 1789.

CHEMICAL INVESTIGATION OF URANIUM, a newly discovered metallic Substance; by Prof. Klaproth. In Chemical Annals for Friends of Natural History, Medical Science, Household Arts and Manufacturers: by Lorenz Crell. IX. 1789. Translated for the SCIENCE NEWS LETTER by Helen M. Davis. This is a literal translation of extracts from this original publication.

AMONG the number of minerals of still unknown constitution, which hitherto, on this account, neither had nor could have a precise name nor a suitable place in the system, belongs the so-called Pitchblende from the mine of George Wahsfort at Johannegeorgenstadt. Misled by the name given to this ore by the common miner, it was formerly listed among the zinc ores, until Mr. Jnsp. Werner in Freyberg, to whom its cleavage, hardness and unusual weight gave sufficient proof that it could be no blende, put it with the iron earths, and named it *Eisenpecherz* (*ferrum ochraceum piceum*). Nevertheless doubt remained as to whether this were really a suitable place for it; and soon after this he brought out the suggestion that perhaps it might have as a constituent the metallic substance or the characteristic acid of Tungsten or Wolfram, combined with iron. This theory too will not last

long. According to an advice in the Bergmännischen Journal two students of metallurgy in Chemnitz have confirmed it by a scholarly piece of research; hence this ore is nothing but a kind of tungsten already sufficiently well known. But in the following results of my investigations this idea is disproved.

2. This ore, for which, for the sake of brevity, I will retain the old name of Pitchblende until, at the end of the present treatise, I will show the necessity for a new name, occurs in the above-mentioned locality, sometimes massive, sometimes interspersed with either stony or earthy material. The former dense variety is of a blackish color, inclining to steel gray, a moderate luster, solid, somewhat irregular, splitting into the smallest pieces like shale; it is quite opaque, possesses a moderate hardness, and upon grinding forms a black powder. Its weight is, on the average, 7,500. It is seldom entirely pure, one usually sees a lead-like part, of gray-white color and dull metallic luster, sprinkled through it in small concretions or as streaks and veins.

The second variety usually occurs in layers, with which are associated sometimes a soluble micaceous kind of rock, sometimes a brown hematite-like iron ore, in varying amounts, and usually also a peculiar yellowish and brownish earth; when it crystallizes in four-sided tablets the so-called green mica also appears. This variety is distinguished from the first by a purer black, here and there with a reddish shade, a stronger luster, not unlike coal, less hardness, differing in that the black color of the powder appears greenish. Also I noticed in some the natural outline marking out the place of fossils, a flat and slightly sunken surface. . . .

7. In order to learn the nature of the metallic base of Pitchblende, several experiments were made with a solution of it in nitric acid and aqua regia. First I tried to find out whether a reduction of the dissolved substance would take place in the wet way; but nothing was precipitated by zinc and iron rods placed in it, either in the cold or when heated.

Volatile liver of sulphur threw down the greater part of the Pitchblende out of the acid, with a brownish yellow color; at which the surface of the mixture was covered with a grayish-white, metallic-looking skin.

With tincture of gall-nuts no precipitate came down; but that formed, whose precipitation the acid hindered, came down as a chocolate brown precipitate

when just neutralized with an alkaline salt. . . .

[A long list of other experiments follows.—Ed.]

17. From these experiments it easily follows that this mineral substance belongs neither to the zinc ores nor to the iron ores, nor to the tungsten- or wolfram-containing minerals, moreover to none of the hitherto known mineral substance, but that it is a unique, independent, half-metallic substance in the system [of minerals]. It must consequently drop its present false names, as Pitchblende, Eisenpecherz, and must be given, on this account, a new, exclusive, specific name. Until the possible discovery of one still more fitting, I give it the name Uranite; which name I, after the example of the old philosophers, take from a planet, namely from the newest discovered, Uranus.

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PHYSICS—GEOLOGY

X-Rays Show Changes Under High Pressures

EARTH MATERIALS under extremely high pressures, such as they have to endure at considerable depths in the earth's interior, act structurally much as they would if subjected to high temperatures. This is one of the results of X-ray investigations of matter at high pressures reported by Dr. Willi M. Cohn of Berkeley, Calif., before the meeting of the American Physical Society in Chicago.

In a special apparatus, it has been made possible to attain pressures as high as 3,000 atmospheres or 45,000 pounds per square inch. Of course, to obtain such pressure it is necessary to make the metal walls of the cylinder thick and exceedingly strong. This would of necessity interpose a very difficult barrier to the passage of X-rays by means of which the materials under pressure are to be studied.

This difficulty is avoided by setting a window of beryllium, a very light but very strong metal, on the side where the rays are admitted. Opposite this window, on the "exit" side, is a second window of glass or bakelite. Behind this the photographic plate is placed. Photographs of the minute structure of the materials under study, made with X-rays both before and after the pressure is applied, give patterns from which it is possible to deduce the physical changes taking place.

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