produced. Here the effect was caused, not by the low potential of the battery current, but by the much higher potential of the extra current produced by the constant breaks at the lower end of the thread. This was demonstrated by placing a non-inductive resistance of about 1,000 ohms in parallel with the coherer. This entirely prevented the action. Attaching the ends of the secondary of an induction coil to the coherer gave similar results, as did also the Holtz machine.

But these threads remained cohering after there had ceased to be a difference of potential between the electrodes. In a vacuum the threads still remained hanging, showing that the friction and pressure of the air did not maintain the coherence. Under the microscope the points of contact appear to be fused, and other observers have noticed bright points after coherence is destroyed. That fusion occurs is also shown by the fact that metals having a high melting point give threads of much less tenacity than those with low melting points. Thus platinum and iron give very fragile threads, while tin, lead and aluminum give threads capable of enduring considerable flexure.

With the Holtz machine threads could be produced only when the machine was run slowly. If it was run too fast the particles would fly back and forth between the electrodes of the coherer. The point of the coherer, becoming charged, induces a charge in the particle nearest to it. This causes an electrostatic attraction, the particle flies to the point and, receiving a like charge, is at once repelled. But the instant it comes in contact the points of contact fuse, and if the charge on the electrode be small this fusion will be sufficient to resist the tendency to fly off and the filing will remain, becoming a part of the electrode and repeating the action on the next particle. Thus consecutive filings are united and a continuous thread of filings fused together, which connects the electrodes, reducing the resistance greatly. In a Hertzian field the action is precisely similar, the difference of potential here being produced by the action of the Hertz waves. Short threads of filings were obtained, as in the preceding experiments.

These experiments show that the great reduction in the resistance of the tube is due to the formation of continuous threads of metal connecting the electrodes. They also indicate some of the points which a good coherer must possess. The filings used should be composed of metal not easily oxidized, of small specific gravity and low melting point. The electrodes should consist of points or roughened surfaces of similar metal. Further, it is difficult to decohere a thread while a current is flowing, since the induced current at any break tends to bring back the parts to coherence. Marconi avoids this action by the use of a high resistance in parallel with the coherer. The necessity for this resistance can be avoided by having the current through the coherer broken before the tapping occurs. Experiments are being continued in the direction of a practical application of these principles.

M. H. LOCKWOOD,
E. B. WHEELER.

MARCH 30, 1899.

### TWO-HEADED SNAKES.

TO THE EDITOR OF SCIENCE: I am engaged in the study and description of two-headed snakes by means of skiagraphy. Although I have in hand eight specimens from various museums, I have been unable to locate the Tropidonotus from the Massachusetts State Collection, described by Wyman in the *Proc. Bost. Soc. Nat. Hist.*, Vol. IX., p. 193, and the three snakes described by Mitchell in the *Amer. Jour. of Science*, Vol. X., p. 48.

I write in the hope that one of your readers may be able to help me in my quest of these four specimens, and that I may be informed of any other snakes with this abnormality in American collections, in order that I may make note of, or describe, them in my forthcoming paper.

ROSWELL H. JOHNSON.

1727 CAMBRIDGE STREET, CAMBRIDGE, MASS.,
April 14, 1899.

### DUPLICATION OF GEOLOGIC FORMATION NAMES.

IT was not my intention, in my letter in SCIENCE of March 31st, to discuss the question as to whether certain names of geologic formations conflicted, or to discuss the undesirability of using names that have more or less similarity. Its purpose, as stated, was 'to illustrate what the present system is leading to.' Names of formations and dates of publication were given for this purpose.

However, Director G. M. Dawson, in his recent communication in SCIENCE, states that it is not apparent from my remarks that Cache Creek group of formation holds priority. I do not see how any other construction can be given to the third paragraph of my letter. It is there briefly shown that Dr. Selwyn described the Upper and Lower Cache Creek group in 1872, and that in 1896 Dawson applied the name Cache Creek formation to both series. It is further evident, from the names and dates given, that the Cache Creek group has priority over either Cache Valley group or Cache Lake beds.

F. B. WEEKS.

U. S. GEOLOGICAL SURVEY,
WASHINGTON, D. C.

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*NOTES ON INORGANIC CHEMISTRY.*

AT the meeting of the Chemical Society (London) on March 16th Professor Dewar presented a paper on the boiling point of hydrogen, which is printed in the *Proceedings*. In obtaining liquid hydrogen great difficulty is experienced owing to the presence of small traces of air. Quantities amounting to only one thousandth of one per cent. accumulate in the solid state and eventually choke the nozzle of the apparatus, necessitating the abandonment of the operation. Dewar obtained 250 cubic centimeters of colorless liquid hydrogen and used this for the determination of the boiling point. His previous observations, using a platinum resistance thermometer, gave the boiling point as —238°. In these latest experiments a possible constant error in the use of the platinum thermometers was checked by using a rhodium-platinum resistance thermometer, the alloy containing ten per cent. rhodium. Examination had shown that alloys, unlike pure metals, showed no sign of becoming perfect conductors at absolute zero. The rhodium-platinum thermometer gave the boiling point of hydrogen as —246°, and this the author considers to be more accurate than the previous determinations, especially as it agrees very fairly with the boiling point calculated from the results of Wröblewski and of Olszewski.

IN an addendum dated March 17th Dewar gives the first results from a constant-volume hydrogen thermometer working under diminished pressure. This gave —252° as the boiling point of hydrogen. The three results in absolute temperature are: (1) platinum resistance thermometer, 35°; (2) rhodium-platinum resistance thermometer, 27°; (3) hydrogen thermometer, 21°. From this Dewar states that it appears that the boiling point of hydrogen is really lower than was anticipated.

IN the *Journal of the Society of Chemical Industry* the use of titanium compounds in the dyeing industry is discussed, and it is shown that in many cases they may be successfully utilized. Especially are they valuable as mordants for alizarin yellows and oranges, and for basic dyestuffs. The tannate is not unstable towards acids and little influenced by light, and according to the author is valuable as a water-color. As experiments progress it is by no means impossible that many of the elements which now have little or no practical value may find uses, and work along this line offers much prospect of success.

IN the last number of the *Zeitschrift für anorganische Chemie*, Piccini publishes the full details of the preparation of cesium manganese alum and a complete description of the salt. This is of more than passing interest from the fact that it is the first salt of trivalent manganese whose constitution is not open to question. Manganese alums are described in older chemical literature, but efforts to repeat their preparation have not been successful. By utilizing the electric current to oxidize manganese sulfate, Piccini forms the alum without difficulty, and in crystals large enough for a complete crystallographic study. It is thus settled that in manganic compounds the manganese is trivalent, and hence allied to aluminum, chromium and iron. From a private communication I learn that other manganese alums have been prepared and studied by Professor Christensen, and will shortly be described.

J. L. H.