Cambridge argillite in the order named. Hitherto certain argillites interbedded with the Roxbury conglomerate have been confused with the Cambridge argillite. The structures have been simplified by the discovery of this error.

The thrust planes within the basin are abnormal since they have been tilted from a low angle at the time of their initial development into vertical or overturned positions at the present time. Doctor Billings' sections were sometimes difficult to understand since the field evidence would force his thrusts to originate in a direction *away from* that toward which the planes now dip—the thrusts coming from the south and the thrust planes now dipping steeply to the north.

Twenty-eight colleges and institutions were represented during the excursion.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

ISOPROPYL ALCOHOL AS A PRESERVATIVE

WHILE working at Reed College in 1922 I put up several specimens of the western newt, *Triturus torosus,* in isopropyl alcohol in order to test the usefulness of this alcohol as a preserving fluid. This was done at the suggestion of Dr. L. E. Griffin, who was experimenting with substitutes for ethyl alcohol. Six newts were preserved; one each in 40 per cent., 50 per cent., 60 per cent., 70 per cent. and 80 per cent. of Petrohol (the trade name of the isopropyl alcohol used) with a control in 70 per cent. grain alcohol. As the Petrohol contained only 91 per cent. of isopropyl alcohol the actual concentrations ranged from 36.4 per cent. to 72.8 per cent. The newts varied from 134 to 178 mm in length and from 14 to 19 mm in greatest diameter of body. They were chloroformed and the abdomen pierced with a stout pin before putting them in the preserving fluid.

I looked for these specimens last spring but could not find the control. As they were dated March 31, 1922, they had stood for six years, a very fair test for the fluid.

The discoloration of the liquid was quite noticeable, for it grew progressively darker as the concentration decreased. The 80 per cent. was almost clear, while the 40 per cent. was a greenish amber, though no darker than ethyl alcohol sometimes gets by standing on specimens. As the skins of the newts were faded proportionately, it seems clear that isopropyl alcohol dissolves the dermal pigment more readily in low than in high concentrations.

The specimen in 40 per cent. Petrohol was faded to a dull grayish brown above and dirty yellowish white below, the original reddish brown and orange yellow having completely disappeared. The 80 per cent. specimen had the colors very well preserved for an alcoholic and the others varied between the two extremes.

The bodies of those in 40 per cent., 50 per cent. and 60 per cent. were soft and pliable (except that the last was rather stiff) and the jaws could be opened easily. The 70 per cent. and 80 per cent. specimens on the other hand were stiff and badly shrunken and the jaws were very hard to open. The muscles of the first three were in good condition for dissection. The skin peeled readily from the muscles and the latter were easily parted from the bones. Apparently it would be easy to make a skeleton from any of the specimens. The cartilage was yellow like the muscles, otherwise it appeared about as in life.

The viscera of all were perfectly preserved with no sign of decay anywhere. The liver was soft but not mushy except in the 70 per cent. and 80 per cent. specimens, where it was harder and adherent to the body wall.

The heart, blood vessels and contained blood were faded to a yellowish color. Heart muscles were in good condition except that in the 60 per cent. specimen they were rather brittle. This fading of the blood made it rather hard to trace veins and arteries except in the liver.

Perfect preservation in such low concentration of any alcohol is unusual and may prove to be a valuable property of isopropyl alcohol. The fading effect seems to be confined to the blood and heart muscles and to the yellow pigment of the skin, as the 40 per cent. specimen was only a little paler dorsally than the 80 per cent., though much less yellow. Perhaps this would not be the disadvantage in other groups that it is in the Amphibia. The ones in 40 per cent. and 50 per cent. were softer and in better shape for examination or dissection than most alcoholics are. For many anatomical specimens I believe that isopropyl alcohol would be an excellent preservative.

Griffin[1] has shown that isopropyl alcohol is useful for histology, that it may be used freely without the annoying restrictions placed on the use of grain alcohol and that it can compete with the latter in price. The fact that it can be used in low concentrations should make it an economical preserving fluid. It lacks the irritating properties of formalin and does not soften the bones or teeth in the same way.

[1] L. E. Griffin, "Practicable Substitutes for Grain Alcohol," SCIENCE, 55: 262, 1922.

This experiment is a very incomplete one and I should be glad to see further work (which I can not do myself at present) done on the uses of this interesting fluid.

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A NEW PROCESS FOR HANDLING SOUTH AFRICAN PLATINUM ORES

THE *South African Mining and Engineering Journal* for September 8 and 15 gives a detailed description of a new process of platinum recovery from the sulfide-norite ores of the Transvaal, which has been originated in the Ferreira laboratory of the Rand Mines metallurgical department. As the process is along new lines, a brief outline is of general interest.

The ores, after crushing and ball-mill grinding, are reduced by flotation to a 5 per cent. concentrate. These concentrates contain, in addition to the platinum metals, copper and nickel sulfides and a small amount of gold. They are first roasted to a negligible amount of sulfur, then mixed with salt and heated with chlorine in a muffle. The temperature used is about 540° C., at which heat the platinum metals, as well as the copper and the nickel, are completely changed into soluble chlorides, while the temperature is too high for the chlorination of the gold. The current of chlorine is so controlled that practically all is absorbed, the amount used being 100 to 120 pounds per ton of concentrates. The platinum metals are changed into the very soluble sodium chloro-salts.

The chlorinated mass is leached with slightly acid water and the copper precipitated as the carbonate by finely ground limestone. This precipitate runs about 20 per cent. copper and can be smelted direct to blister copper. The small amount of platinum and iridium precipitated with the copper is recovered as anode sludge when the copper is electrolytically refined. After filtering from the copper precipitate, the platinum metals are precipitated by zinc dust, and after refiltering the solution is run through a zinc extractor for complete recovery of the platinum metals. The nickel present is then thrown down with bleaching powder. The chlorinated ore, after leaching, is treated by cyanidation for gold.

The novelty of the process consists in the chlorination of the platinum metals and the precipitation of the copper by limestone. The process has already passed beyond the laboratory stage, and works satisfactorily on semi-plant scale. It promises to be a solution of the difficult problem of handling the South African platinum ores.

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SPECIAL ARTICLES

SCATTERING OF QUANTA WITH DIMINUTION OF FREQUENCY

THE purpose of this note is to point out the correlation of several recent experiments on scattering of quanta with one another and with a very general principle which was foreshadowed some years ago, and has since then become more plausible through the demonstration that quanta and electrons alike possess some of the qualities of waves.

The notable experiments of Raman, verified and extended by several other physicists,[1] have shown that a quantum of sufficient frequency impinging upon a molecule may employ some of its energy in exciting the molecule, and continue on its way with the remainder, rebounding from the impact in the form of a quantum of diminished energy and augmented wave-length. The analogy with the electron is very close, for an electron may use part of its energy in exciting an atom, and rebound from the encounter in the form of an electron of diminished energy and augmented wave-length. In addition, various experimenters[2] have shown that a quantum impinging on a crystal may spend part of its energy in exciting vibrations of the sort which are responsible for Reststrahlen, and which are attributed to inter-atomic forces of the lattice; and having done this, the quantum may emerge with the balance of its energy and a correspondingly modified wave-length.

In the Compton effect—to use this term in its restricted sense—a quantum confers upon a free or nearly free electron a fraction of its energy, and goes onward with the remaining fraction, its wave-length being altered accordingly. In a sense, this case is at the opposite extreme from that which Raman observed, for the transferred energy goes into a non-quantized form. Cases intermediate between these two extremes are disclosed by two recent series of experiments. In those of Davis and Mitchell,[3] the scattered X-rays emerging from carbon (in the form of graphite) irradiated by the $K\alpha_1$ rays of molybdenum were found to comprise quanta which are evidently incident quanta which have given up an amount of energy just sufficient to extract an electron from the K-level of a carbon atom. The wave-length of these agrees within 4 per cent., as the authors point out, with the value predicted from this interpretation. There are two other sets of scattered quanta

[1] C. V. Raman and K. S. Krishnan, *Indian Jl. of Phys.*, March 31 and July 31 (1928); *Nature* (1928) *passim;* P. Pringsheim, *Naturwiss.*, August 3 (1928); R. W. Wood, *Nature*, Sept. 8 (1928).

[2] C. V. Raman, *ibid.;* G. Landsberg, L. Mandelstam, *Naturwiss.*, July 13 (1928).

[3] B. Davis and D. P. Mitchell, *Phys. Rev.*, 31: 1119; 32: 331–335 (1928).