COPERNICUS BY EARTH LIGHT.

On page 82 of the current volume, we gave a condensed report of a lecture by Professor Morton, of Philadelphia, and of the magnificent experiments by which the lecture was illustrated. We also described some splendid photographic views of the moon, and of the planet Mars, among which was the view of the lunar volcano Copernicus. We herewith reproduce this view from the Journal of the Franklin Institute, and we feel that in so doing we are presenting an engraving that will prove of the greatest interest to our readers. Who does not long, while gazing upon the serene face of the queen of night, as she glides in majesty over a cloudless sky, to know and see the hidden wonders of her structure? Her mean distance from the earth is two hundred and forty thousand miles, yet it is hard to realize on one of those glorious autumn evenings which occur in our latitude, that she is so far away. It is even harder to realize that her fair face is seamed, and scarred, and blotched, and torn—a scene of the wildest confusion, a dreary, barren, and lifeless desert, only variegated by rude precipices of enormous height and extinct volcanoes, which, in their former active state, must have presented a spectacle of the aroused forces of nature beyond conception, awful, and sublime.

We ordinarily see the moon by means of the light of the sun reflected from her surface. During one half of her revolution, however, the sun shines upon the portion of her surface which is entirely or partially turned away from us, leaving the side which is toward us, dark, with exception of the light which falls upon it from the stars and planets, and the light of the sun reflected from the earth. Surfaces are good reflectors of light, in proportion to their smoothness. A body like the earth can, therefore, be only an imperfect reflector. Even the water, which, if at rest, would form a more perfect reflecting surface than the land, is rarely perfectly still; and the regions near the poles, where the water is congealed into snow and ice, present also great irregularities of surface. Color has also much to do with the amount of light which bodies reflect, and all reflecting bodies which have not pure white surfaces, modify more or less the character of the light which they reflect. Snow is, therefore, a better reflector than the bare earth, both because it is white, and its surface is smoother than the land which it covers. All bodies seen by reflected light are less illuminated than the reflecting surface. The moon, viewed only by the reflected light of the earth, stars, and planets, is, therefore, very dimly seen. The eye, unassisted, can scarcely see more than the mere outline of her form. When the moon is entering upon her first quarter, she may be seen as a thin crescent upon that side of her disc which lies nearest the sun. The remaining portions being only just perceptible. The dark portions of the moon which, seen at the full, are fancied to resemble the human face, are shadows cast by the summits and craters of extinct volcanoes. The principal mountains which form these shadows are called Tycho, Copernicus, and Kepler. The largest of these is Copernicus, which has a crater fifty-five miles in breadth. Its height above the surrounding plains is eleven thousand two hundred and fifty feet.

The engraving represents this immense crater as seen by earth-light. It is a vast plain surrounded by a circular wall, with central cones and huge boulders scattered over its surface. Mars, proportionately magnified, is seen above the horizon, with masses of clouds floating in his atmosphere, and showing the marks of continents and seas. In the immediate vicinity are seen lesser craters, their edges illumined, and inclosing gulfs of vast depths and proportions. The rugged and mountainous appearance of the moon is admirably shown, and the appearance of desolation most truthfully delineated. What features are presented by the side of the moon which human eyes have never seen we cannot certainly say; but it is probably just to infer that it possesses the same general characteristics as the side presented to us. The craters of some of the lunar volcanoes are of immense depth, their sides rising almost vertically, often to a height of many thousand feet.

In 1787, it was announced by Sir Wm. Herschel that he had observed three volcanoes in a state of eruption upon different parts of the moon. Astronomers have, however, generally supposed that the phenomena seen by Herschel were due to peculiar reflections of earth-light from portions of the peaks having great reflecting power. There have been, without doubt, some recent changes in the craters, which are found everywhere upon the moon's surface. In 1866, Schmidt, Director of the Observatory of Athens, observed the total disappearance of the deep crater Linné. In its place remained only what appeared to be "a little white cloud." This obscuration, which was observed by other astronomers, occurred in October and continued till the latter part of December, when the crater was again distinctly visible. The cause of this phenomenon has never been explained; but it indicates that the forces which have so convulsed the surface of the moon in ages past, have not yet fully expended their energies.

A SINGLE coffee plant, taken from Arabia to Paris, in 1614, was the parent stock of all the coffee plantations in the West Indies.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents

Experiments---The Condensation of Alcohol by Frost.

MESSRS. EDITORS:—Being induced to believe that the severe frosts of winter may be utilized in the condensation of alcoholic liquids, by the freezing of the water combined with the alcohol, and subsequent separation of the water by draining off the unfrozen liquor, leaving the water in the bottle as ice, I instituted the below-described experiments to satisfy myself as to the correctness of this idea:

A bottle of pure new grape wine, having been exposed at a low temperature, appeared to have become frozen. Upon examination I found that its contents were only partially frozen, a feathery crystallization filling the bottle, the interstices between which were occupied by the unfrozen liquid. Suspecting that this latter was prevented from freezing by the greater amount of alcohol which it contained, I decanted the unfrozen liquid into another bottle, leaving the ice (or water) in bottle No. 1. Though the liquid thus decanted remained a liquid, the ice in No. 1 remained unthawed. No. 2 was finally frozen, however, by the increasing severity of the weather (winter of 1867-'68), which, as the technical nature of the experiment demanded, was my only reagent for reduction of temperature. A crystallization similar to that in the first instance also existed throughout the contents of the second bottle, No. 2; but as before, a portion of the liquid did not congeal. This also was decanted, the operation being repeated until the original wine had been separated into five portions, the last decanted of which—the fifth—which was of a ruby red color—refusing to congeal even at a temperature of from 28° to 30° Fah.

The liquids thus separated had the following peculiarities: The liquid in bottle No. 1, which was obtained by thawing the ice, formed in the first instance by the partial congelation of the wine, was greater in amount than any of the separated liquids, having a slight amberish tint, though almost clear.

No. 2. This liquid was one quarter less in amount than that in No. 1, but had much the same color and quality, containing, however, a little organic, saccharine, and volatile matter, with tartaric acid, depositing one half to one quarter of a minim of sediment from seventy-five minims of liquid.

No. 3. The liquid in receptacle No. 3 was still less in amount, one quarter less than the contents of No. 2. Color, red amberish, light tint of red prevailing. Organic, volatile (alcoholic), and acid matter, etc., were present in increased quantity.

No. 4. Amount of liquid one quarter less than No. 3. Color, clear red; about five minims in one hundred and eighty minims of liquid, being a faint reddish sediment of organic matter, containing much tartaric acid.

No. 5. The amount of liquid was similar in its proportion to the rest, being about equal to three quarters of the contents of No. 3; its specific gravity being perceptibly greater than any of the preceding. Color, deep, rich red; liquid, sirupy and rich.

The comparative amount of liquid, color of, and specific gravity of, was, in a sort of proportion, much as below:

LIQUID No.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Amount of liquid in dr., and fractions of.	9·4	7·05	4·7	3.525	2·1+
Color of liquid.	Clear.	Amberish.	Faint Red.	Red.	"Deep, rich Red."
Specific gravity in proportion of.	0·6	0 7	0·8	0·9	1·0

The next step taken in the examination of the separated liquids was a fractional distillation; or the separation by heat (in the form of vapor) of the different substances existing in the liquids.

No. 1. The liquid denominated "No. 1" was not distilled, being little but water.

No. 2. Also undistilled (only differing from No. 1 in leaving a sediment).

No. 3. One hundred and eighty minims of this reddish liquid being distilled, gave one hundred and fifty minims clear distillate; thirty minims remaining in tube-retort, and consisting of fined carbon and yellow volatilizable matter, which latter was almost inappreciable. It was probably derived from the decomposition of the sugar present. About five minims out of one hundred and eighty minims was a precipitate containing tartaric acid.

No. 4. One hundred and twenty of the clear red liquid being distilled, yielded one hundred and ten minims, clear distillate; about three minims of yellow liquid of empyreumatic odor was rendered by severe heat (fusing of tube retort), and seven minims of fixed carbon, etc., remained. About four minims in one hundred and eighty minims was a brown sediment containing much tartaric acid, together with some organic or microscopic vegetable matter. Alcohol and sugar, undetermined; though the former was present in some quantity in the clear distillate, and the latter (sugar) existed in quantity in the remainder, being afterward metamorphosed by heat into the yellow liquid and fixed carbon.

No. 5. In this instance the record of amounts and results distilled was unfortunately lost; however, the general tenor of the experiments suffices. This was the rich, blood-red liquid, heavy and sirupy; greater in specific gravity than any of the preceding. From its characteristics I was led to suppose that I had succeeded in condensing nothing but the sugar. Here, however, I was mistaken; the clear distillate which first passed over was a proof spirit, inflammable. A piece of paper dipped in it was lighted upon being brought near flame. Much of the yellow liquid before described passed over with severe heat, and considerable "fixed" carbon remained in tube, covering the sides of tube with a black scale, that shrunk with a "crinckling" sound upon the cooling of the tube.

From the result of these experiments I was led to infer that the process of freezing and decantation, etc., had been one of condensation.

That from the regular increase of specific gravity in the liquids, something besides alcohol was being condensed. From the results of distillation, caromel and yellow liquid, having the odor of burnt, or, rather, decomposed sugar, sugar was supposed, also, to have been condensed. Tartaric acid, or tartrates, were also condensed.

My conclusions are, that, by the method described, alcoholic liquids, wines, etc., may be condensed; the sugar, alcohol, and tartaric acid, being the condensed substances. I have thought that the condensation of the sugar was more complete than that of the alcohol and tartaric acid.

A hundred casks of wine, of an inferior grade, may, by freezing and decantation in the winter season, be condensed into a less in amount, but stronger, more sirupy, and valuable "port" wine.

It is a fact, that, from a barrel of fermenting cider, well frozen, may be drawn gallons of strong drink, unfit for temperance folk.

It is a fact of the "Sugar Bush," that maple sugar-makers, when, on a sharp morning, they find a bucket of sap standing half frozen under the tap, throw out the clear, tasteless ice, and find a thick syrup beneath.

Hoping that these hasty notes may not be without interest, and, perhaps, of assistance to those desirous of pursuing the subject further, or may save others from wasting time upon an already explored field, I remain, respectfully,

Albany, N. Y. VERPLANCK CALVIN.

Change of Pitch in the Tone of Moving Bodies.

MESSRS. EDITORS:—In regard to this subject—first mentioned by a correspondent, page 247, Vol. XVIII, and correctly explained by Mr. Welling, page 323, same volume—it may be remarked that I was present at the first experiments, made in Holland about the year 1845, on the railroad from Amsterdam to Rotterdam, of which the purpose was to ascertain if practice would fully verify the teachings of theory, as to the amount a musical tone would become sharp or flat, when the distance between the ear and the instrument producing the tone was rapidly diminishing or increasing. It was done simply by sounding a trumpet or other loud musical instrument on one train, and observing carefully the pitch on the other train passing in an opposite direction, or similarly sounding the instrument on board the passing train and observing it upon the road, or *vice versa*. The results were always perfectly in accordance with the theory.

The theory is very simple. For instance, the middle C of the musical scale makes 256 vibrations in one second, which are transmitted with a velocity of nearly 1,100 in the same time. Suppose now we could move toward the sounding body with a velocity of 1,100 feet in a second, twice the number of vibrations, or 512, would reach our ear, which corresponds with the octave above and the tone would appear an octave higher. Such velocity is, however, at present beyond the power of actual experiment, but the illustration serves to make the theory clear. As the octave is divided into twelve so-called semitones, we can easily find how fast we have to move to raise the pitch a semitone; namely, the twelfth part of the velocity of sound or about ninety feet in