



On certain phænomena of forced dilatation of liquids

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nide of silver, so as to affect a small piece of copper, which was rapidly covered with a coating of silver, which upon drying peeled off. In this case the cyanide of silver was pure, without any salt; but in subsequent attempts to silver a wire in this way, I have not succeeded, only a very slight deposit taking place, which was not increased by long exposure to the influence.

But in all the cases I tried subsequent to the one first alluded to, the oxide of silver was dissolved in cyanide of potassium. In the course of time bright and minute crystals were formed, transparent and colourless, on a copper coin.

Yours truly,

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Surgeon-Assistant, Lahore.

ON CERTAIN PHÆNOMENA OF FORCED DILATATION OF
LIQUIDS. BY M. MARCELLIN BERTHELOT.

If a somewhat strong capillary tube, closed at one end and drawn out at the other to a slender point, is filled with water at the temperature of 28° or 30° Cent.; if this tube is cooled down to 18° , so as to cause a certain quantity of air to enter it at the open point, and it is then closed, and again heated to 28° and gradually higher, after a certain time the air is completely dissolved. If cooled to 18° , the original temperature at which the tube contained at the same time gas and liquid, it is seen that the water continues to occupy the whole of the internal capacity, and maintains thus an invariable density between 28° to 18° . Its temperature may even be lowered still more. At this moment the least shock or collision, the least variation causes the instant reappearance, with a sort of ebullition, a slight noise, and a shock more or less perceptible, of the gas dissolved in the water. It dilates rapidly, and in less than a second has resumed its primitive volume at 18° . I have made the same observations with the following liquids, selected from all classes:—water, solutions of various salts and gases, solution of soda, various acids, alcohol, æther, acetone, Dutch liquid, essence of turpentine, oil of olives, creosote, sulphuret of carbon, chlorides of metalloids and metals, bromine. Mercury is the only liquid with which I have not succeeded, either in the presence of the air or *in vacuo*. A bubble of air remained several days in presence of the mercury without dissolving, at least completely, and that under pressures of 200 to 300 atmospheres, produced by preventing, for that length of time, the dilatation of the mercury due otherwise to an increased temperature of 8° or 10° .

In these phænomena there are two things very distinct. 1. An unstable supersaturation of the liquid by the gas, produced under the influence of the pressure. There are numerous examples of this order of facts. 2. A state of forced dilatation of the liquid: the latter, in fact, an instant before the vibration, fills the volume which the gas occupies an instant after conjointly with it, and this volume is the same which the dilated liquid filled on an elevation of temperature of 8 to 10 degrees and more. The variation of density thus produced is enormous; for water it is equal to $\frac{1}{42.6}$ of its volume at 18° ; for alcohol to $\frac{1}{9.3}$, for æther to $\frac{1}{2.9}$. Such an effect would be produced in an opposite direction only by a pressure of 50 atmospheres for

water, of 150 for æther. This phenomenon is very general, as is proved by the variety of the liquids on which I have operated. It probably accompanies all supersaturations, but at variable degrees and in various directions, without being capable of being proved.

Following the advice of M. Regnault, I endeavoured to separate the two facts, and to produce the dilatation of the liquids *in vacuo*. A peculiar apparatus enabled me to fill the tubes with liquids absolutely freed from air, and to close them without letting any gas enter. Under these new conditions, I reproduced the phenomenon of forced dilatation with water and æther, and have thus seen that it is independent of supersaturation. This permanence of the density of the liquids in an interval of temperature more or less considerable, appears to me attributable to the adhesion of the glass and the liquid: it is a force which is opposed to the division of this latter, and which can only be destroyed by an increase of the molecular attraction of the liquid for itself, an increase produced under the influence of cooling.—*Comptes Rendus*, June 24, 1850.

METEOROLOGICAL OBSERVATIONS FOR JUNE 1850.

Chiswick.—June 1, 2. Very fine. 3, 4. Fine, but air excessively dry. 5. Slight haze: sultry. 6. Overcast: rain. 7. Cloudy and boisterous: showery. 8. Dull and cloudy: fine. 9—11. Very fine. 12. Fine: cloudy. 13. Cloudy: clear. 14. Uniformly overcast: rain: showery. 15. Rain: clear at night: frosty. 16. Clear: cloudy and fine. 17. Very fine. 18. Cloudless: very dry air: large distinct halo round the sun at noon. 19—22. Very fine. 23. Hot: quite cloudless. 24, 25. Hot, with slight dry haze. 26. Hazy: hot and sultry: heavy rain at night. 27. Rain: fine. 28. Hazy: rain. 29. Cloudy: very fine: clear and cold. 30. Fine: cloudy.

Mean temperature of the month	59°·26
Mean temperature of June 1849	59 ·30
Mean temperature of June for the last twenty-three years ...	60 ·88
Average amount of rain in June	1·88 inch.

Boston.—June 1. Cloudy. 2—5. Fine. 6, 7. Cloudy: rain p.m. 8, 9. Cloudy. 10, 11. Fine. 12, 13. Cloudy. 14. Cloudy: rain a.m. and p.m. 15, 16. Cloudy. 17. Cloudy: rain, with thunder and lightning a.m. 18, 19. Fine. 20. Cloudy. 21. Fine. 22. Cloudy. 23. Fine. 24. Fine: thermometer 88° 2 o'clock p.m. 25—27. Fine. 28. Fine: rain a.m. and p.m. 29, 30. Cloudy.

Applegarth Manse, Dumfries-shire.—June 1. Fine: fair: very warm. 2. Fine: very warm. 3. Fine: getting cloudy. 4. Fine: still cloudy. 5. Shower a.m.: thunder. 6. Shower a.m.: heavy rain p.m. and thunder. 7. Showery a.m.: fair p.m. 8. Showery all day. 9. Fair, but getting cloudy. 10. Slight shower early: fair p.m. 11. Slight shower early: fine day. 12. Rain and wind all day. 13. Rain during the night: fair all day. 14. Rain nearly all day. 15. Fair all day and fine. 16. Fair and fine: cloudy p.m. 17. Rain early: fine day. 18. Fine all day. 19. Cloudy, but fine. 20. Fair and fine: getting moist p.m. 21. Showery. 22. Cloudy: rain during night. 23—25. Very fine all day. 26. Very fine: fresh and invigorating. 27. Parching east wind. 28. The air highly electric. 29. The air highly electric: a few drops. 30. Rain p.m.: continued all night.

Mean temperature of the month	57°·6
Mean temperature of June 1849	53 ·3
Mean temperature of June for twenty-eight years	55 ·9
Rain in June for twenty years	3·16 inches.

Sandwich Manse, Orkney.—June 1. Fine. 2, 3. Fine: warm. 4. Fine. 5. Rain: fog. 6. Damp: cloudy. 7. Drops: showers. 8. Drops. 9. Drops: rain. 10. Fine: rain. 11. Showers: clear. 12. Rain: showers. 13. Drizzle: showers: drizzle. 14. Bright: drops. 15. Bright: clear. 16. Fine: clear: fine. 17. Fine. 18. Fine: cloudy. 19. Cloudy. 20. Showers: cloudy. 21. Rain: thunder: showers. 22. Bright: rain. 23. Cloudy. 24. Bright: clear. 25, 26. Cloudy. 27. Bright: cloudy. 28. Bright: clear. 29, 30. Bright: drops.