count for 33 atmospheres pressure in a normal solution of cane sugar, nor does it, in our opinion, account for the ascent of sap in the tube attached to the *Begonia*.

Van't Hoff's law is based upon Pfeffer's researches, and Pfeffer states: 'The same pressure (22.4 atmospheres) must be exerted by a solution of 342 grams of cane sugar in one liter of water;' and further: 'Hence it follows that osmotic values may be calculated directly with perfect safety and accuracy.' It is certain that, if Morse and Frazer's results are reliable, Pfeffer's osmotic conclusions and van't Hoff's theory collapse, and the true osmotic pressures are not yet known.

The experiment with the *Begonia* plant, in the light of the results of Morse and Frazer, leads one to suppose that the actual osmotic pressure—or that force producing pressure—is far in excess of that indicated in van't Hoff's law.

JAMES B. DANDENO.
AGRICULTURAL COLLEGE, MICH.
October 30, 1902.

THE GRAND GULF FORMATION.

THE classification of the formations of the gulf coastal plain more recent than the Vicksburg Limestone, has long presented difficulties to the geologist.

One of the most important of these formations, as regards at least extent of surface outcrop, is the Grand Gulf, classed as Eocene by Dr. Hilgard and by Mr. Kennedy of the Texas Survey; as Oligocene by Mr. Gilbert Harris and Miss Maury; as Miocene by the Alabama Geological Survey ('Coastal Plain Report'). Dr. Wm. H. Hall, who has published much concerning the formation, has at different times referred it to the Eocene, the Oligocene and the Miocene.

These classifications, in the absence of characteristic fossils, have been based largely, if not solely, on the stratigraphical position of the beds, heretofore supposed to be unconformably overlying, and chronologically next succeeding the Vicksburg Limestone, and many sections have been published showing these beds and the Vicksburg Limestone in immediate contact.

Our observations made during the past summer, of the surface distribution of the Grand Gulf beds in Washington, Mobile, Baldwin, Escambia and Covington Counties; an interpretation, in the light of these observations, of some sections recorded in the 'Coastal Plain Report'; and our identifications of some shells brought up from borings recently made at the Bascom Well near Mobile, and at Alabama Port in the southeastern part of Mobile County will, it is believed, help to clear up some of the obscurities which have heretofore beclouded the classification of the coastal plain formations of the Gulf States.

1. From Healing Springs in Washington County southward to within three miles of the coast near Bayou La Batre in Mobile County, the surface formations are Lafayette sands and pebbles, resting *directly* on Grand Gulf mottled clays, overlying cross-bedded sands of the same formation. Along bay, river and gulf margins the more recent Port Hudson strata occur.

2. In Baldwin County, from its northern border down to the Gulf coast, a distance of seventy miles or more, the surface is in like manner formed by the Grand Gulf beds with overlying mantle of Lafayette.

Southward of the line of the L. & N. railroad, this county is a high plateau, 200 feet above tide near the line of the railroad, declining to 75 feet or more on Perdido Bay; with surface, away from the immediate vicinity of the streams and bays, almost perfectly flat, but for the slight sinks or depressions of the hundreds of ponds and savannas which characterize the Grand Gulf in the lower parts of the two coast counties of Alabama, and contiguous parts of Florida. The original plain in Baldwin has been far less modified by erosion than that of Mobile.

The high land in places extends to the water's edge, terminating in high bluffs along Mobile Bay from Daphne down below Montrose, and along Perdido Bay from above Suarez's landing down to Soldier Creek.

These bluffs, 75 feet and upwards sheer height, show in most characteristic exposures the thin capping of Lafayette resting on the clays and cross-beds sands of the Grand Gulf.

3. While in most cases the Grand Gulf along

the northern border of its outcrop overlies the Vicksburg Limestone, in Covington County we see it lapping up over both upper and lower Claiborne.

4. At Chattahoochee landing on the Georgia side of the river there is a well-known exposure of Tertiary (Chattahoochee) fossiliferous beds, overlain by the cross-bedded sands and purplish clays of the Grand Gulf, which in turn are capped by the sands, etc., of the Lafayette.

5. In Escambia County, at Coal Bluff and at the mouth of Silas Creek on Escambia River, and at Lovelace's old mill near Roberts, the Grand Gulf beds are seen overlying strata holding casts of *Cardium Chipolanum* and other fossils, which led Dr. Dall to correlate them with the lower Miocene (more recently Oligocene). In our 'Coastal Plain Report,' we considered the fossiliferous beds to be a part of the Grand Gulf strata, and the lower Miocene age of the latter was thus thought to be definitely fixed. Our recent observations, however, of the unconformity existing between the Grand Gulf and the fossiliferous Tertiary beds in these localities, and of the occurrence of the former as surface beds, southward to the very shores of the Gulf, compel us to change our views and to assign to the Grand Gulf a place in the stratigraphical column not only far above the Tertiaries exposed on the Chattahoochee and Escambia rivers, but also above any unquestioned Tertiary existing in Alabama.

6. The evidence of the comparatively recent age of the Grand Gulf formation thus furnished by its surface distribution, is confirmed and extended by the materials brought up from three deep wells bored in Mobile County, viz., one at the brewery in the city, one about three miles southwest of the city, (the Bascom Well) and one at Alabama Port on Mon Louis Island near the southeastern end of the county.

The boring at Alabama Port had last summer gone down to a depth of 900 feet, and from near the bottom shells were brought up which have been identified, viz., *Rangia Johnsoni*, Dall; *Mactra lateralis*, Say; *Hydrobia Mobiliana*, Dall, and about ten other species, mostly new and brackish water forms. Above the shell horizon the boring penetrated mainly sands and clays and sandstones, the latter reported as being altogether 400 feet thick and in places exceedingly hard. These beds can not well be anything else than Grand Gulf, and the shells come from below them and represent the Pascagoula horizon of Johnson, regarded by Dr. Dall as of Chesapeake Miocene age. The boring at the brewery in Mobile brought up the same shells from a depth of 735 feet, and the boring at Biloxi, Miss., reached the same Pascagoula formation at the depth of 700 feet.

The boring at the Bascom Well near Mobile pierced the same formation and furnished the same fossils, but this boring went deeper, and between the depths of 1,500 and 1,556 feet brought up shells which are identical with forms occurring at Oak Grove in Florida, now considered as Oligocene by Dr. Dall.

List of Shells from Bascom Well, Mobile, Ala. (from 1,500 to 1,556 feet depth).

Mitra cf. *Hanleyi*, Dohrn.
Litiopa sp. fragments (probably young).
Nassa sp. fragments (probably young).
Tornatina incisula, Dall.
Terebra indenta, Con.
Neverita duplicata, Say.
Bittium priscum, Dall.
Oliva sp. young.
Turritella terebriformis, Dall (Alum Bluff horizon).
Micromeris sp. very young.
Leda acuta (?) Con. young.
Leda sp.?
Nucula sinaria, Dall.
Phacoides piluliformis, Dall.
Hemicardium apatelicum, Dall.
Corbula Whitfieldi? Dall. (young).
Orbitolites duplex, Carp.
Orbiculina adunca, F. & M.
Lucina Pennsylvanica, Linn.
Lucina dentata, Lam.
Venus Burnsii, Dall.

To sum up the evidence thus adduced: The Grand Gulf is not Eocene, it is not Oligocene, it is not Miocene, since it overlies in turn each of these formations. By its position it must, therefore, be either Pliocene or more recent,

and we are inclined to the belief that it is Post-Tertiary because, among other things, it carries fresh-water fossils. We are also inclined to the belief that the Pascagoula formation will eventually turn out to be Pliocene. If we are correct in our belief that the Grand Gulf is of Post-Tertiary age, the Lafayette formation must be advanced higher in the scale than the position now generally assigned to it.

EUGENE A. SMITH,
TRUMAN H. ALDRICH.

THE JOHN FRITZ MEDAL.

A 'JOHN FRITZ MEDAL,' established by personal and professional friends in celebration of the eightieth birthday, August 21, 1902, of the 'Nestor of the American Iron and Steel Industry,' and in honor of that venerable pioneer, was formally announced at a banquet tendered Mr. Fritz by its founders, on October 31, at the Waldorf-Astoria. The medal is to be annually awarded to perpetuate the memory of his achievements and for notable scientific or industrial discoveries, inventions or other great work performed by its recipients.

The new honor is to be conferred on men nominated, not less than one year in advance of the date of award, by a board consisting of sixteen men, chosen in equal numbers from each of the four national engineering societies by their governing bodies. The medal is of gold, its design by Mr. Brenner, the obverse presenting a good portrait of Mr. Fritz, the reverse bearing the symbolic device, a messenger, her right hand sustaining a shield on which is to appear the name of the recipient of the medal, the left hand carrying laurels and a palm branch. In the distance appears the torch of learning and a scroll on which is inscribed a statement of the purpose of the medal. The endowment of this foundation is made by contributions from several hundred members of the engineering profession and amounts to about $6,000. Its recipient will also be given a certificate stating the origin and purpose of the medal and the specific achievement for which the individual award is made. The plan adopted is similar to that on which the award of the famous Bessemer Medal of the Iron and Steel Institution of Great Britain is made by its founders and which medal has been several times awarded to distinguished Americans, Mr. Fritz among others. In the present case, the specific provision is made that 'there shall be no restriction on account of nationality or sex.'

John Fritz, in whose honor this new and important scientific distinction is established, was born at Londonderry, Pennsylvania, August 21, 1822, the son of a reputable farmer. At the age of sixteen he entered a country machine shop at Parkersburg, later a similar establishment at Norristown, to learn the business. He next took up the construction of rolling mills and, meantime, made himself familiar with every detail of the iron and steel business from that of reducing the ores in the blast furnace to the puddling of iron and the final work of the rolling mill. He became, in due time, an authority and acknowledged expert in his art and erected some of the most important establishments of the time, including the Cambria Iron Works, and, finally the now enormous plant of the Bethlehem Iron and Steel Works, of which latter he was manager and with which he remained for a generation. He introduced some of the most important of modern methods and apparatus and was one of the earliest and most successful among the pioneers in the use of the Bessemer process in the United States.

Since his retirement from the superintendency of the mammoth establishment which grew up under his hand, Mr. Fritz has been engaged in many enterprises as consulting expert and in some public works. He is a member of the principal associations, professional and scientific, in his field, both at home and abroad. He still enjoys good health and is strong and active and as much interested in life and good works as ever.

The foundation of this medal is hoped to prove a valuable incentive and aid to applied science, evidencing appreciation of good work and great deeds on the part of able men, as well as constituting a permanent and worthy monument to the man whose own admirable life and great work is thus given an enduring and fitting memorial.

R. H. THURSTON.