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ARTICLE XXIV.

FIRST REPORT TO THE "COTTON PLANTERS' CONVENTION" OF GEORGIA:

On the Shell-Limestone and Marls of Gerrgia. By JOSEPH JONES, M. D., Chemist of the "Cotton Planters Convention of Georgia" and Professor of Medical Chemistry in the Medical College of Georgia at Augusta.

Summary: Geological position and extent of the Tertiary Lime formation of Georgia—Marls and Shell Limestone of Burke County, Georgia—Chemical Constitution—Value as Fertilizers—Amounts of Phosphate of Lime, Phosphoric Acid and Carbonate of Lime, which they are capable of yielding for Agricultural purposes—Amount of Lime which they are Capable of Yielding for Architectural purposes. Shell Limestone of Washington County, Chemical Constitution—Amounts of Phosphate of Lime Phosphoric Acid, and Carbonate of Lime, which it is Capable of yielding for Agricultural Purposes—Valuable to the State as an inexhaustible source of Lime for building and Agriculture. Tables Exhibiting the Chemical Constitution of the Marls and Shell Limestone—Comparison of the Shell Limestone and Marls of Georgia, with the Limestones and Marls of Europe, Massachusetts, Rhode Island, Maryland, South Carolina, Alabama, Kentucky and Arkansas—The Shell Limestone and Marls of Georgia are equal in Commercial, Agricultural and Architectural value to any in the World—Georgia is independent of the world in Lime for Architecture, and the Phosphates for Agriculture—Comparison of the Marls and Shell Limestone, with Commercial Fertilizers—Superphosphates Phosphatic Guanos, and Manipulated Manures—The amount of Georgia Marl and Shell Limestone, which may at a trifling cost be applied to each acre of land contains more than double the amount of Phosphates contained in the most expensive and highly prized Commercial Manures—Tables Illustrating the relative value of fertilizers. Relations of the Marls and Shell Limestone of Georgia to the Soil, Plants and Animals—Lime indispensable to the fertility of Soils—Lime indispensable to the healthy Constitution of Plants and Animals—Effects of Calcareous Manures upon soils and Vegetables—Practical experimental results in the use of Marls and Lime—Results of Marling in Virginia—Mr. Ruffins Experience—Experiments upon Marling in South Carolina, and

other States—In Europe and amongst the ancients—Testimony of Pliny to the value of Calcareous Manures—Methods of Applying Marls to the soil. Native Resources of Georgia for the reclamation of her worn out soils—Chemical Constitution of the various native fertilizers—Swamp muck—Suspended Matters in Swamp Water—Stable manure—Cowpen Manure—Black Rush—Charcoal—Bones—Salt mud—Cotton Seed—Cotton and Corn stalks and leaves—General Conclusions—The Planters of Georgia have upon their own soil inexhaustible stores of fertility, and if they are true to their present interest, and to the interest of their children and to the future prosperity and independence of their native State, they will abandon in a great measure imported Compounds, and thus stop a ruinous expenditure of money which flows out of the State into the pockets of men in most cases, foreign to our soil and thus inaugurate that system of agricultural improvement, which will result not only in the restoration but also in the preservation of the land in its primitive fertility—Joint Clay of Georgia—Geological position and extent—Proportion of Phosphates, which it contains—Importance of its relations to Agriculture—Value as an application to sandy land—Comparison of the Joint Clay of Georgia, with various European and American Clays and Soils.

I. Geological Position and Extent of the Tertiary Lime Formation of Georgia.

The Shell Limestone of Georgia belongs to the Eocene, the lowest divison of the Tertiary formation.

This formation is called Eocene, because it is the *dawn* of the existing state of the animated creation, for whilst in the more recent formations, the Pliocene and Miocene, which in the Southern portions of Virginia, North Carolina, South Carolina, Georgia, Alabama and other States rest upon the Eocene, many of the fossil species have been identified with species now living in the seas and oceans, in the Eocene formation on the other hand, but very few of the fossils have been identified with living species.

The fossils characteristic of this formation will be noticed in the general Report on the soils and geological formations of Georgia, which I hope to present to the Cotton Planters Convention at an early day—at present we will merely state that it is exceedingly rich in fossil shells, corals, bones and teeth of Sharks and other extinct vertebrate and invertebrate animals—300 species of shells have been discovered at a single locality at Claiborne Alabama, and described by Mr. Isaac Lea and Mr. Conrad of Philadelphia, and in Europe more than twelve hundred distinct species of shells have been discovered in this formation.

The Cretaceous and Eocene formations underlie the great Atlantic slope or low region (called the Alluvial Plain by

many writers) extending from Long Island to the Eastern Shore of the Gulf of Mexico. The Eocene formation crops out, or has been laid bare, at various localities as Wilmington, North Carolina, on the Santee and Cooper Rivers, Stoudenmire Creek at Eutaw and many other localities in South Carolina, at Shell Bluff, Stony Bluff, Mill Haven, Jacksonboro, Briar Creek, Paramour's Hill, Millen, on the Ogeechee in Burke Co., Tennille, Washington Co., below Columbus Ga., Eufaula and Claiborne, Ala., and many other localities. These localities are mentioned in a regular series from North East to South West. This list which might be greatly enlarged will serve our present purpose, in illustrating the wide distribution of this shell limestone formation. Accompanying the full report to the Cotton Panters Convention we hope to present a Map showing the distribution and relations of this formation.

The wide distribution and inexhaustible stores of the Eocene formation in South Carolina, Georgia, Alabama, Mississippi and other States renders a knowledge of its chemical constitution of the greatest value to the Agriculturist.

For the present we have selected Burke and Washington Counties for two reasons:

1st. They represent a large planting interest, 2d. They are intersected by Railroads, which can distribute the Marl and Shell-limestone to all parts of the State for agricultural and building purposes. In succeeding Reports and in the General Reports to the Convention we hope to be able to present the Chemical Constitution and Agricultural value of the Marls and Shell limestone of every county in Georgia, which possesses these deposits.

II. Chemical Examination of the Marls of Burke Co., Georgia.

No. 1 Green Marl.

This specimen was obtained upon the plantation of J. V. Jones, Esq., 6 miles East of the 90 mile station, Central Railroad.

The Marl is composed of a mixture of Green silicate of Alumina and Iron, Silicious Sand and Shells.

Section above the bed of Marl.

Sandy Soil - - - - -	2 feet.
Yellow Clay and sand - - -	3 "
Joint Clay - - - -	35 "
Bed of Green Marl - - -	Undetermined.

The bed of Green Marl is found 40 feet beneath the surface and extends downwards to an unknown depth.

ANALYSIS NO. 1—GREEN MARL.

	100 parts contain.	100 pounds contain.	One Ton of 2000 pounds contain.	100 Bushels contain pounds.	200 Bushels contain pounds.	300 Bushels contain pounds.	400 Bushels contain pounds.	500 Bushels contain pounds.	1000 Bushels contain pounds.
Carbonate of Lime 43,435 {Lime	24.282	242.820	485.640	2428.	4856	7284	9712	12141.	24282.
{Carbonic Acid	19.153	191.530	383.060	1915.	3830.	5745	7661.	9576.	19152
Phosphate of Lime 3,649 {Lime	1.972	19.720	39.440	197.	394.	591.	788	986.0	1972.
{Phosphoric Acid	1.677	16.770	33.540	167.	335.	503.	670.	838.5	1677.
Carbonate of Magnesia	0.27	2.700	5.400	27.	54.	81.	108.	135.	270.
Sulphate of Lime	trace.								
Sulphuric Acid	trace.								
Chlorides	0.014	0.140	0.280	1.4	2.8	4.2	5.6	7.0	14.
Alumina and Silicates of Iron	7.196	71.960	143.92	719.	1439.	2158	2876	3598.	7196.
Insoluble Silicates	31.941	319.410	638.820	3194.	6388	9582	12776	15970.	31941.
Silicious Sand	8.055	80.550	161.10	805.	1601.	2415.	3222.	4027.	8050.
Water as Moisture	5.714	57.140	114.28	571	1142.	1714.	2285.	2857.	5714.

The Green color of this Marl is due to the presence of Silicate of Iron.

This Marl will yield 33½ pounds of Phosphoric Acid to the ton of 2000 pounds.

Each ton of this Marl contains 73 pounds of Phosphate of Lime (Bone Earth)—If now we assume that the Phosphate of Lime is worth 2 cts. per pound, then this constituent alone would be worth $1.46 per ton. The Carbonate of Lime is also valuable as a fertilizer as are also the Insoluble Silicates which contain small quantities of Soda and Potassa—and will during their slow decomposition yield them to the soil. At a moderate calculation this Marl is worth $2 per ton to the agriculturist. One hundred bushels of the green marl contains four times more phosphoric acid, and as a necessary consequence, four times more phosphate of lime, than one hundred pounds of Phosphatic and Peruvian guano, or of any other commercial fertilizer.

No. 2 Yellow Marl.

From well near the Methodist Church, 5 miles east of 90 mile station Central Railroad, on the land of J. V. Jones, Esq.

This Marl is composed of yellow clay and shells. The bed lies 30 feet beneath the surface in contact above with joint clay and rests below upon hard shell limestone and is 2 feet thick.

ANALYSIS 2.—YELLOW MARL.

		100 parts contain.	100 pounds contain.	One ton of 2000 pounds contains.	100 bushels contain pounds.	200 Bushels contain pounds.	300 Bushels contain pounds.	400 Bushels contain pounds.	500 Bushels contain pounds.	1000 Bushels contain pounds.
Carbonate of Lime 43.023	Lime	24.993	249.930	499.860	2499.	4998	7497.	9997	12496	24993.
	Carbonic Acid.	18.030	180.300	360.600	1803	3606	5409	7212	9015	18030.
Phosphate of Lime 6.465	Lime	3.494	34.940	69.880	349.4	698.8	1048.2	1397.6	1747.0	3494.
	Phosphoric Acid.	2.971	29.710	59.420	297.1	594.2	891.3	1188.4	1485.5	2971.
Carbonate of Magnesia		0.841	8.410	16.820	84.	168.	252.	336.	420.	841.
Sulphate of Lime		0.002	0.020	0.040	0.2	0.4	0.6	0.8	1.0	2.
Sulphuric Acid		0.001	0.010	0.020	0.1	0.2	0.3	0.4	0.5	1.
Chlorides		0.010	0.100	0.200	1.0	2.0	3.0	4.0	5.0	10.
Oxide of Iron		0.265	2.650	5.300	26.	53.	79.	105.	132.	265.
Silicates Insoluble in Hydrochloric Acid		40.178	400.780	803.560	4017	8035.	12053.	16071	20089.	40178.
Silcious Sand		5.620	56.200	112.400	562.	1124.	1686.	2248.	2810.	5620.
Water as moisture		3.100	31.000	62.000	310	620.	930	1240	1550	3100

This Marl will yield to the Ton of 2000 pounds.

Carbonate of Lime - - -	860.460 pounds.
Phosphate of Lime - - -	129.300 "
Phosphoric Acid - - - -	59.420 "

This Marl will prove a most valuable fertilizer to all soils and especially to sandy soils, on account of the insoluble silicates, (clay,) as well as on account of the ingredients mentioned above. One hundred bushels of the yellow marl contain eight times more Phosphate of Lime than one hundred pounds of any known Guano or manufactured manure.

It would be perfectly safe to apply one hundred pounds of these marls to any land in Georgia, and if the lands be newly cleared and rich in organic matters, we might double and treble the amount.

The experience of Senator Hammond, of South Carolina, and others, have rendered it at least probable that the lands of South Carolina and Georgia will not bear as heavy applications of marl as the lands of England, Virginia and Maryland, and hence I would not, until careful experiments have

determined the exact amount of marl which is sufficient for our lands in Georgia, recommend the application of these green and yellow marls, upon sandy and cultivated lands, in larger quantities than two hundred bushels to the acre.

When I have completed the chemical analyses of the soils of Georgia, and have elaborated and finished my investigations upon the climate of Georgia, and its relations to the soil and vegetation, I hope to be able to speak with more precision.

It is, nevertheless, evident, that even with this small amount to each acre, the marls of Georgia will furnish far more Phosphoric Acid and Phosphate of Lime than a corresponding application of the most expensive commercial fertilizers. In making this comparison, we have impartially compared the yellow and green marls with the very best fertilizers in the market.

No. 3 White Shell Marl or Limestone.

Well at the Methodist Church—land of J. V. Jones, Esq. This specimen was taken from a bed of conglomerated fossil shells, lying immediately beneath the Yellow Marl No. 2.

SECTION.

Sandy Surface Soil - - - -	2 feet.
Yellow Sand and Clay - - - -	3 "
Joint Clay - - - - - -	25 "
Bed of Yellow Marl No. 2 - - -	3 "
White Shell conglomerate - -	undetermined.

This bed of fossil shells lies 33 feet beneath the surface of the soil, Joint Clay and Yellow Marl, and extends downwards to an unknown depth, probably for more than 100 feet.

When pulverised it resembles in appearance slaked lime.

ANALYSIS NO. 3—WHITE SHELL LIMESTONE.

	100 Parts contain.	1000 Pounds contain pounds.	One ton of 2000 pds. contains pds.	100 bushels contain pounds.	200 bushels contain pounds.	300 bushels contain pounds.	400 bushels contain pounds.	500 bushels contain pounds.	1000 bushels contain pounds.
Carbonate of Lime 87,742 { Lime........	49.192	491.920	983.840	4919.	9838	14757	19676	24596	49192.
Carbonate of Lime 87,742 { Carbonic Acid	38.650	386.500	773 100	3865	7730	11595	15460	19325	38650.
Phosphate of Lime 0,933 { Lime..........	0.506	5.060	10.120	50.6	101.1	151,8	202,4	253.0	506.
Phosphate of Lime 0,933 { Phosphoric Acid.	0.427	4.270	8 540	42,7	85.4	128.1	170.8	213.5	427.
Carbonate of Magnisia..................	0.770	1.700	3.400	77.	154.	231.	308.	385	770.
Sulphate of Lime......................	0.103	1.030	2.060	10,3	20.6	30.9	41,2	51.5	103.
Chlorides.............................	0.005	0.050	0.100	0.5	1,0	1.5	2.0	2.5	5.
Alumina and Oxide of Iron..............	0,266	2,660	5.320	26.6	53.2	79.8	106.4	133.0	266.
Silicates insoluble in Hydrochloric Acid.....	4.552	45,520	91.040	455.	910.	1365.	1820.	2276.	4552.
Silicious Sand	4.062	40,620	31.240	406,	812.	1218.	1624.	2031.	4062
Water as Moisture......................	0.117	1.170	2.340	11.7	23,4	35.1	46.8	58,5	117.6

One ton of this Shell Limestone will yield 1756.840 pounds of Carbonate of Lime and when burned 983.040 pounds of lime. It is therefore valuable for architectural as well as agricultural purposes.

*No. 4—Soft White Shell Marl.**

From well near negro quarters on the Plantation of J. V. Jones, Esq., 48 feet beneath the surface of the earth. This bed of Marl is much softer than those just described and the lumps crumble upon the slightest touch—when pulverized it presents a perfectly white appearance and resembles shell lime.

No. 5. Bluish Black Marl†

This bed of Marl lies in a dense swamp upon the South side of Buck-head Creek, 13 miles from the 90 mile station Central Railroad and 11 miles from Waynesboro. The land is owned by Capt. Matthew McCullers. This specimen was taken from beneath the roots of a large water oak which had been overturned by a storm.

The trees in this swamp are as large and luxurious as any I have ever seen in this section of the country. The roots of immense trees penetrated this marl in every direction—thus showing that it was favorable to vegetable growth. The hills around were sandy and appeared to be much exhausted by long culture. This Marl or more properly calcareous earth conisted chiefly of Blue Clay in which small fragments of shells and Carbonate of Lime were imbedded, and appeared to have resulted from the washings of the surrounding hills which are composed of sandy soil, joint clay beneath the sandy soil of and shell limestone beneath the joint clay ; and from sediment (mud, particles of shells, Carbonate of Lime, sand and organic matters) deposited from the waters of Buck-head Creek.

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*See Analysis 4 on next page.

†See Analysis 5 on page 530.

ANALYSIS NO. 4—WHITE SHELL MARL.

		100 parts contain.	1000 pounds contain pounds...	1 ton of 2000 pds. contains pounds	100 bushels contain pounds...	200 bushels contain pounds...	300 bushels contain pounds...	400 bushels contain pounds...	500 bushels contain pounds...
Carbonate of Lime 71.932	Lime.....	40.282	402.820	805.640	4028.	8056.	12084	16112.	20140.
	Carbonic Acid. ...	31.650	316.500	633.000	3165.	6330.	9495	12660	15825.
Phosphate of Lime 0.426	Lime,.....	.0230	2.300	4.600	23.	46	69	92	115.
	Phosphoric Acid.....	0,196	1.960	3.920	19.	39.	58	78	98.
Carbonate of Magnisia.....		0.028	0.280	0.560	2.8	5.6	8.4	11.2	14.0
Sulphate of Lime.....		0.001	0.010	0.020	0.1	0.2	0.3	0.4	0.5
Chlorides.....		0.005	0.050	0.100	0.5	1.0	1.5	2.0	2.5
Alumina and Oxide of Iron.....		1.248	12.480	24.960	124.	249.	373.	498.	624.
Silicates Insoluble in Hydrochloric Acid.....		19.062	190.620	381.240	1906.	3812.	5718	7624.	9530.
Silicious Sand.....		5.466	54.660	119.320	546.	1093	1639.	2186.	2733.
Water as moisture.....		0.842	8.420	16.840	84	168.	252.	336.	420

ANALYSIS NO. 5.—BLUISH BLACK MARL OR CALCAREOUS EARTH.

		100 parts contain.	1000 pounds contain pounds...	1 ton of 2000 pds. contain pounds...	100 bushels contain pounds...	200 bushels contain pounds...	300 bushels contain pounds...	400 bushels contain pounds...	500 bushels contains pounds..	1000 bushels contain pounds...
Carbonate of Lime 9,739	Lime........	5.454	54.540	109,080	545.	1090.	1635.	2180.	2725.	5450.
	Carbonic Acid	4.285	42.850	85.700	428.	856.	1284.	1712.	2140.	4280.
Phosphate of Lime 0.615	Lime........	0.332	3.320	6.640	33.	66.	99.	132	165	330.
	Phosporic Acid	0.283	2.830	5.660	28	56.	88	112	140	280.
Carbonate of Magnesia..................		0.030	0.300	0.600	3.	6.	9.	12.	15	30.
Sulphate of Lime.....................		trace	——	——	——	——	——	——	——	——
Chlorides............................		0.120	1.200	2,400	12.	24.	36.	48.	60.	120.
Alumina and Oxide of Iron..............		1.140	11.400	22.800	114.	228.	342.	456.	570	1140.
Organic Matters Ulmic and Humic Acids &c.		1.398	13.980	27,960	139.8	279.6	419.4	559.2	699.0	1398.
Silicates insoluble in hydrochloic Acid (Clay)		32.190	321,900	643,800	3219.	6438.	9657.	12876.	16077.	32190
Silicious Sand........................		47.173	471,730	943.460	4717	9434.	13151.	18868.	23585.	47170.
Water as moisture.....................		6.628	66.280	133.560	662.8	1325.6	1988.4	2651.2	3314.0	6628.

One ton of this Marl or calcareous earth contains 28 pounds of organic matter, 195 pounds of Carbonate of Lime, 12 pounds of Phosphate of Lime and 943 pounds of Insoluble Silicates (Clay). This Marl will therefore prove a valuable fertilizer upon the surrounding sandy lands. It may be applied in much larger quantities than the shell limestone It would be safe to apply 1,000 bushels of this bluish black marl, which occurs on the plantation of Captain Matthew McCullers, in Burke county, to each acre of land, for in this amount we would have only 9,739 pounds of carbonate of lime, intimately mixed with clay.

In this amount we would obtain 610 pounds of Phosphate of Lime. an amount at least twice as great as that contained in a most liberal application of the best guano and commercial manures.

Hence, with truth and reason we may affirm that this bluish black deposit will prove a valuable fertilizing agent to the surrounding exhausted sandy lands. The clay alone will prove a valuable addition to the sandy lands.

No. 6.—Black Swamp Deposit rich in Carbonate of Lime.

Plantation of Capt Matthew McCullers, 300 yards south of Buck-head creek and 260 yards south of deposit No. 5.

This deposit occurs in a dense swamp, and is of recent origin, being derived from the washing of the surrounding hills, the vegetable matters of the dense forest, and from the calcareous matters dissolved in the waters of the small stream which issues out of the shell-limestone hills half a mile distant, and which flows through the swamp near this deposit. In wet weather the stream overflows its banks and covers this deposit. This deposit varies from one to three feet in thickness.

One ton of this dried swamp deposit contains 164 pounds of Organic Matter, 135 pounds of Carbonate of Lime, and 16½ pounds of Phosphate of Lime. The large proportion of Organic Matters also assist in rendering this a valuable manure. The value of this swamp deposit, as well as the efficacy of the Shell Marl, is increased by mixing them

together, at the time of their application to the fields. It would be safe to apply one thousand bushels of the black swamp deposit No. 7, to each acre of land. In this amount we would apply as much Phosphate of Lime, as is contained in one thousand pounds of the very best Phosphatic Guanos, and in addition to this we will apply eight thousand two hundred and twenty-one pounds of organic matters and six thousand eight hundred and eight pounds of Carbonate of Lime.

Although these organic matters are not as soluble, or as valuable sources of ammonia, as the organic matters of Guano, or of animal manures, still they are valuable, for they consist of animalcules, stems, roots and leaves of trees in various stages of decomposition, in addition to various other organic compounds, as humic and ulmic acids. It is well known to every chemist that lime promotes the disintegration and preparation for vegetables, of the most stable and insoluble compounds; hence the deposits of swamps and peat bogs, which are comparatively inert, are readily decomposed and prepared for vegetation by the action of lime. The value of this black swamp deposit, on this very account, will be increased, by mixing it intimately with one-quarter of its weight of pounded lime-stone, or one-twentieth of its weight of lime—this would be easily accomplished on the plantation of Capt. McCullers, where this deposit occurs, for the surrounding hills are composed in great measure of shell Limestone. It should be borne in mind that a less quantity of this mixture should be added to the land. That portion of this swamp deposit, which we designate as insoluble silicates and silicious sand, will of itself alone be a useful addition to the neighboring sandy lands, for it is composed chiefly of a clay, rich in lime, and contains, also, some soda and potassa.

That the deposits from swamps are useful applications to sandy lands, and greatly increase (when applied in sufficient quantities) the yield of both cotton and corn, I have had most favorable opportunities of observing in my native county, Liberty county, Ga.) upon cotton plantations in the immediate vicinity of the plantations cultivated by my brother and myself; and in this connection I would simply remark, that

I have collected deposits from the salt marshes of the Atlantic coast of Georgia, from the brackish swamps, from the deltas of both salt, brackish and fresh water rivers, and from the fresh water swamps which lie above the tertiary formation, and have been, and am still, engaged in a careful chemical examination of these deposits. We hope to be able to present a report upon these deposits. as well as upon the waters from which they are derived, at an early day, to the Cotton Planters' Convention. In this report the agricultural value of these deposits will be carefully described.

ANALYSIS NO. 6—BLACK SWAMP DEPOSIT IN NATURAL CONDITION.

	100 parts contain....	1000 pounds contain p'nds	1 Ton of 2,000 pounds contain pounds	100 bushels contain pounds.....	200 bushels contain pounds.....	300 bushels contain pounds.....	400 bushels contain pounds.....	500 bushels contain pounds.....	1000 bushels contain pounds ....
Carbonate of Lime, 2.083 { Lime,...............	1.167	11.670	23.340	116.7	233.4	350.1	468.8	583.5	1167.
{ Carbodic Acid......	0.916	9.160	18.320	91.6	183.2	274.8	366.4	458.0	916.
Phosphate of Lime, 0.292 { Lime,.............	0.158	1.580	3.160	15.8	31.6	47.4	63.2	79.0	158.
{ Phosphoric Acid...	0.134	1.340	2·680	13.4	26 8	40.2	53.6	67.0	134.
Carbonate of Magnesia......................	0.009	0.090	0.180	0.9	1.8	2.7	3.6	4.5	9.
Sulphate of Lime.............................	trace.								
Organic matters, Humic and Ulmic Acids, &c., containing Salts of Potassa and Soda........	2.912	29.120	58.240	291.2	582.4	873.6	1164.8	1456.0	2912.
Oxide of Iron and Alumina..................	1.329	13.290	26.580	132.9	265.8	398.7	531.6	664.5	1329.
Insoluble Silicates and Sand, (chiefly clay).....	28.409	284.090	568.180	2840.9	5681.8	8522.7	11363.6	14204.5	28409.
Water as Moisture..........................	64.714	647.140	1294.280	6471.4	12942.8	19414.2	25885.6	32357.0	647 14

This analysis reveals the fact that each ton of the moist swamp deposit contains 1294 pounds of water; this fact shows the necessity of drying this swamp deposit before transportation. Dried at a temperature of 230°, this swamp deposit presented the following composition;

ANALYSIS NO. 7—DRY SWAMP DEPOSIT.

	100 parts contain.... ..	1000 p'ds contain pounds	1 Ton of 2,000 pounds contain pounds	100 bushels contain pounds.....	200 bushels contain pounds.....	300 bushels contain pounds.....	400 bushels contain pounds.....	500 bushels contain pounds.....	1000 bushels contain pounds ....
Carbonate of Lime, 6,808 { Lime,...............	3.813	38,130	76,260	381.3	762.	1043.	1524.	1805.	3810.
{ Carbonic Acid,......	2,995	29,950	59,900	299.5	599.	899.	1198.	1497.	2990.
Phosphate of Lime, 0,822 { Lime,...............	0,444	4,440	8,880	44.4	88.	133.	177.	222.	444.
{ Phosphoric Acid,....	0,378	3,780	7,560	37.8	75.	113.	151.	189.	378.
Carbonate of Magnesia,........................	0,029	0,290	0,580	2.9	5.	8,	11.	14.	29.
Sulphate of Lime,..............................	trace.								
Organic matters, Humic and Ulmic Acids, &c., containing also Salts of Soda and Potassa,....	8,221	82,210	164,420	822.1	1641.	2466.	3288.	4110.	8221.
Oxide of Iron,..................................	3,766	37,660	75,320	376.6	753.	1189.	1506.	1813	3766.
Insoluble Silicates and Silicious Sand,....	80,211	802,110	1604,220	8021.1	16042.	24063.	32084.	40105.	80211.

No. 7.—Reddish Brown Marl.

This deposit lies on the edge of the dense swamp in which the previous deposit was found, 340 yards south of

ANALYSIS 8.—REDDISH BROWN MARL.

	100 parts contain........	1000 pounds contain pounds, ..	1 Ton of 2,000 pounds contain pounds, ...	100 bushels contain pounds,..	200 bushels contain pounds...	300 bushels contain pounds,..	400 bushels contain pounds,..	500 bushels contain pounds,..	1000 bushels contain pounds...
Carbonate of Lime, 42.389 { Lime, ...	23.738	237.380	474.760	2373.	4647.	7121.	9485.	11869.	23730.
Carbonate of Lime, 42.389 { Carbonic Acid,.	18,651	186.510	373.020	1865.	3730.	5595.	7460.	9325.	18650.
Phosphate of Lime, 0.218 { Lime.........	0.118	1.180	2.360	11.8	23.6	35.4	46.4	59.0	118.
Phosphate of Lime, 0.218 { Phosphoric Acid	0.100	1.000	2.000	10.	20.	30.	40.	50.	100.
Carbonate of Magnesia,.................	0,157	1.570	3.140	15.7	31.4	47.1	72.8	78.5	157.
Sulphate of Lime......................	trace,								
Chlorides,............................	trace,								
Oxide of Iron..........................	2.265	22.650	45.300	22.6	453,	679.	906.	1132.	2265.
Silicates insoluble in Hydrochloric Acid (clay)	23,346	233.460	466.920	2234.	4669.	7003.	6338.	11672.	23340.
Silicious Sand.........................	22.900	229.000	458.000	2290.	4570,	6870.	9160.	12450.	22900.
Water as Moisture,.....................	8.102	81.020	162.040	810,	1620.	2430.	3240.	4050.	8100.

Buck-Head Creek, 290 yards south of Deposit No. 5, and 40 yards east of Deposit No. 6.

This Deposit appears to be recent, resulting from the washing of the surrounding joint clay and shell lime hills.

This Marl presents a yellow and reddish brown color, and contains numerous nodules of oxide of Iron. When pulverised, it resembles some varieties of American Guano.

No. 8.—Reddish Brown Marl. *

Land of Capt. McCullers, near Limestone Spring. This bed of Marl was found at the base of a hill composed of joint clay and shell Limestone, and extended across the bed of a stream which issued out of the Shell Limestone formation, one hundred yards beyond. It is composed of a mixture of yellow and reddish brown clay and fragments of fossil shells.

No. 9.—White Shell Limestone. †

Plantation of Capt. Matthew McCullers, near Limestone Spring. This formation of shell conglomerate is composed of fossil shells and star-fish, and appears to form the greater portion of the surrounding hills. Many of the star-fish are completely filled with crystallized Carbonate of Lime. Many of the shells are encrusted with beautiful crystals of Carbonate of Lime. This specimen was selected from the side of the stream near the Limestone spring.

This stream, like other streams in this limestone region, issues from the base of a hill, throwing up the small particles of shell and white sand. The banks of the stream and the sides of the hill are clothed with the magnificent virgin forest, which forms a dense and delightful shade. The water is very cool and as clear as crystal—it fails, however, to quench thirst, and is injurious on account of the large proportion of lime which it contains. We shall present, in our report to the "Cotton Planter's Convention," analyses of these waters, and also point out their relation to disease and their value in agriculture.

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*For Analyses of this Marl in natural and dried condition, see Analysis Nos 9 and 10. †For Analysis see page 738.

ANALYSIS NO. 9—REDDISH BROWN MARL IN NATURAL STATE.

	100 parts contain,....	1000 pounds contain pounds,. .	1 Ton of 2,000 pounds contain pounds,..... ..	100 bushels contain pounds,...	200 bushels contain pounds,..	300 bushels contain pounds,..	400 bushels contain pounds,..	500 bushels contain pounds, ..	1000 bushels contain pound.s..
Carbonate of Lime, 15.473, { Lime,........	8.665	86.650	173.300	866.	1733.	2599.	346.6	4332.	8660.
Carbonate of Lime, 15.473, { Carbonic Acid,	6.808	68.080	136.160	680.	1361.	2042.	272.3	3404.	6808.
Phosphate of Lime, 0.349, { Lime,....	0.188	1.880	3.760	18.8	37.6	56.4	75.2	94.0	188.
Phosphate of Lime, 0.349, { Phosphoric Acid,	0.161	1.610	3.230	16.1	32.2	48.3	64.4	70.5	161.
Carbonate of Magnesia,..................	trace,								
Sulphate of Lime........................	trace,								
Sulphuric Acid	trace,								
Chlorides,............	0.086	0.860	1.720	8.6	17.3	25.8	34.4	43.0	86.
Insoluble Silicates, (clay)...............	42.662	426.620	853.240	4266.	8532.	12798.	17064.	1733.0	42660.
Silicious Sand..........................	16.942	169 420	338.840	1694.	3388.	5082.	6776.	7470.	16940.
Alumina and Oxide of Iron...............	2.005	20.050	40.100	200.	401.	601.	802.	1002.	2005.
Water as Moisture,.................	21.856	218.560	427.120	2185.	4371.	6556.	8742.	10928.	21850.

ANALYSIS NO. 10—REDDISH BROWN MARL DRIED AT 230°.

	100 parts contain	1000 pounds contain pounds,..	1 Ton of 2000 pounds contain pounds,.....	100 bushels contain pounds...	200 bushels contain pounds,..	300 bushels contain pounds,..	400 bushels contain pounds,..	500 bushels contain pounds...	1000 bushels contain pounds,..
Carbonate of Lime, 19.799 { Lime,.....	11.087	110.870	221.750	1108.	2216.	3326.	4434.	5543.	11087.
Carbonic Acid	8.712	87.120	174.240	871.	1742.	2613.	3484.	4356.	8712.
Phosphate of Lime 0.446 { Lime,.....	0.240	2.400	4.800	24.	48.	72.	96.	120.	240.
Phosphoric Acid	0.206	2.060	4.120	206.	41.2	61.8	82.4	103.0	206.
Carbonate of Magnesia,.....	trace,								
Sulphate of Lime,.....	trace,								
Sulphuric Acid,.....	trace,								
Chlorides,.....	0.107	1.070	2.140	10.7	21.4	32.1	42.8	53.5	107.
Insoluble Silicates, (clay).....	54.594	545.940	1091.880	5459.	10918	16378.	21837.	27297.	54594.
Silicious Sand,.....	21.680	216.800	633.600	2168.	4336.	6504.	8672.	10840.	21680.
Alumina and Oxide of Iron,.....	2.565	256.500	513.000	256.	513.	719.	1026.	1282.	2565.

ANALYSIS NO. 11.—WHITE SHELL LIMESTONE.

	100 parts contain	1000 pounds contain pounds,..	1 Ton of 2000 pounds contain pounds,......	100 bushels contain pounds,..	200 bushels contain pounds...	300 bushels contain pounds ..	400 bushels contain pounds...	500 bushels contain pounds...	1000 bushels contain pounds,...
Carbonate of Lime 80.075, { Lime,..	44.843	448.430	896.860	4484.	8968.	13452.	18936.	22421.	44843.
Carbonate of Lime 80.075, { Carbonic Acid..	35.233	352.330	704.760	3523.	7046.	10569.	17092.	17616.	35230.
Phosphate of Lime, 1.181, { Lime,.........	0.637	6.370	12.740	63.7	127.4	191.1	254.8	318.5	637.
Phosphate of Lime, 1.181, { Phosphoric Acid,	0.544	5.440	10.880	54.4	108.8	163.2	217.6	272.0	544.
Carbonate of Magnesia,..................	0.009	0.090	0.180	0.9	1.5	2.7	3.6	4.5	9.
Sulphate of Lime........................	0.004	0.040	0.080	0.4	0.8	1.2	1.6	2.0	4.
Chlorides,............................	0.009	0.090	0.180	0.9	1.8	2.7	3.6	4.5	9.
Oxide of Iron and Alumina...............	0.594	6.940	13.880	69.	138.	218.	277.	357.	694.
Insoluble Silicates, (clay)................	4.018	40.180	80.360	401.8	803.6	1205.4	1607.2	2009.0	4018.
Silicious Sand,.........................	13.081	130.810	261.620	1308.	2616.	3924.	5232.	6540.	13081.
Water as Moisture,......................	0.681	6.810	13.620	68.	136.	204.	272.	340.	681.

ANALYSIS NO. 12.—WHITE COMPACT SHELL LIMESTONE.

	100 parts contain	1000 pounds contain pounds...	1 Ton of 2000 pounds contain pounds.....	100 bushels contain pounds...	200 bushels contain pounds...	300 bushels contain pounds...	400 bushels contain pounds...	500 bushels contain pounds...	1000 bushels contain pounds...
Carbonate of Lime, 85.285, { Lime.....	47.760	477.600	955.200	4776.	9552.	14328.	18004.	23880.	47760.
{ Carbonic Acid,	37.525	375.250	751.500	3752.	7505.	11257.	15019.	17762.	37525.
Phosphate of Lime, 0.250 { Lime.....	0.135	1.350	2.700	13.5	27.0	40.5	54.0	67.0	135.
{ Phosphoric Acid,.	0.115	1.150	2.300	11.5	23.0	34.5	46.0	57.5	115.
Carbonate of Magnesia,.....	2.220	22.200	44.400	222.	444.	666.	888.	1110.	2220.
Sulphate of Lime,.....	trace.								
Chlorides,.....	0.019	0.190	0.280	1.9	3.8	5.7	7.6	9.5	19.
Insoluble Silicates, (clay).....	0.393	3.930	7.860	39.3	78.6	87.9	157.2	196.5	393.
Silicious Sand,.....	10.708	107.080	214.160	1070.	2141.	3212.	4282.	5354.	10708.
Alumina and Oxide of Iron,.....	0.876	8.760	17.520	87.	175.	262.	350.	438.	876.
Water as Moisture.....	0.214	2.140	4.280	21.	42.	64.	85.	107.	214.

This bed of White Shell conglomerate will yield when burned 955 pounds of Lime to the ton, suitable for building as well as for agriculture.

This specimen, as well as the preceding one, No. 9, was selected from the base of the hill where the formation is exposed, and at this point streams of water issue, bearing down in their course much white sand. From this fact it is reasonable to infer that if the lime rock is taken from the interior of the hill, it will contain much less sand, and will yield proportionally more Lime.

III. Shell Limestone of Washington County, Georgia.

The Central Rail Road passes through the Eocene formation in Screven, Burke, Jefferson and Washington counties, and many fine deposits of Shell Limestone and Marl may be seen along the route, especially in Jefferson and Washington counties. We shall, at present, present the results of our examination of the deposit in Washington county, near the Station Tennille, No. 14, Central Rail Road. We have selected the deposit in this locality for an early examination and report, because it yields Lime of an excellent quality for architectural as well as agricultural purposes, and because it is inexhaustible, containing lime sufficient to supply every planter and architect in Georgia. I am indebted to Samuel O. Franklin, Esq., of Tennille, for the opportunity of examining the durability and finish of the plaster made from this Lime.

The Station Tennille, near where the Shell Limestone is found, is the most elevated point on the Central Rail Road between Savannah and Macon, being 465 feet above tide-water, 244 feet above the station ten miles above; 279 feet above the Oconee River, 12 miles above; 174 feet above Station No. 12, ten miles below; 285 feet above the Ogeechee River, and 168 feet above Macon.

SECTION AT TENNILLE.

Surface soil, vegetable mould, sand and clay,	6 to 18 inches.
Yellow and Red Clay and Sand, . . .	5 feet.
Joint Clay, ...	12 "
Coarse Sand without Clay, ...	22 "
Solid Shell conglomerate, . . .	undetermined.

At the depth of 51 feet, an abundant supply of water is obtained.

Upon the plantation of Mr. Sneed, one mile and a half from Tennille, the Shell Limestone crops out at the surface, and the sides of several hills which I examined were covered with fragments of oyster shells. These shells, bleached by the sun and acted upon by the weather, resembled the shells which cover the surface of the islands of our sea-coast. The surface shells were easily crushed, whilst those lying in the streams, and which had been washed out of the sides of the hills, were of flinty hardness. Beneath the bed of oyster shells is found a solid conglomerate of shells and star fish. In some localities, sharks' teeth, and vertebræ and ribs of cetaceous and various extinct vetebrate animals are found.

The streams have formed subterranean passages through these hills of Shell Limestone.

In some places, it is possible to pass entirely through the hills in the tunnel formed by these streams. The water flowing in these streams is limpid and cool. The beds of the streams where they flow over the solid shell rock, are paved with fossil star-fish, which being harder and more compact than the surrounding shell conglomerate, resist the action of the water, and stand out above the lime rock. In other places where the loose sand accumulates, sharks' teeth and fossil bones are found, having evidently been washed down by the water.

The Shell Limestone can be obtained in inexhaustible quantities from the sides of the hills, without any excavation, and without suffering any inconvenience from an accumulation of water.

No. 10—*White Compact Shell Limestone.*

From same Deposit as No. 9. This specimen was much more compact and hard than No. 9. The interior of the shells and star-fish were lined with beautiful crystals of Carbonate of Lime.

ANALYSIS NO. 13—SHELL LIMESTONE OF WASHINGTON CO.

		100 parts contain	1000 pounds contain pounds,..	1 Ton of 2000 pounds contain	100 bushels contains pounds..	200 bushels contain pounds,..	300 bushels contain pounds,..	400 bushels contain pounds,..	500 bushels contain pounds ..	1000 bushels contain pounds,..
Carbonate of Lime 92.216	Lime,.....	51.860	515.040	1030.080	5186.	10372.	15558.	20744.	25930.	51860.
	Carbonic Acid,.	40.356	403.560	807.120	4035.	8071.	12106.	16142.	20177.	40356.
Phosphate of Lime & Magnesia 0.628	Lime and Magnesia, .	0.328	3.280	6.520	32.8	65.6	98.4	131.2	164.0	328.
	Phosphoric Acid,...	0.298	2.980	5.960	29.8	59.6	89.4	119.2	149.0	298.
Carbonate of Magnesia,.....		trace,								
Sulphate of Lime.....		0.300	3.000	6.000	30.	60.	90.	120.	150.	300.
Chlorides,.....		0.015	0.300	0.600	1.5	3.0	4.5	6.0	7.5	156.
Oxide of Iron,.....		trace,								
Alumina,.....		1.170	11.700	23.400	117.	234.	351.	468.	585.	1170.
Silicates, (insoluble in Hydrochloric Acid)..		4.500	45.000	90.000	450.	900.	1350.	1800.	2250.	4500.
Silicious Sand,.....		0.933	9.330	18.660	73.	186.	279.	373.	466.	930.
Water as Moisture,.....		0.300	3.000	6.000	30.	60.	90.	120.	150.	300.

This Shell Limestone will yield 1030 pounds of excellent Lime to the ton. For agricultural purposes it will yield 1837 pounds of Carbonate of Lime, and 12½ pounds of Phosphate of Lime. It is highly probable that an extended and careful search would result in the discovery of deposits much richer in the Phosphates. We would look for an accumulation of the Phosphate of Lime in those deposits which are rich in the remains of vertebrate animals. We will in the next place consider the relative value, effects and mode of application of the Marls and Shell Limestone of Georgia. It will be impossible upon the present occasion to do more than present general and well established facts and conclusions.

The whole subject will be fully and carefully discussed in the large Report, which we expect to present to the "Cotton Planters' Convention" when the Agricultural Survey is completed.

IV. Comparison of the Shell-Limestone and Marls of Georgia with the Limestones and Marls of Europe, and with the Limestones and Marls of Massachusetts, Rhode Island, South-Carolina, Alabama, Arkansas and Kentucky.

The following tables will present comparative views of the chemical constitution of the Limestones and Marls of Europe, and of several States where similar deposits have been carefully examined and analyzed by reliable chemists.

In the selection of the materials for the tables of the chemical constituents of the Limestones and Marls of Europe, and of the United States, I have impartially chosen the results obtained by the most reliable observers, and have carefully stated not only the observer's name, but also the titles of the works in which the results were originally published.

In the construction of these Tables I have made no omissions, but have embodied all the results obtained by each observer. These are not, therefore, selected observations, isolated, and partial, but entire series of observations, conducted by the various chemists named. I believe that in this way alone, can fair and impartial comparisons be instituted between

the chemical constituents of the Lime-formations of Georgia, and of other parts of the United States and of Europe. We are fully aware that many of the results embodied in these Tables, relate to formations of different Geological ages, from those of the Eocene of Georgia; and this is precisely one of the results which we wish to accomplish. By this comparison we wish to present in one general view, the chemical constitution of the Lime-formations of various Geological ages.

Every one will admit that this is the only just way of testing the relative value of the Shell-limestone and Marls of Georgia.

TABLE I.—Chemical Constitution of the Shell-Limestone of Georgia, showing the percentage of the various ingredients.

	ONE HUNDRED PARTS CONTAIN.				
	Near Tennille, Washington co. plantation of Mr. Sneed....	White Shell Limestone, Burke co. 6 miles east of Central R. R. plantation of J. V. Jones, Esq.	White Shell-Limestone, Burke co. 6 miles east of Central R. R. plantation of J. V. Jones, Esq.	White Shell Limestone, Burke co. 12 miles east of Central R.R. plantation of Capt. M. McCullers	White Shell-Limestone, Burke co. 12 miles east of Central R.R. plantation of Capt. M. McCullers
Carbonate of Lime	92.21	87.74	71.93	80.07	85 285
Percentage of Quick-lime	51.860	49.192	40.282	44.843	47·760
Phosphates of Lime and Magnesia	0.628	0.933	0.426	1.181	0·250
Percentage of Lime in the Phosphates	0.328	0.506	0.230	0.637	0.135
do. Phosphoric Acid do.	0.298	0.427	0.196	0.544	0.115
Carbonate of Magnesia	Trace	0.770	0.028	0.009	2.220
Sulphate of Lime	0.300	0.103	0·001	0.004	Trace
Chlorides	0.015	0.005	0.005	0.009	0.019
Oxide of Iron	Trace	.....	.....	.....	.....
Alumina	1.170	.....	.....	.....	.....
Oxide of Iron and Alumina	.....	0.266	1.248	0.694	0.876
Silicates insoluble in Hydrochloric Acid	4.500	4.552	19.062	4.018	0.393
Silicous sand	0.933	4.062	5.466	13.081	10.708
Water as moisture	0.300	0.117	0.842	0.681	0.214

TABLE 2.—Chemical Constitution of the Marls of Georgia, showing the percentage of the constituents.

	Green Marls, Burke county, 6 miles east of Central Rail Road, plantation of J. V. Jones, Esq.	Yellow Marl, Burke co., 5 miles east of Central Rail Road, plantation of J. V. Jones, Esq.	Bluish-Black Marl, plantation of Capt. Matthew McCullers, Burke co. 12 miles east of Central R. R.	Black Swamp Deposit, in natural condition, plantation of Capt. Matthew McCullers, 12 miles east of Central Rail Road	Dry Swamp Deposit, plantation of Capt. Matthew McCullers, Burke county, 12 miles east of C. R. R.	Reddish Brown Marl, Buckhead creek, plantation of Capt. McCullers, Burke county, Ga.	Reddish Brown Marl in natural state, Buckhead creek, plantation Capt. McCullers, Burke county	Reddish brown Marl, Buckhead creek, plantation of Capt. McCullers, Burke county
Carbonate of Lime	43.435	43.023	9.739	2.083	6.808	42.389	15.473	19.799
Percent. of Quick-Lime	24.282	29.993	5.454	1.167	3.812	23.738	8.665	11.087
Phosphate of Lime	3.649	6 465	0.615	0.292	0.822	0.218	0.348	0.446
Percentage of Lime in the Phosphates	1.972	3 494	0.332	0.158	0.444	0.118	0.188	0.240
Per centage of Phosphoric Acid	1.677	2.971	0.283	0.134	0.378	0.100	0.161	0.206
Carb. of Magnesia	0.270	0.841	0.030	0.009	0.029	0.157	trace	trace
Sulphate of Lime..	trace	0.002	trace	trace	trace	trace	trace	trace
Sulphuric Acid...	trace	0.001	trace	trace	trace	trace	trace	trace
Chlorides	0.014	0.010	0.120	——	——	trace	0.086	0.107
Organic Matters. (Humic and Ulmic Acids, &c.	——	——	1.398	2.912	8.221	——	——	——
Oxide of Iron and Alumnia	7.196	0.265	1.140	1.329	3.766	2.265	2.005	2.565
Silicates Insoluble in Hydrochloric Acid	31.941	40.178	32.190	28·409	80.211	23.346	42.662	54.594
Silicious Sand	8.055	5.620	47.170	——	——	22.900	16.942	21 680
Water as Moisture,	5.714	3.100	6.628	64,714	——	8.102	21.856	——

TABLE 3.—Chemical Constitution of European Limestones.*

100 PARTS CONTAIN.

	Carbonate of Lime	Carbonate of Magnesia	Alumina	Insoluble Clay		Carbonate of Lime	Carbonate of Magnesia	Alumina	Insoluble Clay
Near Innsbruck	57.10	40.28	2.12	0.43	Predazzo, in the Tyrol	58.70	39.20	2.00	—
do do	52.69	39.00	7.20	1.20	From Tivoli, near Rome	94.40	2.18	4.00	—
Kahl on the Spessart	49.20	37.30	5.60	7.80	Chumlis, above Wyssenburg,				
do do do	50.40	39.00	3.50	8.00	in Switzerland	94.40	2.00	1.60	2.40
Annaberg, Lower Austria	88.00	3.37	7.82	0.59	Untersburg, near Salzburg	94.00	2.00	4.00	—
Muthmannsdorf, do	89.60	3.70	1.60	5.00	Nickolsburg in Moravia	60.40	36.80	3.60	—
Groisbach, do	88.00	5.00	2.20	4.80	do do do	58.60	37.21	2.60	—
do do	88.40	5.10	3.00	3.60	Great Oetscher, Austria	87.60	1.90	6.80	4.00
Ranek, Lower Austria	84.40	5.88	3.60	14.00	King's Tombs, near Thebes	89.00	2.07	3.20	5.60
do do do	83.60	5.88	2.00	16.00	Gravesend, in Kent	90.60	2.07	3.00	3.40
Eppan in the Tyrol	85.60	4.33	3.17	6.20	Island of Rugen	91.20	2.07	3.00	1.80
Rudolstadt in Thuringa	95.40	3.30	tra.	2.00	Meudon, near Paris	92.40	2.11	2.40	2.40
do do	92.80	2.98	3.20	2.00	do do	91.40	2.11	2.80	2.80
Ilmenau, (Stinkstein)	92.20	2.90	3.50	2.40	Island of Hellgoland	94.00	2.17	1.20	2.00
do do	90.80	2.80	3.20	4.00	Louisburg near Aix-la-Chapel	79.60	1.72	2.00	15.20
Parternion in Carinthia	91.80	4.10	3.20	0.80	Lewes, near Brighton	88.00	1.80	4.00	6.28
do do	90.00	4.90	4.00	1.10	Auerbach	94.80	1.17	2.40	2.00
Seisser Alp. Tyrol	81.60	3.00	6.40	10.80	Aigen, in the Gastien Valley	91.20	1.32	2.80	4.00
do do do	80.00	3.20	7.20	14.00	Hiesberg, near Melk, Austria	89.60	1.49	5.00	4.00
St, Triphan in Switzerland	90.40	4.14	1.80	2.80	Koflach, in Styria	54.12	42.60	1.60	2.00
do do do	90.40	3.56	2.00	3.60	Brunnam Walde	48.40	32.47	3.20	4.40
Roos, Moos-Alm, near Iscnl	95.00	2.40	1.66	—	Niesen Chain	79.20	1.45	2.00	18.00
Steinabruno, Lower Austria	95.00	2.27	1.66	—	Wimis Bridge, in the Grisons	76.00	1.4	6.40	18.80
Cassle-Rock, at Staatz, do	94.00	2.77	3.06	—	Fromme in Saxony	59.20	1.17	1.60	41.60
Hottinger Alp	97.45	2.20	tra.	—	Stuttgart	66.00	1.44	2.40	30.00
Innsbruck	97.00	2.86	tra.	—	Western Swiss Alps	64.00	1.90	2.40	32.00
Island of Lessind, Dalmatia	94.00	2.42	2.00	0.80	do do do	66.60	1.78	1.60	30.39
Mundl-Rock in the Tyrol	96.80	2.80	1.20	—					
Predazzo, in the Tyrol	57.00	39.68	4.00	—					

TABLE 4.—Chemical Composition of Eropean Marls.

100 PARTS CONTAIN.

	Luneburg, Powdery Marl,	Osnabruck, Stony Marl,	Magdeburg, Clayey Marl,	Brunswick, Loamy,	Wesermarsh, Powdery,	Brunswick, Stony,
Carbonate of Lime,	85.50	35 00	18.20	18.10	8.20	13.30
Carbonate of Magnesia,	1.35	0.90	3.80	1.50	3.00	2.60
Phosphate of Lime,	2.30	0.50	0.50	0.70	1.20	1.20
Nitrate of Lime,	0 01					
Organic Matter,	0.60	20.50				
Sulphate of Lime, Gypsum,	0.06	0.90	2.10	0.10	0.50	trace.
Cloride of Sodium, Common Salt,	0.03	trace.	trace.	trace.	0.10	trace.
Potash and Soda, combined with Silica,	0.05	trace.	1.60	0.80	0.70	0.20
Alumina,	0.40	10.00	8.40	1.90	3.10	4.0
Oxide of Iron,	4.20	1.90	6 70	3.20	3.80	6.50
Magnesia,	trace.	trace.	0.30	0.30	0.30	7.10
Sulphuret of Iron,		7.30				
Quartz Sand and Silica,	5.6	2.30	58.4	73.4	78.9	71.1

* Analyzed by Holger, Liebig and Kopps, Annual Report on the Progress of Chemistry, &c. 1850. Vol. IV. p. 562.

TABLE 5.—Chemical Composition of the Limestones of Massachusetts, according to Prof. Hitchcock. Geology of Massachusetts, vol. 1, p. 80, 81.

100 PARTS CONTAIN.

LOCALITY.	Carbonate of Lime,	Carbonate of Magnesia,	Peroxide of Iron,	Silicia, Alumina, &c.,	Specific Gravity,	Per Centage of Quick Lime,
North Adams, Crystalline White,	99.60		trace	0.40	2.74	55.78
Lanesboro, do do	99.40		trace	0.60	2.69	55.66
West Stockbride, do do	98 10	1.16	0-14	0.60	2.67	54.94
do do do do	98.67	0.47	0.08	0.78	2.81	55.25
Lanesboro, best for Marble,	96.11	2.28	0.22	1.39	2.74	53.82
Boston Corner, White Crystalline,	87.32	1.20	0.25	11.25	2.69	48.90
Hancock Greyish do	93.38	3.56	0.57	2.49	2.67	52.29
Worthington, White do	99.85		0.15			55.92
Bernardston, do do	98.38		0.62	1.00	2.72	55.09
Whately, Grey, do	66.00			34.00	2.72	36.97
do do do	64.66	5.01	1.54	28.79		36.21
Southampton, Grey do	38.40			61.60	2.93	21.50
Walpole, do do	70.30			29.70	2.80	39.27
Attleborough, do Compact,	94.60			5.40	2.71	52,98
Norwich, do Micaceous,	53.80			46.20	2.79	30.13
Sheffield, White Crystalline, Girard College Quary,	97.80			2.20	2.75	54.77
Egremont, White Crystalline,	92.80	1.20		6.00	2.69	51.97
Sheffield, Dolomitic Granular,	58.04	40.40		1.20	2.84	32.70
do do Marble,	54.87	40.61	0.38	4.14	2.83	30.73
Lanesboro, Grey Marble,	93.60	5.50	0.60	0.30	2.76	52.42
New Ashford, Flexible Marble,	81.80	16.20	0.60	1.40	2.68	45.81
New Marlborough Crystalline, Dolomitic,	54.24	44.28	0.59	0.89	2.81	30.37
do do do do	55.45	42.76	0.86	0.93	2.88	31.05
Tyringham, South part, Magnesian,	54.34	44.24	0.67	0.75	2.77	30.43
do Northwest part, do	61.88	32.56	0.46	4.10	2.82	34.65
Becket, Southeast part, do	58.31	28.61	1.24	11.84	2.84	32.65
Pittsfield, Grey, fine Granular,	54.60	43.92	0.55	0.93	2.86	30.57
Williamstown, Saddle Mt.,	55.79	42.96	0.47	0,78	2.79	31.14
do Grey, near the College,	52.31	32.79	0.74	14.16	2.82	29.29

TABLE 5.—Limestones of Massachusetts, continued.

LOCALITY.	Carbonate of Lime,	Carbonate of Magnesia,	Peroxide of Iron,	Silica, Alumina, &c.,	Specific Gravity,	Per Cent of Quick Lime,
Great Barrington, Clouded Marble,	60.30	38.09	0.65	0.96	2.84	33.77
Compact Limestone, Agawam,	30.81	18.33	5.53	45.33		17.25
do do do	26.04	13.45	6.51	54.00		14.58
Argillaceous Limestone, Ashfield,	55.16	22.21	7.07	15.56		30.89
Micaceous, do Ashfield,	46.85	1.60	1.55	50.00		26.24
do do do	45.13	3.50	2.70	48.64		25.37
Newbury,	80.72	2.97	0.72	8.00		45.20
Lanesboro,	56.82	38.50	0.67	4.01	2.81	31.82
Lee,	54.8	44.98	0.22		2.77	32.88
Dalton,	56.58	43.07	0.35		2.86	31.68
Bolton Quarry, Crystalline,	61.80	27.00		1.20	2.80	34.61
Chelmsford Quarry, do	56.52	39.38	0.90	3.20	2.85	31.65
Stoneham, White Compact,	59.28	15.71	1.21	23.80	2.84	33.19
West Springfield, Grey Fetid,	93.48	0.90		5.60	2.73	52.35
Sprinfigeld, Chicopee Compact Septaria,	46.06	27.35	5.62	20.97	2.74	25.75
do do Fetid Grey,	86.80			13.20	2.73	48.61
do Cabotville, Septaria,	43.69	39.35	3.39	13.57		24.47
Middlefield, Coles Brook, White,	56.25	31.56	1.12	11.07	2.78	31.50
Middlefield, Coles Brook, White,	88.02	9.91	0.15	1.92	2.71	49.29
Blanford, White,	51.66	39.49	0.91	7.95	2.77	28.93
Littleton, White Crystalline,	54.70	43.35	0.51	1.46	2.87	30.63
Sherburne, Bowlders, White,	60.43	29.84	2.36	7.37		33.84
Concord, S. W. part Grey,	77.33	1.65	1.19	19.83		43.30
West Natick, Grey Crystalline,	72.10	7.50		20.40	2.75	40.38
West Natick, Grey, finer specimen,	56.81	39.08	1.37	2.74		31.81
West Compact, Yellowish, Railroad Cut,	54.20	0.60		45.20	2.68	30.35
West Compact,	61.18	12.30	1.27	25.25		34.26
Claystone, Hadley,	56.60			43.80		31.71
do North Adams,	53.60	1.20		45.20	2.60	30.02
do West Sprigfifield,	48.40			51.60	2.68	27.10

TABLE 6.—Chemical Composition of the Marls of Massachusetts according to Professor Hitchcock.—Geology of Massachusetts, vol. 1, p. 70.

LOCALITY.	Phosphate of Lime,	Carbonate of Lime,	Carbonate of Magnesia,	Soluble Gelne	Insoluble Gelne,	Silicates	Water of Absorption,	Specific Gravity,	REMARKS.
Stockbridge	0.7	73.4	0.15	4.8	4.6	13.5	3.3	1.82	2¼ feet thick.
do. North-east of the Village	0.6	46.0	tra.	5.0	8.9	36.6	2.9	....	
do. do. do.	0.8	31.8	....	0.0	3.8	59.8	1.7	....	Sulph. of Lime 1.5.
Pittsfield, east of the Village	0.7	86.4	0.46	3.1	3.0	3.01	3.0	1.82	4 feet thick.
do. s.w. do. do.	0.4	64.8	tra.	3.1	3.2	25.2	1.9	....	[water.
West Stockbridge	0.5	74.8	0.53	1.7	5.0	14.7	2.8	1.61	Exposed to running
Lee Sedgwick & Co's Mills	1.0	93.2	....	1.2	2.1	0.9	1.6	1.89	9 to 12 feet thick.
L. Bassets bed near surface	1.4	93.0	....	1.8	2.2	2.2	0.4	....	
do. do. 10 feet below surface	1.0	88.8	....	1.6	2.8	4.4	1.4	1.75	
do. do.	1.2	86.2	....	2.6	3.4	5.0	1.6	....	
Sedgwick's Mills	1.0	83.6	....	0.8	4.4	9.2	1.0	....	
Farmington, Conn.	0.4	64.4	....	3.0	9.5	17.8	2.9	....	2.0 Sulph. of Lime.
Marly Clay, Williamston	....	11.7	1.86	....	....	75.7	2.3	....	
do. North Adams	....	28.0	1.59	....	....	64.5	0.7	....	
do. South Lee	....	12.2	2.02	....	....	73.3	3.0	....	
do. Springfield	....	7.0	2.36	....	....	79.21	3.8	....	

Table 7.—Limestones of Rhode Island.*

LOCALITY.	VARIETY.	Carbonate of Lime.	Insoluble Matter.	Oxide of Iron	Magnesia	Lime	Specific Gravity
Cumberland Hill, F. Brown	White, Greenish Granular	52.2	6.	.....	40.6	29.4	2.723
do do	Green-Stone, (S.0 water)	68.8	23.2	1.al	6.2	38.7	.....
Johnston, Mr. Brown	Stone-white, yellowish spots and crystalline	55.2	46.6	.....	4.2	31.1	.....
do Mr. Je kins	White, compact, sub-crystalline	56.1	11.4	.....	32.50	31.6	.....
North Providence	Stone-white and Green Crystalline	97.2	0.8	.....	0.6	54.6	.....
Newport Harbor, Lime Islands	Compact, blue and Buff-colored	53.2	7.0	1.9M	37.9	29.9	2.824
North Providence, Lime Quarry	Stone-white and compact	68.6	8.6	.....	21.	38.6	.....
Smithfield, Harris Rock	Rhomb. Spar	92.8	.....	.....	3.4	52.2	.....
Shore, near Fort Adams	Yellow buff colored, compact	50.9	4.3	2.1M	2.27	28.7	.....
Smithfield, Harris Quarries	Soft Rock	92.4	6.	0.4M	1.2	52.	.....
do Harris Rock	First Quality Hard Rock	60.4	1.	2.6	3.6	34.	.....
do Dexter's Quarry	White, granular and crumbly	94.8	1.6	.....	.....	53.4	2.663
do do do	Compact, white, insoluble matter, in acicular crystals	64.6	2.	T.	32.	36.4	2.850
do S. Arnold	Stone-white, coated, with talc and crystalline	50.6	3.8	T.	44.4	28.5	.....
do Harris Quarry	1st quality soft blue-stone, with blue and white stripes, ditto	92.2	1.0	.....	6.8	51.9	.....
do Harris Rock	Crystalline and granular	95.8	1.4	.....	2.8	58.	2.681
do do do	Very clear light blue stratified and crystalline	87.	12.8	.....	.....	49.	2.715
do E. Angell	Stone-White and crystalline	97.6	1.	.....	.....	54.9	.....

*Geological and Agricultural Survey of Rhode Island, by Charles T. Jackson, M.D., p. 246.

Table 8.—Limestones and Marls of Maryland. *

100 PARTS CONTAIN.

NAMES AND LOCALITIES.	Carbonate of Lime,	Lime,	Carbonic Acid,	Magnesia,	Oxide of Iron and Soluble Silica,	Insoluble Silica,	Potash,	Phosphate of Lime,
Limestone, Pipe Creek, Carrol co.		53.40	43.17	1.13	1.90	0.40		
Limestone Long Green, Baltimore co.,		36.73	35.97	6.25	3.30	17.75		
Limestone, Howard county,		35.27	29.41	1.76	8.39	25.17		
Marl,	26.5			2.70		66.5	1.30	
Marl, near Fort Tobacco,	12.91				9.45	55.73	2.07	
Coral Marl, Talbot county,	26.91				3.07	67.54		2.90
Coral Marl,	26.13				11.62	55.58		6.67
Fresh Water Marl,		52.53	41.29			6.16		trace

* First Report of Philip T. Tyson, State Agricultural Chemist to the House of Delegates of Maryland. 1860, p. 71, 81.

TABLE 9.—Chemical Composition of the Limestones and Marls of South Carolina.*

100 PARTS CONTAIN.

NAMES AND LOCALITIES.	Carbonate of Lime, ..	Carbonate of Magnesia	Silica.....	Alumina of Iron.....	Phosphate of Lime, Magnesia and Iron,	Organic Matter,.....
Limestone, from Limestone Springs.....	90.56		6.40	3.14		
Crystalline Limestone, Saluda, Laurens Dist.	92.00	1.00	7.00			
Limestone, Garlington's Quarry,.....	86.00	0.50	13.50			
do York.....	85.00	0.50	10.00	4.50		
do do Harden's Bed, ...	86.00	0.50	11.00	2 50		
do do.....	75 00	trace.	16.00	9.00		
do Brasstown Creek, Pickens Dist...	70.00		25.00	5.00		
Marl from Tilly's Lake. Waccamaw.....	65.00		20.00	15.00		
do do. Black River, Sumpter,.....	70.00		20.00	9.50	0.5	
do do do do do	67.00		16.50	16.50	trace.	
do do 6 miles S.E. of Darlington C. H...	60.00		35-00	15.00		
do do do do do do do..	68.00		22.00	9.600	0.4	
do do do do do do do..	64.50		20.00	15.00	0.5	
do do Dr. Holmes' Marl Pit, Cooper River	87.50		6.00	5 00	1.50	
do do Pooshee.....	90.00		4.00	5.50	0 50	
do do Bees' Ferry, on the Ashley River,.	55 00		32.00	9.00	4.00	
do do Combahee River.....	36.00		39.50	25.50		2.00
do do Thomas Parish, near the Coast...	60.00		36.00	4.00		
do do Wadmalaw,.....	57.00		40.00	3.00		
Marly Limestone from Wilmington, N. C.....	80.00			1.00	2.80	
Argillaceous Chalk Marl, Mr. Dixons' Plan'n	63 50	7.00	16.00	4.75	2.00	
Greyish White Chalk Marl, Drayton Hall, ..	66.04	2.56	10.20	1 00	8.60	
do do do do Goose Creek, b. C.R.	68.00	1.20	16.80	0.40	9.20	
do do do do Elwood, Cooper R..	76.88	1.40	16.20	trace	2.60	
do do do do do do do	72.06		15.00	0.40	6.80	
Yellowish Grey Chalk Marl, (Green Marl) Ashley River, 14 miles of Charleston,.....	58.00		28.00	0.80	8.80	
Yellowish Grey Chalk Marl, Church Creek..	44.40	9.58	29.08	0.80	7.00	
do do do Pen Pen on the Ashepoo.	58.56	2.12	34.41	0.40	2.47	
do do do do do	57.55		30.43	0.66	6.09	

*As determined by Professor Shepard, Dr. Smith, and Prof. M. Toumey. *Geology of South Carolina, by M. Toumey.*

TABLE 10.—Per centage of Carbonate of Lime in the Shell, Limestone and Marls of South Carolina.*

NAMES AND LOCALITIES.	PER CENT. OF CARBONATE OF LIME.
CRETACEOUS MARL.	
Peedee River,	
Birch Ferry, Peedee River Bottom,	36
do do do do 3 feet from Bottom,	33
do do do do 10 feet from Bottom,	51
do do do do 12 feet from Bottom,	66
Mouth of Jeffrey's Creek, Surface,	24
do do Willow Creek, do	45
do do do do Marlstone,	77
Binghams, on Stage road,	32
Leggetts upper part,	57
Giles Bluff,	42
do do next to low water,	14
do do Marlstone,	86
Meyers Land,	84
do do	76
Gibson's Bluff,	82
do do	10
Brown's Upper Ferry,	72
Stony run, Georgetown,	55
MARLS ON LYNCH CREEK.	
Sparrow Swamp, at top,	18¾
do do 3 feet deep,	21
do do 6 do do	25½
do do Marlstone,	66
Henry Hams, Sparrow Swamp, 5 ft	25
Lynch Creek, top,	15
do do 6 feet deep,	27½
do do 3 feet deep,	27½
EOCENE AND MORE RECENT MARLS.	
MARL AND MARLSTONE OF SAVANNAH RIVER AND TRIBUTARIES.	
Shell Bluff, white compact marl,	89
do do darker,	52½
do do Harder,	86
do do Stony Marl,	94
do do Concrete Shells,	82
do do	60
do do Cream Colored Marl,	86
Lower Three Runs,	74
do do do	62
do do do	64
do do do	62
do do do	22
Gillett's Mills,	64
do do	46
Sav. River, above Three Runs,	92
Sav. River, above Three Runs,	90
Lower Three Runs,	50¼
do do do	32
ASHLEY RIVER AND TRIBUTARIES.	
Brisbane's Landing,	64
do do	74
do do	6
O'Neal's Landing,	76
Drayton Hall,	63
Bee's Ferry,	50
Magnolia,	75
Greer's Landing,	52
Pringles,	75
Cattell's Bluff,	52
do do	78
Cohen's Land,	62
J. A. Ramsay's Land,	67
Cedar Grove,	76
Oak Forest,	36
Wassamasaw Swamp,	72
Indian Fields,	47
do do	50
ARTESIAN WELL, CHARLESTON.	
120 feet below the surface,	65
135 do do do do	56
160 do do do do	69
162 do do do do	44
180 do do do do	59
200 do do do do	54¼
225 do do do do	60½
227 do do do do	58½
230 do do do do	55
258 do do do do	58
270 do do do do	66
274 do do do do	79
282 do do do do	79
309 do do do do	74
COOPER RIVER.	
Grove, Dr. Ravenel's,	52
Mulberry, Dr. Millekin's'	60
do do	76
do do	42
Lewisfield Simon's,	84
Point Comfort, R. W. Ropers,	79
Steep Bluff,	80
Rectory,	80
Monk's Corner Road,	80
Near Santee Canal,	95
Isaac Porchers,	81
do do	61
Near Santee Canal,	90

*NOTE.—Determined by Mr. Ruffin, of Virginia. Report of the Agricultural Survey of South Carolina, by Edmund Ruffin. See also Geology of South Carolina, by M. Tuomy.

TABLE 10—Continued.

NAMES AND LOCALITIES.	PER CENT OF CARBONATE OF LIME.	NAMES AND LOCALITIES.	PER CENT OF CARBONATE OF LIME.
SANTEE RIVER.		Huspa Creek,	16
Balls Dam,	91	do do	93
Old Jamestown Landing,	66	PLIOCENE MARLS.	
Lenuds Ferry,	93	Giles Bluff, Peedee,	78
do do	97	do do do do	60
Williamsburgh,	91½	do do do do	64
Eutaw,	94	do do do do	66
do	88	Godfrey's Ferry,	69
Rocks Creek,	94	do do	89
Nelsons Ferry,	83	Gibson's Landing,	81
Vance's Ferry,	86	do do	74
do do	90	Witherspoon Bluff,	62
Hale's Mill,	84½	do do	74
do do	51	Goose Creek, near Cooper River,	82
Stout's Creek,	20	do do do do do	80
Edisto River,		Swift Creek, near Darlington C. H.	64
Binnaker's Bridge,	36	do do do do do	69
Johnson's Bridge,	38	do do do do do	63
do do	36	do do do do do	64
Walker's Brigde,	31	POST-PLIOCENE, OR COAST MARL.	
do do	87	Doctor's Swamp, Johnson Island,	41
Cawcaw Swamp,	62	Stone Creek, Edisto Isld,	18
do do	26	do do do do	27
LITTLE SALKEHATCHIE.		Edisto Island,	58
Dowling's Mill,	7	Distant Island,	47
Cedar Spring,	73		
Ashepoo River,	92		

Chemical Analysis of Shell-Marl, Green county, Arkansas, according to Dr. David Dale Owen.*

Water,	1.3	The insoluble Sicates consisted of—	
Insoluble Silicates,	8.49	Silica,	72.8
Carbonic Acid,	2.7	Alumina, tinged with Iron,	6.8
Peroxide of Iron,	3.6	Lime,	0.8
Alumina,	2.0	Magnesia,	0.3
Lime,	2.9	Potash,	0.9
Magnesia,	1.2	Soda,	3.2
Phosphoric Acid,	0.45	Manganese,	trace
Potash,	0.05		
Loss,	0.45		
	100.00		84.8

* First Report of a Geological Reconnoissance of the Northern counties of Arkansas, 1857–'58, by David Dale Owen. Little Rock, 1858, p. 27.

Anæsthesia and Anæsthetics. By Edward R. Squibb, M. D., of Brooklyn, N. Y.

The condition of insensibility to pain belongs exclusively to the brain proper, or to that part of the nervous system which provides for sensation and voluntary motion; and is effected when not the result of mechanical injury, invariably through the agency of the circulation. It therefore follows upon this, and upon the circumstance that the nervous centres of organic life exercise no primary function of ordinary sensation or voluntary motion, that the special agents resorted to for anæsthetic purposes should not only be directed especially to the sensorium, but should be diverted as far as practicable from the remaining portions of the nervous system, in effect. But, the circulation carries the anæsthetic agent everywhere, and with the elements of vitality and molecular reproduction must convey and distribute this powerful agency also; and hence the special agent for effecting anæsthesia should not only act directly, promptly, and transiently upon the sensorium, but should be, as far as possible at least, innoxious elsewhere. In short, it should suspend the functions of the sensorium without liability to interference with any other organ or function.

Such an anæsthetic effect is produced perhaps in the greatest degree of perfection by a certain amount of concussion of the brain, which sometimes results from accidental violence; and the effect is most perfect here, because it is produced directly upon the brain without any contamination of the circulation with foreign influences; and the circulation thus left free for the performance of its normal functions not only preserves the organic life intact during the temporary abstraction of the presiding sensorial functions, but through its reparative agency quickly remedies the shock, and restores the brain to its normal condition.

The next most perfect anæsthetic effect is that to which a small proportion of persons are susceptible, wherein the sensibility to ordinary impressions of pain or injury is suspended or overpowered through concentric nervous effect. Whenever the balance of nervous power is so disturbed as to reverse the current of the nervous batteries (so to speak), as in the so-called mesmeric condition of certain persons of feeble nervous tone or energy; and in the high degree of nervous excitement to which others are liable through agencies that act altogethor from without, the æsthetic functions of the sensorium, are altogether suspended, as in

catalepsy, or are so impaired that serious injuries are unconsciously received.

The effect, however, in both these classes of cases can never be utilized if from no other cause than because it is independent of the circulation, and all other practical means of production, maintenance, and control. The circulation therefore becomes indispensable as the means of introducing the anæsthetic agent, and of controlling its effect; and the collateral circumstance that the circulation must inevitably carry the agent to parts where it is not desired, and where it may become noxious, must be taken as a drawback, and a most important indication in both the selection and management of the anæsthetic to be used.

From these circumstances, and inductions taken as points of departure, it is not difficult to deduce the indications in the use of anæsthetics as being, first to suspend sensation and voluntary motion; and, secondly, to do this with the least possible interference with the functions of organic life. These points admitted, and kept prominently in view, will, with a little reasoning, render the management of anæsthetic agents very simple, and will make the accidents and mismanagements more intelligible and more easily avoided.

These accidents are, first in importance as well as in frequency perhaps, some form or degree of asphyxia. All the vapors used for anæsthetic purposes are irrespirable. That is, they do not contain oxygen in a condition in which it is available in the lungs for renewal of the blood. Just in proportion, therefore, as the vapor is introduced is the normal quantity of air diminished, and the proper oxydation of the blood prevented; and the ratio of this proportion is as inevitable in the effect upon the powers of life as it would be if carbonic acid or water, or any other irrespirable medium was substituted even up to that proportion which produces spasmodic closure of the glottis. It has been not unfrequently noticed, in what the writer believes to be the mismanagement of both the common aæsthetics, that the administration has commenced with a proportion of the vapor so large as to produce this spasmodic closure of the glottis. Under such circumstances, if it was possible to keep up such a proportion throughout the struggling of the patient, the spasmodic closure would doubtless be as persistent as it is drowning. But when from withdrawing the sponge a little, or from the displacement of it in strug-

gling, the proportion of air is increased, the glottis is relaxed again, and the imperfect respiration goes on quickly to a point when, from the undue, sudden and depressing effect of the anæsthetic on the nervous centres, the glottis no longer responds to the action of the irritant, and the vapor passes freely into the lungs, no matter how strong or how small the proportion of air mixed with it. The pulse and respiration then give the indications to suspend and reapply the anæsthetic, and it becomes a matter of time, endurance and of management as to how far the powers of life are taxed.

It is, therefore, not a question as to whether aeration of the blood is to be interfered with at all, or not, since some portion of anæsthetic vapor is indispensable, and since that portion must exclude a corresponding portion of the air; but the question is rather, how far the due aeration of the blood may be judiciously and safely interfered with; or in other words, what degree of asphyxia is justifiable and proper in the management of anæsthetics; and the natural conclusion is as practical as it is logical, namely, that the least possible degree is safest and best, and that the interference should not be hurriedly induced, or maintained a moment longer than is absolutely necessary.

If suspended animation from the circulation of venous blood in the brain was to be resorted to for anæsthesia, it would be necessary to immerse the patient at intervals in water, carbonic acid, or other irrespirable medium, in order to maintain the condition; and the risk of fatal asphyxia would be here much more apparent, though really not very much more imminent than in the nearly parallel case wherein the irrespirable vapor of ether is substituted throughout a clinical lecture, with the antagonistic stimulant effect of the operation postponed till near the end of a long period of insensibility. The position that the insensibility in ordinary anæsthesia is due to the circulation of unrenewed blood in the brain is, however, only true in part at the utmost, and this introduces another of the accidents that may occur in the management of anæsthetics.

If it were possible to separate the true desirable anæsthetic effect from every vestige of asphyxia on the one hand, and from all direct interference with the functions of organic life on the other, it would probably be found to consist in a simple specific paralysis of the nervous ganglia of sensation; and the desirable degree of such effect would be that which did not at all overreach the object. By over-

reaching the object however, whether it be by a too profuse, or a too prolonged use of the agent, the result must be injurious, since suspended function is but one step in the catenation which leads to disorganization and death, and that step once passed, the others may be accomplished insidiously. Such an hypothetical position is, however, only assumed to show that there must be a condition of hyperanæsthesia, or excessive anæsthetic effect—that such a condition is hurtful and unsafe, and that it should be avoided by skill in management, no matter how safe the agent used may be considered.

That such conditions do not occur without washing through the failing functions of organic life, is the fortunate result of the harmony and dependent action of the nervous centres, and these functions of organic life are commonly and very properly watched, as the means of control in the administration of anæsthetics. But apart from the fact that a most hurtful and dangerous degree of asphyxia may be induced suddenly, and while both pulse and respiration are spasmodically kept up by the stimulus of the first effect of the agent used, there are grave accidents which occur to the centres of organic life, both by reflex action from the brain proper, and by the presence in the circulation of such powerful depressing agents. Blood overcharged with anæsthetic vapors, and particularly when imperfectly aerated and slowly circulated, must necessarily fail of its due impression upon the cardiac and respiratory ganglia, and paralysis of the heart, or muscles of respiration are, therefore, the common fatal accidents of anæsthetic practice.

All these circumstances lead directly to the conclusions, first, that anæstics should be given slowly and carefully, with free, unlimited admixture of air, so that there should never be any choking or spasmodic action of the glottis. Secondly, that they should only be given at the time when the effect is needed, and be abandoned the moment the necessity is passed. Thirdly, that not only should the pulse and respiration be watched carefully during the whole period of insensibility, and be kept as near the normal standard as possible, but the slightest amount of blueness or lividity should be regarded as an indication of asphyxia, and be promptly responded to by a more free admission of air.

In the choice between the two anæsthetics in common use, one or two points are deserving of attention.

Chloroform is much less liable to produce cyanosis or asphyxia, because it is effective in much smaller quantity than ether, and does not therefore displace so much air in the respiratory process. The writer has never noticed any degree of blueness from the use of chloroform, but has often seen it in the use of ether. On the other hand, unless chloroform be given with far more care than is necessary with ether, it is, from its greater efficiency, much more liable to produce hyperanæsthesia, and to paralyse the heart and respiratory muscles. Hence chloroform, under ordinary circumstances, must be considered more dangerous to life, because its greater efficiency and activity, while they render it less liable to produce asphyxia, render it more liable to produce the other accidents of anæsthetic practice. The balance against it is, however, more applicable to its common and indiscriminate use than when applied with the care and precaution indicated in the foregoing remarks; and there is probably quite a large class of cases in which it cannot judiciously be replaced by any other agent, as, for instance, in parturition; in uremic convulsions of gestation and parturition; and, in short, whenever an intermittent and prompt effect are desirable, and the due precautions can be rigidly observed. In careful practice, with ordinary good judgment and observation, it has, in the writer's opinion, the advantage over ether in every point except the single important one that, in rare instances, it is liable to produce sudden fatal paralysis of the heart.

Ether has been regarded as so safe an anæsthetic, that it is scarcely admitted as susceptible of doing harm; and the impression is very common that it can never endanger life. That either of these propositions can be accepted admits of great doubt.

In the asphyxia from drowning, if the immersion be of short duration, and if the muscular system has not lost its vital tonicity, it is usually only necessary to re-establish the respiration and circulation for a short time, by artificial means, to restore life. If that drowning be prolonged, however, by repeated short immersions, so that the same inefficient condition of the circulating blood be brought about during a half or three-quarters of an hour of struggling, and with depressing influences from other sources, as of previous disease or injury, so that the powers of endurance are worn out, and passive exudations are permitted to accumulate and obstruct the pulmonary air cells, the result

would probably be very different. A condition of vital depression would be established which might very slowly go either way in the balance between life and death, but which would probably, in case of other coinciding influences, as after a serious surgical operation, ultimately terminate fatally. The partial asphyxia produced by a prolonged etherization is a nearly parallel case under ordinary circumstances; and here, as in other instances, pernicious influences may be masked by the complication and remoteness of the results.

So strongly has the writer's attention been drawn to these circumstances, by seeing and hearing of the profuse and wasteful use of ether, that it is a prominent object of this article to invite the profession to a closer scrutiny and observation of the effects; and if two or three fluid ounces of ether be found to produce a safer and better effect than double that quantity, an important point will have been attained.

The method of administering ether adopted by some close observers is one which appears well adapted to ensure a due admixture of air. A folded napkin is rolled into the form of a cylinder, or truncated cone, and secured at the overlapping edges by two pins. The larger end is made wide enough to cover the nose and mouth, the nose fitting into a notch, where the two edges of the napkin at the widest end fail to overlap. The opening at the small end should be at least one and a half inches in diameter, and the larger the better. If anything be needed to give stiffness and form to this cone, a piece of pasteboard laid between the folds of the napkin before it is rolled up, will accomplish this purpose. This cone is held in the hand of the person who gives the ether, and as a matter of economy it may be removed from the face during each expiration. About two fluid drachms of ether is poured upon the inside of the napkin at a time, and renewed as often as may be requisite.

In the administration of ether for anæsthetic purposes, at least three well marked stages are commonly observable, and the duration of each varies very much with the temperament of the individual, the condition of the stomach, and the quality of the ether used. One of these stages, namely, that of excitement and delirium, and the only troublesome one, has been hitherto supposed to be shorter in proportion as the ether contained less alcohol; but some

very recent observations made by the intelligent House-Surgeon of the New York Hospital, Dr. Weir—though as yet very limited in number—would appear to indicate that the point of maximum, or best effect in this respect, may be overreached, or that a determinate small proportion of alcohol in the ether may be useful. At least, Dr. Weir has been very naturally led to this inference by the effect of giving a small amount of brandy before the anæsthetic; and subsequently by the use of alcoholic ether. He, however, states distinctly, that as yet his observations are not sufficiently numerous to be relied upon. An occasional accident in the prolonged use of ether, for the mention of which the writer is also indebted to Dr. Wier, is the occasional occurrence of a smart, ephemeral, irritative fever, which follows within twenty-four hours. In view of the circumstance that the local effect of ether is irritant to the extent of producing vesication when confined upon delicate surfaces, it may be easily understood that its application over the large and delicate mucous lining of the bronchial ramifications, throughout an unusually tedious and difficult operation, might produce a transient inflamatory effect. In conclusion, the writer is aware that the character and drift of these remarks are directly at variance with the teachings of some very high authorities, who regard the anæsthetic condition as one of dead drunkenness, and who advise the rapid and copious administration of the ether, in order to reach this condition in the shortest possible time.

It appears singular to the writer, that those who are in the daily habit of making the most delicate distinctions in diagnosis, should fail to discriminate between the effects of poisonous doses of alcohol and the desirable condition in ordinary anæsthesia, since they certainly do not much more nearly resemble each other than the coma of narcotism resembles natural sleep.—*American Medical Times.*

Perchloride of Iron in Epistaxis, etc.—Undiluted solution of perchloride of iron injected into the nostrils, it is said, will stop the bleeding, when all other remedies fail, in this common but occasionally alarming affection. If the first application should not prove a lasting remedy, it may be repeated. In obstinate bleeding, from punctured or incised tonsils, the application of this powerful and efficacious styptic has stopped the hemorrhage when other means have failed.

Mammary Abscess occurring during Lactation. A Lecture delivered in the University Medical College, New York, by T. Gaillard Thomas, M. D., Physician to Bellevue Hospital.

Anatomy of the Mammæ.—The lacteal glands, or mammæ, are composed of numerous follicles grouped together; forming lobules, which penetrate to different depths into the structure of the organs, and give them the character of racemose and conglomerate glands.

Each lobule has its own excretory duct; this joins those from neighboring lobules, and in this way growing larger and larger, until they become reduced in number to fifteen or twenty capacious canals, they pass upward, to end at the nipple by as many small mouths. These dilated portions of the milk-ducts or lactiferous tubes are called reservoirs, and, although not largely developed in the human subject, in the cow will contain a quart of fluid.

Each of the lobules above mentioned is separated from its neighbors by a considerable quantity of areolar, which admits of the free motion of one upon the other, and serves as a bed for the blood-vessels and nerves of the organs. This is the proper parenchyma of the mammæ, and, according to Todd and Bowman, exists in them in "extraordinary abundance."

It is important that you should recognise the fact that this areolar tissue is extremely dense and fibrous, and that it serves not only the purposes of connective material, but that it proves protective and supporting. Passing throughout the gland between the lobules and ducts, it sends strong prolongations to unite with the posterior surface of the skin, which are styled by Sir A. Cooper the "Ligamenta Suspensoria;" and at the periphery of the gland it forms a proper tunic, very much like the "tunica albuginea" of the testicles, or that of the ovaries. In its passage throughout the gland, this dense areolar or fibro-areolar structure forms alveolæ, or vacant spaces, which are filled by adipose tissue; a tissue which Cruveilhier tells us may be found at the very centre of the glands, between the lobules, and in obese women even between the follicles themselves. These alveolæ do not communicate freely with each other, hence the remarkable localization of inflammations attacking the superficies of the gland.

The mammæ rest upon the great pectoral muscles, and are separated from them by a layer of areolar tissue, which

enables them to move about as freely upon their bases as they do. This layer of areolar tissue, which for convenience we may style the submammary, is susceptible of some remarkable changes, not the least of which is great detention after repeated lactation; indeed, Valpeau quotes Nelaton for the assertion that a synovial sac (*"une sorte de bourse synoviale"*) may form there, which is liable to a variety of effusions and inflammatory processes.

The arteries of the mammæ arising from the thoracic branches of the axillary, from the intercostals, and from the internal mammaries, penetrate to the interior or interlobular portions of the glands, and spread themselves in a fine network upon the ultimate follicles.

In absorbents the mammæ are rich, for the investigations of Cooper, to whom we owe almost all our knowledge of their minute anatomy, have demonstrated the presence of two sets; the one superficial and subcutaneous, the other penetrating to the interlobular regions.

The mammary nerves arise from the intercostal and thoracic, and a distinct connection with the great sympathetic exists.

But to return to the ducts and follicles. Were it possible to remove one lactiferous tube and its follicles from the surroundings which we have just been describing, one extremity would be the mouth of the duct as it ended in the nipple; the other would resemble a bunch of grapes, each lobule appearing with its numerous follicles or clusters of milk-cells, like a cluster of grapes around one of the terminal extremities of the stem.

Next we will take a section of this tube and its clusters of follicles, and examine them under the microscope. The follicles are very small, each being, according to Sir A. Cooper, about as large a hole pricked by a very fine pin in a piece of paper, and by measurement giving us only the 1-200th of an inch. Small as they are, however, the powerful lens shows us that they are lined by a layer of delicate epithelial cells, whose function it is to separate from the blood the first food of the mammalian being. As the eye leaves this extremity of the lactiferous twig and passess on towards the duct which leads from it, a stronger structure begins to appear; its walls show fibrous and yellow elastic tissue, and a lining of columnar epithelium. As we go on, the tubes increases, until, towards its mammillary end, it grows small, and becomes sphincteric at its termination, be-

ing finally closed by surrounding contracile fibres, like those of the Dartos.

I have already informed you that at the superfices of the mammæ the areolar tissue arranges itself in the form of a tunic or external covering; this is further covered by a thick layer of adipose tissue, which sometimes becomes very voluminous, and explains the fact that fat women with immense breasts will often prove poor nurses, since the size of the organs does not by any means insure extensive glandular development.

Viewed as a whole, the mammæ may then be said to be two glands, composed of lobules and ducts, bound together by dense areolar tissue, in which run blood-vessels, absorbents, and nerves; the mass thus formed being snugly packed away between the areolar tissue which separates it from the pectoral muscles, and that which forms its external tunic, and which is bounteously supplied with an adipose accompaniment.

Physiology of the Lacteal Secretion.—Between these glands and the uterus a direct and prominent sympathy shows itself from the moment of conception, and indeed is sufficiently evident in the unimp regnated condition. Towards the fifth month of utero gestation, an actual secretion of milk begins, the breasts grow hard and irregular in contour, become tumid and more or less painful; and this state continues until the period of parturition.

After the paturient act, no immediate increase of sympathetic influence is manifested; the breasts, indeed, appearing affected by the sanguineous loss, the vomiting, physical and mental suffering, and abstinence from food incident to that process, become less tense than they were before, and their flabby, soft, and collapsed aspect will often alarm the primiparous mother, lest she lack nourishment for her offspring.

On about the third day, however, the enfeebled sympathies begin to manifest themselves and to increase in development; the breasts swell and become harder and more irregular than before, their temperature is increased, and they become painful and tender. Now, too, the constitution of the woman begins to show evidences of disturbance; the pulse becomes quick, the skin warm and dry, chillness is often complained of, the patient is restless, thirsty and uncomfortable, and her attendant designates as "milk feuer" the *ensemble* of her symptoms.

If, at such a period at this, a section of the gland were placed under the microscope, we should find the epithelial cells of the follicles larger and much more numerous than in the unimpregnated female, and they would be found filled with the constituents of the coming secretion, fat globules being the most distinctly discernible. The latiferous tubes would would be loaded with a thick, yellowish, turbid mixture, to which Dome has given the appellation of Colostrum, and which, though upon being squeezed out is apparently thinner than milk, has been proved by chemical analysis to be really thicker.* Under the microscope, this fluid shows the presence of some irregular oval bodies, each composed of a group of minute oil-globules, imbedded in a mass of organic substance. They vary from 1-1750 to 1-500th of an inch in diameter, and are the "colostrum corpuscles" of Donne.

Now let us glance at the parenchyma of the glands and its contained vessels and nerves. The areolar tissue between these tumid follicles is swollen by reason of its blood vessels being turgid from increased flow of blood, which is first stimulated by the above-mentioned sympathy, and then interfered with in its return by pressure from the distended lobules. This pressure the strong and determined arterial flow overcomes; but the feebler venous current is unable to do so, and a mechanical congestion results.

Between these lobules, infarcted by a semifluid secretion, and the blood-vessels distended by an active (physiological) and a passive (mechanical) congestion, lie the nerve filaments, the results of compression of which are pain, tenderness, and throbbing.

You will perceive, by even this superficial examination, that at such a time all things are particularly favorable for the alighting of inflammatory action, and for its progress to great engorgement and supporation. Indeed, it is not at all to be wondered at that such a state so often produces those pathological conditions, for the physiological action so prepares the way for that which is pathological, that it is hard to draw a dividing line, and say where one ends and the other begins.

Seats of Mammary Inflammation.—The parts of the mammæ which are ordinarily affected by acute inflammation are:

1st. The lactiferous tubes and follicles.

* *Vide* Lehman, Vol, II., p. 63.

2d. The fibro-areolar tissue; subcutaneous, interlobular, or sub-mammary.

Inflammation of the Lactiferous Tubes and Follicles.—This species of mammary inflammation corresponds to, and is produced by, much the same kind of cause which would result in bronchitis, catarrh of the bile-ducts, orchitis, and other like tubular inflammations; and its special causes may be enumerated as:

(a.) Exposure to cold.
(b.) Irritation from inflamed nipples.
(c.) Excessive lactation.

Symptoms.—The symptoms of this inflammation are generally so well marked in the beginning, that it may readily be distinguished from that originating in the areolar tissue; if, however, the case has advanced, no diagnostic difference will be found to exist. At its inception, it may be recognized by:

(a.) Rigors and fever.
(b.) Deficient excretion of milk.
(c.) Pain upon suction.
(d.) Hard and excessively painful points in the breast.
(e.) No general tumefaction, redness, nor tenderness.
(f.) Great suddenness of invasion.

This is the state that is so often found as a consequence of exposure to a draught, or to a shower of rain, and which sometimes so readily passes off by the use of fomentations, as practised empirically by all nurses. Should the disease, however, progress unchecked, lacteal engorgement of the follicles first results, then inflammation of the areolar tissue; and what was in the beginning a simple catarrh of the ducts and follicles, soon becomes one of true mammitis, or inflammation of the parenchyma of the gland.

Diagnosis.—I wish to leave in your minds, gentlemen, a very distinct idea concerning the essential difference between such an inflammation, commencing in the milk-ducts and follicles, and preventing the flow of milk, from a simple lacteal engorgement, the result of non-evacuation of that milk which has been secreted; for the one is a comparatively unimportant affair, while the other, unless well managed will end in abscess. Velpeau describes these states synonymously, (or rather, confounds the two conditions;) and although no man lives to whose opinion on such a subject I would sooner bow, I cannot agree with him; for, after observing closely at the bedside, and discarding all theory, I

am convinced that he is incorrect. With the motto, "*Nullius addictus in verba magistri jurare*," let me try to sustain this view by the relation of a case of inflammation of the milk-ducts and follicles as a result of cold.

Mrs. R., a pultipara, was sitting, four weeks after delivery before an open window in a loose evening-dress, when she was taken with a chill, which was followed by fever, and pain in one areast. She was soon after seen by me, and upon examination, I found a hard tumor near the surface of the organ, about the size of a walnut, and excessively painful. The pain was increased upon lactation, which seemed to produce no diminution in the size of the swelling.

I will not detail the treatment adopted. Suffice it to say, that after about two weeks had passed, signs of inflammation of the parenchyma showed themselves, and that an abscess was the result. Now, what was this? An engorgement of milk? If so, why did it occur so suddenly, from those causes which we know so often result in inflammation of mucous tracts, with so much constitutional excitement, and why did only one lobule of the gland suffer? Was it inflammation of the parenehyma? Then why was there no heat, redness, and rapid tendency to suppuration, which Velpeau and most others acknowledge characterize this state? My belief is, that the mucous membrane of one lobule, and probably of its excretosy duct, was inflamed; that this resulted in obstinate lacteal engorgement, which in turn resulted in mammatis.

We commonly have lacteal engorgement when a nursing woman's child is taken from her; does this, *before it has resulted in inflammation of the parenchyma*, ever give such constitutional signs?

But I cannot give you a better substantiation of my view of the subject than by detailing one of Velpeau's numerous cases, which I think will better argue in my favor than anything which I can say.

Obs. VIII.—"Lacteal engorgement resulting from exposure to cold fifteen days after a second confinement."

The female was delivered, and did well until the fifteenth day, when the narrator proceeds to say: "Then the patient, who was exposed to cold, was taken with chills, and a very high fever, which, however, lasted a short time. A severe lancinating pain established itself at the same time in the right breast, which was at once covered with an emollient poultice. *Two days after the patient observed that the breast*

became engorged, and became more and more painful." The Dr. saw her on the first of January, one month after delivery, and therefore fifteen days after the chill and pain in the breast; then, he says, "the right breast presents at the interior portion a large swelling, indistinct, sensible to the slightest pressure, with some hardness, and without cutaneous redness. *This engorgement seemed to have come from the interior of the breast, and to gain insensibly the external part by following the lactiferous ducts.*" (The italics are all mine.) So far, I think, you will not deny me considerable support from this history; but now listen to the treatment, and its results. "Fifteen leeches were applied near the painful spot; on the next day the pain had disappeared, and the engorgement, on which poultices were kept constantly applied, had notably diminished." And why did they diminish? Not because leeches and poultices can disgorge the breasts when choked with milk, for it would be irrational to suppose this, but because they relieved inflammation in the follicles and ducts, and thus allowed secretion and excretion to go on, where they had been before interrupted.

These are the means by which one state may be distinguished from another:

Lacteal engorgement shows itself by:	*Inflammation of follicles and ducts by:*
Gradual hardening of lobules	Sudden hardening of lobules.
No pain at first.	Pain sudden and severe at first.
No chill, nor high fever.	Chill, and very high fever.
Several or many lobules affected.	One or two only affected.
No great tenderness on pressure.	Great tenderness on pressure.
Lactation and friction relieve	Lactation and friction do not relieve.
Breasts full and rotund.	Breasts rather flabby, except at one spot.
Excretion of milk readily excited.	Excretion not readily excited.

Be it remembered, however, that lacteal engorgement alone may produce, if neglected, inflammatory results, (perhaps in the ducts and follicles, but more commonly) in the parenchyma of the gland.

Mammitis, or Inflammation of the Parenchyma of the Breasts.—This disease bears to pneumonitis the same relation which inflammation of the ducts does to bronchitis; and as pneumonitis may result from uronchitis, or arise primarily, so may mammitis be either secondary to inflammation

of the ducts, or have a cause which produced it as the original affection. As, however, there are three distinct divisions in the areolar tissue of mammæ, in each of which it differs, (in the one being accompanied by much adipose tissue; in another, containing much of the fibrous element; and in the third being loose and purely areolar,) we are forced to recognize three varieties of inflammation arising in it:

1st. Subcutaneous.
2d. Interlobular.
3d. Submammary.

In the first of these, the inflammatory action is confined to that portion of the areolar tissue which is peripheral or subcutaneous; and although it may do so, does not necessarily pass into that which is deeply interlobular. In the second, the morbid process may arise externally, and pass inward; but more commonly arises internally, and subsequently affects that portion of the areolar tissue which is more surperficial. In the third, the pathological process may be confined to the submammary tissue, and pus collecting therein may evacuate itself by coming to the border of the mammæ.

Fortunately, it is not commonly the deep interlobular areolar structure which is thus affected, but that which is superficial, external to the gland-structure, and dividing only the most superficial of the lobules. This superficial inflammation is of course much less severe in its results than would be that which is more deeply seated, in the gland itself, or in the submammary tissue; but, as all three are inflammations of the same kind of structure, and this structure constitutes one of the elements of the mammæ, I have deemed it best to regard them all as mammitis, or inflammation of the parenchyma of the mammæ. True, a purely subcutaneous or submammary abscess might arise without any portion of the gland-structure being affected, but the obstetrician will rarely meet with a perfect case of this kind; and as our nomenclature should apply to the rule, and not the exception, I think that we will avoid confusion by pursuing this course. I have often met, during lactation, with small subcutaneous abscesses, more particularly in the areola, which evidently did not in any way affect the gland; but such do not by any means deserve the name of "mammary abscess."

In frequency of occurrence, the abscesses arising from these varieties of inflammation may thus be arranged :

1st. The subcutaneous abscess.

2d. The interlobular "

2d. The submammary "

Causes of Mammatis.—As the causes, symptoms, and treatment of these three varieties of mammitis resemble each other closely, we will proceed to investigate the disease in its different localities as a unit, begging you to remember, however, that much slighter injury or irritation will suffice for the production of the more superficial varieties than would do for the deeper seated.

The cause of mammatis are :

(a.) Exposure to cold.

(b.) Injury.

(c. Lacteal engorgement, (whether it occur from neglect, inflammation of ducts, or aversions to nursing from sore nipples.)

(d.) Excessive sanguineous congestion, with commencing lactation, (physiological congestion gradually verging into that which is pathological.)

(e.) Inflammatory affections of nipples or skin, as ulceration, eczema, impetigo, erysipelas, &c. How the first, second, fourth and fifth of these causes may resul in mammitis, it is not necessary for us here to inquire, since the same explanation will attach to their influence in producing this inflammation, as it does to their mode of causation in many others of like character.

The third cause, which is probably the most prolific of all as a cause of mammitis, proves effective in this way: The follicles and tubes becoming gorged with milk which is not evacuated, the former enlarge into the form of irregular tumors, press upon the surrounding vessels, prevent perfect venous return, and thus rapidly bring about a perenchymatous engorgement, which may result in abscess. Let me, by a familiar example, illustrate these remarks : You are all acquainted with that disease of the sebacic follicles of the face and shoulders, called acne simplex, which produces angry "pimples," as they are called, or pustules as they really are, on the faces of those just arriving at the dignity of a beard ; watch one of these through its course, and you will readily trace these steps. First a black speck is seen, which consists of duct enlarged at the exposed end by a mass of sebaceous material which is retained in the unemp-

tied gland. No redness surrounds this; no pain is experienced; and if the gland be squeezed at its base, a small worm-like body, with a black tip, is displaced, and the affair is ended. Should repletion of the sac still continue, however, a roseate circle is observed around the black speck, inflammation has set in in the surrounding areolar tissue, and the second stage of this miniature disease is at hand. A few days after this, suppuration is fully established, and should the mass now be squeezed, the operator is gratified by the forcible ejection of a plug bathed in pus, which will often fly out with sufficient force to establish itself to the mirror which probably guides his manipulations.

Now this is, *in parvo*, the process of formation of a mammary abscess, from lacteal engorgement; *i. e.*, 1st, simple engorgement of the follicles; 2d, inflammation of neighboring areolar; 3d, suppuration and abscess.

One circumstance (which I have so often mentioned to-day) must be borne in mind as constituting a difference, however, between the two inflammations; namely, that in the mammæ the resulting inflammation is generally in the superficial areolar tissue, or that dividing the most external of the lobules.

Upon observing that even inflammation of the ducts must result in secondary mammitis before a true abscess can be formed, the student is apt to ask, "Why make a distinction since the result is the same in both cases?" To such a question I would reply, "Because without doing so we could not get concise and accurate views of the diseases of any organs of the body, and because in the beginning, before one of these pathological conditions has run into, or produced, the other, the treatment of the two will differ." Orchitis may result from epididymitis, and epididymitis from urethritis, or either may arise primarily. Can any reason be given why, *ergo*, all three should be confounded under the name of inflammation of the genitals? Or why, in studying abscess of the testicle as a result of orchitis, we should ignore inflammation of the spermatic cord as a primary cause, which results in abscess by producing this very orchitis? Medical nomenclature is the student's "slough of despond," and from its fettering influences many a practitioneer has grown old with indistinct and confused notions of diseased conditions; and with all due respect for so high and worthy an authority as Dr. Watson, I must say that nothing more clearly illustrates the difficul-

ties which surround its improvement than the sight of his endorsement of its non-progressive state by speaking of endocarditis, pericarditis, and carditis, all under the head of "rheumatic carditis," as he does in his work on Practice.

But let me, in the present case, show how much is gained by attention to the true pathology of the states we are studying.

Inflammation of the ducts does not always end in mammatis, even when it progresses to an unfavorable termination; sometimes lymph is poured out into the tubes by which they are occluded, and such immense distention of the reservoirs occurs from accumulation that a true milk deposit is formed, which may contain quarts of pure lacteal fluid, and which it is necessary to evacuate by puncture. Dr. Willard Parker, of this city, reports a case where three quarts were thus evacuated by a first incision, and three pints by a second one; and Scarpa tells of a still more remarkable one, where the distended breast measured thirty-four inches in circumference, and rested, when the patient sat, upon the corresponding thigh; a trocar being introduced, ten pints of pure milk poured off in a continuous stream. Now, how could you understand this condition, without being acquainted with the distinction as to the origin of mammary inflammation, which has here been made? Not only may milk be thus collected in a cryst-like dilation of a duct; the watery portions may be absorbed, and a caseous tumor, or "butyrous tumor," (as styled by Gross,) be formed, and under such distention the duct will sometimes rupture, and the distending material be infiltrated into the areolar tissue of the gland.

Pathology of Mammitis.—As I have endeavored to show, no true mammary abscess can occur unless there be inflammation of the areolar tissue of the breasts. Such inflammation progresses through three stages, giving in each the following morbid appearances: If a breast be examined in the first stage, its blood-vessels will be found distended, and gorged with blood; red corpuscles will be discovered packed closely together, and choking their little canals, and a stasis, (marked during life by heat, swelling, redness, and pain,) will be found existing.

Very soon, unless this congestion be relieved, an effusion of lymph takes place into the areolar tissue surrounding these vessels, and instead of having that appearance which gave it, according to early writers, the name of "cellular

tissue," it is firm, and cuts like a solid tumor. This constitutes the second stage, or stage of effusion. If this stage be left to itself, very soon suppuration will occur; and if examined in this, its third stage, pus will be seen insinuating itself into the meshes of the areolar tissue, perhaps passing between the ducts and follicles, and often forming sinuous passages throughout the organ. In one point this pus collects, advances towards the surface, distends the skin, gives to the finger the sense of fluctuation, and constitutes the much dreaded "broken brast," the mere mention of which will make your parturient patient shudder with apprehension.

Prognosis of Mammitis.—As you will see by the sequel, I believe that in many cases this disease may be prevented when threatened; and fortunately, after its first stage is fully established, it may be readily cut short in its course. Nay, more; if proper means are at once adopted, and persisted in, failure, so far from being the rule, will constitute the inglorious exception.

Even when effusion has occurred, and we recognize the second stage, the prevention of abscess, though more difficult, is still quite possible; the exuded lymph may be taken up, the choked-up currents of the vessels freed from obstruction, and resolution, or return to health, be attained.

When the presence of pus is once ascertained, there is no more room for hope of prevention, for the evil is already upon us, and all that we can do now is to extricate our patient as soon as possible from it, and protect her from its resulting waste of strength.

The prognosis, as regards, recovery after the discharge of the purulent collection, is, of course, favorable, but you will sometimes reduce even a strong and healthy woman. Emaciation, extreme dubility, night-sweats, hectic fever, and the whole dread train of symptoms which mark phthisis pulmonalis, will in succession appear, until the poor sufferer, worn with pain and bankrupt in hope, will pray for death to relieve what the art of man seems impotent to cure. True, this picture is one of a badly-managed case; it is the story of an unfortunate who has confided in one who is unprepared to give her that aid which his art through a more capaple disciple might render; but believe me, that it and in evidence of the fact that my coloring is not too high, hear what others have said in describing it. Dr. Ramsbotham says, "if the drain continue for any length of time

after the evacuation of the pus, a gradual loss of strength, appetite, and flesh is observable; distressing rigors occur daily; the patient obtains but little refreshing sleep, and is annoyed by profuse nocturnal perspirations; sometimes she is harassed with sickness, more frequently with obstinate diarrhœa." Again, he says, "The body has been known to dwindle to a mere shadow. In some instances, the patient has sunk under the debility induced." Dr. Gilmour, in an Essay in the *Lancet*, says, "I have a patient under my care at present, aged twenty-three, with sinuses in one breast of six weeks' duration, who presents all the appearances of a person far advanced in phthisis;" and Benjamin Bell aludes in strong terms to the "pain and misery to the patient in such cases."

A very curious and important result which sometimes follows the formation of these abscesses, is that exerted upon the brain. Sometimes the patient becomes furiously delirious, and the symptoms lead us to a diagnosis of puerperal mania, when the slight collection of pus is the cause of the mental aberration. The acute observation of Hippocrates did not allow him to overlook this fact, as is clearly seen by the following passage: "*Mullierbus quibuscunque ad mammus sanguis colligitur insaniam stgnificat.*"—(Opera, 1588, tom. i., lib. v., aphosism xi.)

Ramsbotham relates the following case in corroboration of this fact: "I was once sent for to see a woman, on the third or fourth day after delivery, in a state of the most furious delirium that can be conceived, which had come on rather suddenly. She appeared laboring under the most acute phrenitis, and in the most urgent danger. A copious bleeding seemed absolutely indicated, but on examining the breast (as should be done in all puerperal diseases,) I found them both very large and tense, and the surface red; fluctuation was distinguishable in each; it was evident that they had both suppurated, and probable that the violent symptoms depend on their condition. They were freely opened, and in less than an hour the patient had recovered her reason."

Symptoms. In those rare cases which we see mammitis as a primary disease, it may be differentiated from inflammation of the tubes and follicles by the following signs:

(*a.*) There are ordinarily no rigors seen in the beginning.

(*b.*) The induration is not so localized.

(*c.*) There is much less pain.

(*d.*) There is a greater tendency to suppuration.
(*e.*) *There is more eternal redness.
(*f.*) There is no pain in lactation.
(*g.*) There is no obstruction to the lacteal flow.

When, as is generally the case, mammitis is a disease secondary to lacteal engorgement, we have these symptoms in connection with those dependent on that condition.

Means of preventing Mammary Abscess.—Always make it a rule, in visiting a female who has been recently delivered, to *examine the state of the breasts*, at each visit, or at any rate, at each visit subsequent to that made on the third day, and previous to that of the ninth.

If trouble is pending, you will generally find evidence of it upon one of these six examinations. When you discover the existence of any symptom which presages mamitis, never leave its treatment to the nurse, but take the management of the case into your own hands, and allow of no experiments, no suggestions, no interference, any more than you would if the patient's lung or liver, instead of her breast, were inflamed. Do not underrate the results which may accrue from your neglect; I have seen many a lady who dreaded mammary abscess much more than she did the pains and dangers of parturition.

You will, in the course of practice, too, find many a one who will suffer the penalty of confiding to the empirical treatment of an ignorant, uneducated nurse, (trying, one after another, all the plasters, unguents and lotions which every nurse has found to prove specific in her experience,) until, too late, she informs her physician of her trouble, states with evident surprise that she has been rapidly getting worse under treatment which, in the nurse's hands, had worked such miracles before, and prays him for that relief which it is now out of his power to give, in preventing an abscess which has already formed.

I am careful to guard you upon this point, because many nurses seem to regard the management of the breasts as their especial prerogative, and to believe that while they deferred to the doctor in his proper province, the conduct of the labor, in the cure of the breasts and the baby, his skill is entirely dwarfed by a comparison with theirs. This

* Dewees says just the contrary, but my statement agrees with those of Velpeau, Rambotham, and others.

is not singular, but what strikes me as wonderful is, that many physicians seem to agree with them.

Let me suppose that you are called to a lady who, during her first promenade after confinement, has been caught in a shower, or exposed to a draught of cold air ; and who has just after had a chill, followed by febrile action ; and that, upon examination, you find a hard, irregular, painful tumor in one of her breasts, that the flow of milk is very much diminished, and that suction produces pain. When indications would present themselves for fulfilment regarding this, as you would do, as an example of inflamation of the tubes and follicles ; of the gland-structure proper ?

They would be, 1st. To quit the catarrh, which has affected the ducts and follicles.

2d. To prevent accumulation of milk.

3d. To diminish vascular supply to the breasts, and moderate the general circulation.

The first inclination may be met by refrigerant applications to the breast, and none has gained so great a popularity as a mixture of vinegar and water. Simple as this is, it answers the purpose admirably ; but for to act as it should do, as an evaporating lotion, it should be frequently renewed; for even if applied cold, it very soon takes upon itself the characters and functions of a fomentation, rapidly absorbing warmth from the heated breast.

It is really curious to see how this simple prescription, like so many others, has worked its way down to our times from remote periods. Paulus Ægineta "squeezed a sof sponge out of tepid oxycrate, applied to the breasts, and bound it on in a proper form, (Syd. Soc. Ed., Vol. I., p. p. 540 ;) Moschion, a cotemporary of Nero, advises vinegar and water; Van Swieten, in his commentaries, speaks highly of Moschion's method; and Dr. Gilmour accuses Dewees of gleaning the hint from these ancient sources, and not accrediting them with the same. I do not myself believe that this answers any better purpose than a cloth soaked in cold water, and repeatedly renewed.

To fulfill the second indication, let the breast be gently rubbed toward the nipple with olive oil, and the follicles be gently squeezed while this is being done, so as to force the imprisoned milk through the tubes, or to stimulate the absorbents to its removal. (Of this method of evacuating the breasts I will speak further anon.) If the milk cannot be thus removed, it must be done by the child, a pump, or,

what is still better, by the mouth of the nurse.

For the accomplishment of the third indication, let the bowels be freely acted upon, and the heart's action reduced, by a faline cathartic.

℞.—Sulphatis magnesiæ, . . ℥iss.
Tr. Aconiti radicis, (Fleming,) mvi.
Antimonii et potass, tart, . gr. ¼.
Acidi sulphurici arom., . mxxx.
Aquæ aurantii florum, . ℥iii. M.

S.—One-third to be taken every three hours, until the bowels are freely acted upon.

This treatment, continued, if necessary, for two or three days, and the patient being confined to strict diet and allowed very little fluid, will generally meet our expectations.

If the case has commenced as one of mammitis, or if that condition has superadded itself to the last, the treatment should differ somewhat. As a primary disease, however, I believe that you rarely meet with mammitis; it is almost always secondary to the condition just mentioned, to lacteal engorgement, or to some other. Should it be found to exist either as a primary or secondary affection, the indications, although very similar to those in the last case, will be best accomplished by other means.

A number of leeches should be applied to the breast, or just below it, the bleeding from their bites freely encouraged, and after their removal, a cold saturine lotion applied, which should be carefully renewed whenever it becomes warm.

I am not in the habit of recommending to you special prescriptions, and that which I subjoin as a local application, I do not insist upon at all, but merely offer it as an example of the class which will be appropriate. The indication is the important point, and if you know of any better means of fulfilling it, employ them.

℞.—Acetat. plumbi, ℥i
Tr. opii acetat., ℥ii
Aceti,
Aquæ, aa ℥vii. M.

To be applied cold, and renewed whenever it becomes warm.

The bowels should then be freely moved by the prescription given, or any other which may be preferred, and a febrifuge and refrigerant employed—such, for instance, as the following:

℞.—Totassæ nitratis, ℥ii.
Antimonii et potass. tart., gr. i.
Tr. verat. viride, mi.
Aquæ, ℥iii. M.

A dessert-spoonful every three hours while there is fever.

In addition to this, the milk should be carefully drawn by suction, or a pump. While in the case of inflammation of the ducts, rubbing will be better than suction for the evacuation of the milk, here the latter will be found far preferable to the former, which is liable to injure the areolar tissue, which is already in a state of disease. And last, (but not least,) do not let the inflamed organ hang and drag upon that very tissue which is the seat of the inflammation, for its support; but pass a broad band of adhesive plaster beneath it, and carry it up over the shoulders, to act as a sling. A handkerchief will answer the same purpose, but not near as perfectly. The last direction is one of no slight importance.

So much, at present, for the management of a commencing case of mammatis; that is, of a case in the first stage of inflammation. Before proceeding to speak of the treatment of its second and third stages, it is my desire to draw your attention to the treatment of one of its causes, which is of too much importance to be passed unnoticed longer. I allude to lacteal engorgement, occurring as a committant of congestion, or as productive of it.

In this condition, if active congestion have not occurred, our chief aim is to prevent it by prompt measures, for it will soon appear if not thus warded off.

The indications presenting themselves in such a state are:

1st. To evacuate the distended follicles.

2nd. To diminish the amount of secretion.

3rd. To lessen vascular supply to the breasts.

As soon as you recognize the state of lacteal engorgement, attend to the first indication by having the breasts drawn by the child, a pump, or the nurse, and having them well rubbed towards the nipple, the hands being covered with olive oil or glycerine. The oil is used merely to facilitate the rubbing, and not for any specific action of its own; therefore, do not use oil medicated with camphor or any other substance, which may bring out a very disagreeable eruption, render the child averse to taking the nipple, and make the application of leeches, which we may subsequently wish to apply, almost impossible, on account of

their repugnance to the medicinal substance used. The rubbing should be practised for fifteen minutes out of every two or three hours, should the breasts fill in that time; and although at first painful and disagreeable to the patient, it will soon be asked for, and relied upon by her, as a means of relief.

But its practice requires some skill, and a great deal of gentleness and perseverance. You will often have to explain its *modus agendi* to the nurse, and will do well on the first occasion to perform it for yourself. After rubbing for ten minutes sometimes, you will see no flow of milk follow, but at the end of so long a time will often be gratified by the accomplishment of all you desire.

When practiced as it should be, this is one of the most effectual means with which I am acquainted for preventing abscess from this cause, and in the Dublin Lying-in Hospital is (or rather was in 1853) relied upon almost to the exclusion of all other local means.

At this time, that is, before any inflammatory action has been set up in the areolar tissue or follicles, and when simple lacteal engorgement exists, warm applications should be made to the breasts, one of the best of which is a sponge or bit of linen, soaked in warm water and covered by a cap of oil silk, made to fit the breast.

But you may ask, Why apply cold in the two diseased states just mentioned, and warmth here? The reason is this: in the first stage of inflammation the vessels are dilating and becoming choked with blood, and you should do all in your power to brace them up, give them tone, and prevent the morbid process. Here, however, you have no such state; you wish simply to seethe the tense organ, and to relax any contraction which may exist in the milk-ducts. It is a fact well recognized by anatomists that the milk-ducts, at their termination in the nipple, are surrounded by contractile or dartoid fibres, and it is highly probable that these, under irritant influences, spasmodically contract, and prevent the escape of milk. The American editor of Ramsbotham's System of Obstetrics expresses such a view on p. 481 of that work, and I have seen several things which led me to the same belief. Now, warmth relaxes this and any other vital contraction which may exist in these ducts, and thus favors excretion.

To fulfill the second indication, viz: the diminution of the secretion of the breast, act freely upon the alimentary

canal, restrict the diet, give little fluid, employ antigalcatics, and resort to compression of the gland.

The two first of these methods for producing the desired end are very valuable ones, but will require no further allusion than that which has already been made to them in this lecture, and we proceed to consider at once those antigalatics upon which we can rely. The first is iodide of potassium, given in full dose; the second is the extract of belladonna painted around the nipple. These two remedies have found great favor with the vast majority of those who have tried them, and although I have seen them both fail in checking or even in diminishing the secretion, I have much oftener in my own practice observed that benefit resulted from their use. I therefore advise you to treasure them in your memories, as means which will prove most serviceable in time of need.

The third indication will be fulfilled by means already mentioned in the treatment of the first stage.

Do all these means ever fail when properly and perseveringly applied; and does the obstetrician ever see his best-directed efforts end in disappointment? I regret to answer in the affirmative, but at the same time express the belief that such failures will be very rare, unless he has to deal with a very unchangeable patient, or with a case which had advanced before he saw it to the second stage of mammitis. Should this stage have arrived, however, before the case came under his care, or in spite of his efforts to ward it off by checking the first stage at its inception, he is by no means without resources which may result in prevention of the third stage, which is the greatest misfortune that he fears under the circumstances.

Treatment of the Second Stage of Mammitis.—The second stage of mammatis consists in an effusion of lymph into the areolar tissue of the mamma; may be recognized by great hardness, pain, tumefaction, redness and heat, and may well be dreaded as the precursor of abscess, unless its progress is checked and suppuration prevented.

All those means which have been detailed as applicable to the disease in its first stage, are to be preserved in this; but should we find that, in spite of them, the case progresses steadily towards the dreaded result of abscess, no time should be lost, but pressure should be established, with a well-founded hope of successful prevention.

It is now about fifteen years since Trousseau and Contour

published an essay on the treatment of mammary abscess, by compression, bringing the subject prominently before the profession. It was not original with them, however, for according to Dr. Jas. Gilmour, of Liverpool, in an excellent articles on this subject in the *Lancet*, already alluded to in the works of Heister, and its use may be found alluded to in the works of Pearson, Smellie, and Cooper. In this city I know of no one who has so systematically resorted to this means as Dr. S. Conant Foster, who published an excellent article upon it some four years ago in the *New York Journal of Medicine*.

In obstinate lacteal engorgements it is very serviceable; even after pus has begun to form, it relieves pain, and although it does not prevent the coming abscess, seems to prevent the passage of the pyogenic process to larger parts of the organ; but in the second stage of mammatis, where engorgement is ending in effusion of lymph, it is certainly one of the greatest boons with which either patient or accoucheur could meet.

I have myself repeatedly employed it, and never without being not only pleased, but surprised at its results. Equable pressure overcomes the tendency to congestion, keeps the distended follicles closed, and stimulates the absorbents to great activity. Do not let any theoretical objections prevent you from employing this means, and believe me that you will find it one of the most precious resources which you can bring to your aid.

The means by which pressure is best affected is by adhesive straps from 15 to 16 inches in length, and from 1 to 2 inches broad. Suppose, by way of illustration, that the right breast is to be compressed, let the end of the first strip be fixed in the right axilla, and then being drawn tight, let it be carried over the lower border of the breast, and its other end attached to the lower border of the breast on the other side. Then let the second strip be fixed at the upper border of the left breast, and this being firmly drawn over the lower border of the right, or diseased breast, let it be fixed so that its lower end will be attached to the right side, about three inches below the origin of the first.

These two strips should be longer and wider than those which are to follow, for they are to give support to the organ. Shorter strips may follow these, crossing each other as these have done, until the entire breast is shingled over, as it were, with the compressing covering. The particular

arrangement, however, is a matter of secondary importance, as the ingenuity of any one will be sufficient to teach him how to accomplish the desired end. Compress the breast as you like, the principle is what I wish to inculcate.—Should you desire a more powerful compressing agent than the straps, a most excellent one is offered you in compressed sponge, as recommended by Dr. Batchelder. Having compressed a piece of sponge by heavy weights, place it on the breast, apply firmly a roller bandage, and through this wet sponge. Absorbing water, it will soon swell, and give you a powerful, safe, and equable means of compression. By this very ingenious means the hardest tumor will disappear, and the breast be rapidly reduced in its dimensions. The sponge employed may be small and numerous, compressing the different parts of the organ which require such treatment; or one large disk of sponge may be prepared, with a hole for the nipple, which will act upon the entire organ at one.

This was the method employed by Dr. Foster in the cases related in the paper alluded to.

You will often find, in a few hours after pressure has been applied, that a tumid, hot and painful breast will change its aspect most essentially; and even while the straps, or sponge and bandage, are performing their function, the milk can be drawn by suction, the nipple being of course left uncovered; and the adoption of the plan does not prevent the continuance of other means, as saline cathartics, antigalactis, dieting, &c. Pressure, indeed, only takes the place of friction, which has failed us, or which we cannot employ, from the restiveness of our patient, or the pain which it induces after mammitis has been alighted.

When pus has formed, nothing more can be done than to encourage its discharge, and for this purpose a soft poultice should be applied. So soon as the abscess shows a tendency to point, let it be evacuated, and then let the whole breast be supported by strapping, only a space around the opening being left free for the application of a small and light poultice. The straps, now applied, will prevent the formation of sinuses, will force out all the contents of the abscess, and cause a rapid absorption of surrounding effusion.

Should obstinate sinuses have formed, which will not yield to the means mentioned, let them be dilated by sponge-tents, injected with dilute Tr. of iodine, or with simple warm water, and firmly compressed by means of compressed sponge and a roller bandage.

In reference to these and other chronic purulent discharges from the breast, I must guard you against the prolonged use of poultices. Like other very useful means, they are often abused; and if persevered in after the proper time, will tend to weaken the diseased tissues, and encourage the continuance of the exhausting discharge.

In the medical journals of the day you will see many kinds of treatment extolled, and the proof of their efficacy which will be adduced will be the fact of their having prevented mammary abscess in women who have been delivered of still-born children, and have not nursed. Now, this reason is fallacious, for it is very rare that abscess occurs in such cases, and the prevention is entirely imaginary; the appearance of threatened abscess having vanished "*post hoc*," but not "*propter hoc*." I have never seen an abscess of this kind occur in a woman who had not nursed, although I know that they sometimes do so.

In concluding, I will give you a *resume* of the means to be adopted for the checking of a *commencing* mammitis, without which no abscess can form, but which is very sure to appear as a secondary result of uncontrolled lacteal and sanguineous engorgement.

1st. Evacuate the inflamed breast by the breast-pump, or by suction by the child or nurse, the last being decidedly the best method.

2d. Diminish vascular supply, by saline cathartics, nauseants, direct sedatives, topical bleeding, and cold applications.

3d. Diminish lacteal secretion by strict diet and antigalactics.

4th. Aid in the accomplishment of all these ends, and at the same time cause an absorption of effused lymph and serum, by firm and equable compression.

5th. Never let the inflamed organ hang, but always support it by means of a long and broad band of adhesive plaster passing nearly around the body, and thence under the breast.

6th. Avoid poultices and warm fomentations.

Notes upon the Causes of the Distinction between Bronchitis and Pneumonia.

During the ten years that I have taught the substance of the following remarks, I have vainly sought in the greater part of our classical and special treatises the necessary data to solve the question about to occupy me. A simple inspec-

tion of these works explains the cause of the deficiency—for it is easy to perceive that their authors have studied the results of the alterations occurring in the tissues without possessing any exact idea of the character and reciprocal relations of the elements normally composing those tissues. In the case of the lung, for example, they sum up its general structural characteristics by saying, that, when once the bronchi enter the substance of the lung, they rapidly lose their firmness in consequence of the disappearance of the cartilaginous rings, and, becoming at length entirely membranous, are lost in the pulmonary cells or vesicles, hence often called "bronchial terminations." They further assert that a mucous membrane, constituting the essential portion of the respiratory organs, is continued in a uniform layer from the larynx to the extremities of the bronchi, and that this layer, somewhat thinned, exists alone in the pulmonary vesicle. According to some, the vesicles are separated from each other by the interposed cellular tissue—according to others they are in contact, and the dividing wall is homogeneous in its structure.

While, relying upon these statements, I considered the phenomena from this point of view, I was astonished not to see bronchitis invariably pass into pneumonia—especially that form of bronchitis known as capilliary, in which symptoms of asphyxia are superadded to those of intensely acute bronchitis. (The asphyxia is caused by a change in the secretion of the bronchi, which becomes muco-purulent and very viscid.) Yet nothing can be more distinct than the pathological lesions, or the symptons that characterize these two affections. It may be said that the general state of the patient, the nature of the cough, the signs derived from auscultation and percussion, and the character of the expectoration in the two diseases, have no resemblance. No two things can be more distinct than they, and nothing more certain than that they oftener appear simultaneously under the influence of a common cause, than that one passes into the other, either by the extension of the inflammation of the bronchi to the lung—or by propagation from the lungs to the bronchi.

The marked difference between them is, in fact, incomprehensible, and, in some sort, mysterious, when we consider the whole respiratory tract as lined with a continuous membrane from the larynx to the air vesicles or bronchial extremities.

But it is important to know that the anatomists, as well as the practitioners, have allowed themselves to be misled in this case by the too evident continuity of the canal of the bronchus with the cavity of the air-cell opening into it. This is not less erroneous than it would be to assert that the uriniferous tubules were continuations of the uretha, bladder, or ureters, which, as they arrived at the kidney, ramified into the tubules—their mucous membrane, thinned, alone persisting in these conduits. To admit such an hypothesis in regard to the bronchi without direct and careful observation of the tissue which limits them, is to commit an error analogous to that which considered the capillaries to have the same structure as the arteries and veins, on account of the continuity of their canals.

To settle this point, I shall re-state the following facts, which I have already, at different times, given to the public.

After a certain amount of subdivision, the bronchi (one and sometimes two millimetres—3-100, 6-100 inches—in diameter) have no longer the partial cartilaginous rings; they also cease to have transverse muscular fibres, elastic longitudinal fibres and a mucous membrane separable from the proper bronchial wall. They also lose their ciliated epithelial coat—in a word, they lose the characters of bronchi. These pulmonary canaliculi, which are continuous with the real, unmodified bronchi, and are wrongly termed ultimate bronchial ramifications, are further subdivided and terminate in rounded culs de sac, slightly enlarged at their base, and improperly called the bronchial or pulmonary *cells*. (At birth these measure 05.05 mm., and in the adult .1 mm.—.2 mm. in diameter).

These canaliculi have nothing of the bronchial structure, but one of their own, characteristic of the pulmonary parenchyma. Their walls are composed of closely interwoven bundles of fibres of elastic tissue—of a luminated tissue of fibro-plastic elements, and of vessels. These last form on the internal face of the conduits (which present slight salient folds) a network different from that of the capillaries, ramifying upon the bronchi proper. This network is composed of large capillary vessels, so closely interwoven as to leave the free interspaces of less diameter than their own.

It is distributed over the tissue of the walls of the pulmonary conduits, although there is no mucous membrane separable from the elastic coat, and there is nothing between

it and the cavity of the tubes but a layer of pavement epithelium with large nuclei, that commences at the points where the cylindrical or ciliated epithelium of the bronchi ceases.

Thus the pulmonary conduits, where hæmatosis is effected, have a different structure from the bronchial tubes which bring the air to them. It is impossible to find in them a mucous membrane distinct and separable from the elastic parenchyma and laminated tissue in or upon which is distributed a capillary network—such as is seen in the bronchial tubes provided with cartilages, where there is a mucous membrane separable by dissection. This fact affords an easy explanation of the facility of absorption in the lung compared with that in other organs provided with a mucous membrane, and also of the easy rupture of the capillaries and escape of blood (or an injection) into the air-passages.

Thus there is as much difference in anatomical structure between the bronchus and lung as there is between the tissue of a secreting gland and its excretory duct, and the inference is unavoidable that diseases pertaining to one or the other of such distinct tissues should themselves be distinct.

But there is yet another important cause to account for the infrequency of the extension of bronchitis into pneumonia. In bronchitis that portion of the capillary system which is the seat of inflammation, belongs to the general or systemic circulation, and is supplied with red or arterial blood.

In pneumonia, on the contrary, the capillaries of the lesser circulation, in which the dark blood from the pulmonary arteries is aerated and which nourish the parenchyma of the lobules, are the seat of inflammatory action. It is at the expense of the dark blood that the morbid products of pneumonia are formed—as in hepatitis it is the blood of the portal circulation that furnishes materials for suppuration of the liver.

It is well known that the pulmonary arteries, although accompanying the bronchi in all their ramifications, give off no branches to them, nor to the interlobular spaces, and that they do not anastomose with the bronchial arteries. These last are not distributed beyond the point where the nuclei of the cartilages disappear (where the canal has a diameter of about a millimetre), and it is precisely at this

point that the branches of the pulmonary arteries break up into capillaries between the contiguous walls of the pulmonary canaliculi, thence to ramify upon their internal surface beneath the layer of pavement epithelium, in a vascular net work of peculiar character—the type of which is preserved in the lesser circulation of all the vertebrates, as far as the fishes.

The bronchial arteries, on the contrary, beyond the bronchi, give off no branches except the vasa vasorum and those distributed to the interlobular laminated tissues, continuous with the pleura.

The preceding particulars of the organization of the lung, as compared with other organs, are of the first importance for the solution of the question to which this paper is devoted; but they equally well explain the causes which distinguish inflammation of the lung, in its nature and progress, from inflammation of other organs, and also the modifications produced in pneumonia by the age of the patient—modifications more marked than any which occur in a single disease in other organs, and this, not only because, according to the age, the respiratory canaliculi offer marked differences of structure, but especially because inflammation is controlled in its nature and course by modifications of the circulation, and these are nowhere so striking as in the lesser circulation, which anatomically and physiologically unites the two hearts.

Besides differing in arrangement from the bronchial and other systemic capillaries, those of the lung have also a structural difference from them. They are in fact the largest in the economy, and the nuclei in their walls are smaller, more numerous and nearer together than in those of the systemic circulation. It is important to observe that the capillaries of the liver present the same peculiarities.

These facts are not without value, when it is remembered that inflammation is a morbid state of capillary circulation. Inflammation is, in fact, a complex phenomenon, but it principally affects the function of circulation, being especially a modification of it in the capillaries of the part or whole of one or more organs—or rather, it is a succession of phenomena occurring in the capillaries, and characterized by, first, a contraction of the minute arteries and veins of the part—the proper capillaries as yet taking a scarcely apparent, though real part in the phenomena; and, second,

a repletion and dilatation of the true capillaries, with a slackening and oscillation of the circulation—characteristic of simple congestion. In some cases, this state of things may be followed by complete stasis, with great engorgement and distension of the capillaries, gradually extending to the minute arteries and veins. The capillaries in which the veins originate, ceasing to furnish them with blood, the current slackens and finally stops, and the veins are only supplied from the collateral circulation, and with a constantly decreasing force, so that the blood globules, not carried on as in the normal state, gradually accumulate. This is the cause of the sort of passive congestion and swelling, which extends in the inflamed organs beyond the portion of its capillary system, which is the seat of the essential phenomena of inflammation, i. e., beyond the portion of the organ that is really inflamed.

The study of inflammation demands a profound knowledge of the capilliary system—as much in regard to the intimate structure of the vessels, as in regard to the disposition of their ramification. And as these ramifications or meshes ("reseaux") differ in the different tissues, being subordinate to the arrangement of the fundamental elements of the tissues, there result several important physiological peculiarities—among them the fact that inflammation, offering everywhere general or common phenomena, presents different peculiarities according to the tissue in which it occurs. To properly appreciate these differences necessitates the study of the capillary structure of the organs. The process is not only not always identical, but the products—as pus—differ notably in the various tissues. Moreover, the difference of these products is much affected by the influence of the nutrition of the fundamental, anatomical elements upon the blastema, exuded during inflammation.

To the peculiarities offered by tissue, to which the systemic circulation is distributed, these must be added, in the case of the lung—the presence of a capillary system, receiving dark or venous blood, and belonging to a distinct circulation.

These remarks also apply in great part to the liver, inflammation of which presents many points of resemblance to the same trouble in the lung.—*Boston Med. & Sur. Journal.*

The Laryngoscope. (From the Berlin correspondence Medical Times and Gazette.)

As far as I am acquainted with the periodical literature of our profession, no notice has as yet appearod in your columns, or in those of your cotemporaries, with regard to the highly practical results obtained on the continent by the use of the laryngoscope.

Having had occasion to convince myself of the comparative facility with which the larynx can be explored by means of this simple contrivance, I feel confident that its importance for the diagnosis of laryngeal disease cannot be overrated, and it will be a mere truism to state that we shall be able to attack affections of the larynx with far greater discrimination and success, if the uncertainties, inseparable from a symptomatic diagnosis, can thus be replaced by the precise results which a distinct view of the affected parts must afford.

A few weeks ago I was present at a post-mortem of a phthisical individual, whose larynx had been carefully examined, a short time prior to decease, by Professor Traube. The changes found in the larynx bore testimony to the accuracy of the results obtained by larngoscopic investigation. The following remarks on the instrument and its application, are mainly extracted from a monograph, published in the early part of the year, by Professor Czermak, who, together with Dr. Turck, of Vienna, has the great merit of having re-directed the attention of the profession to this important means of diagnosis. Indeed these Viennese physicians may be said to have re-invented the larynx-speculum. Apart from its decided practical usefulness, the fact of the laryngoscope being originally an English invention ought to stimulate English surgeons to take an active part in the reform of laryngo-pathology, to which the general application of the instrument is likely to lead.

In Liston's Practical Surgery, page 417, we read, under the head of Ulcerated Glottis, the following remarks: "A view of the parts may be sometimes obtained by means of a speculum—such a glass as is used by dentists—on a long stalk, previously dipped in hot water, introduced with its reflecting surface downward, and carried well into the fauces."

This pregnant hint of Liston's remained unnoticed till 1855, when Garcia published a most valuable series of auto-laryngoscopic investigations, instituted for the purpose of

elucidating the mechanism of the human voice. In these experiments the image of the larynx was reflected from a mirror placed against the soft palate, so as to be received upon a second mirror placed in front of the observer (auto-laryngoscopy). An elementary knowledge of cateptrics will suffice to explain the principles upon which Liston-Garcia's method of investigation is founded.

The examination itself is conducted in the following manner: A metallic mirror, varying in size from six to fourteen lines in diameter, in shape either square with rounded edges, as recommended by Czermak, or oval, according to Turck's proposal, or, as it has been found very convenient by Dr. Levin, of Berlin, semi-circular, with a concave inferior margin, soldered to a slightly flexible metallic handle, is to be introduced into the well-opened mouth, and fixed in such an angle against the uvula and soft palate as to throw incident luminous rays upon the larynx, and to reflect an image of the parts thus illuminated into the eye of the observer. To prevent the mirror from becoming dim by condensation of vapor upon its surface, it is necessary to warm it previous to introduction, by dipping it into hot water, or holding the unpolished surface over the flame of a small spirit lamp. Garcia made use of the direct rays of the sun in his experiments; as this source of illumination, however, is not always available, and, even if so, attended with obvious inconveniences in practice, Czermak proposes the use of a perforated concave mirror of 7—12 sec. focal distance, by which the light of an ordinary lamp can be concentrated upon the larynx-speculum, the eye of the observer being applied to the perforation. As the distinctness of the image will depend upon the brilliancy of the illumination employed, it will be found advantageous to concentrate the light of the lamp upon the concave mirror, by means of a powerful bi-convex lens. Dr. Levin, of this city, has devised a highly convenient apparatus for this purpose, consisting of a tin tube carrying a convex lens of two and a half inches focal distance, and about the same diameter, which, by means of a simple contrivance, can be fixed horizontally over an Argand lamp, after the shade has been removed.

The perforated concave reflector can either be held between the teeth of the observer, fixed on a suitable ivory handle, as recommended by Czermak, or attached to a large spectacle frame, according to Stellwag's proposal, or it can

be suspended from a support screwed to the corner of the table on which the lamp is placed. The latter contrivance will be found the most convenient for practical purposes. I think it was first introduced by Dr. Levin.*

It will be most convenient to place the lamp to the right of the patient, who is to be examined in the sitting posture, his hands resting upon his knees, his body slightly advanced, and his head slightly reclining backward. According to Professor Traube's advice, the lamp, concave mirror, and larynx-speculum ought to be on the same level, and the angle formed by the rays incident upon, and reflected from, the concave mirror as acute as possible. On this account it will be wise to place the lamp a little behind the patient. The observer supports the head and chin of the patient with his left, and introduces the larynx speculum with his right hand, looking through the perforation of the concave mirror, by means of which he illuminates the pharynx.

By causing the patient to sound alternately the Roman vowels, *a. e.*, the velum and uvula will be raised so as to admit of the mirror being introduced with greater facility. In pressing the speculum against the soft palate and uvula, great care must be taken to avoid touching the posterior wall of the pharynx, the palatine arches, and the base of the tongue, to prevent the supervention of vomiting and deglutition. "In this manner," as Czermac says, "it is possible to look into the very depths of the pharynx, to obtain a distinct image of the individual parts of the larynx, and, as I first demonstrated in my own person, to see the bifurcation of the trachea reflected through the widely opened glottis, with the tracheal rings shining through the thin mucous membrane."

Of course, considerable practice and a certain amount of dexterity are required for successful handling of the laryngoscope, notwithstanding the simplicity of the principle upon which the method is founded.

The difficulties are mainly owing to the great irritability of the palate, which, in some individuals, is so considerable as not to tolerate the contact of a foreign body; others are unable to keep their mouths open for any length of time, or to command the position of the tongue, which ought to be well flattened and protruded. Some patients, as Professor

*Mr. Yearsley has requested us to state that he has used Mr. Avery's ear lamp in this way for several years past.

Traube correctly remarks, suffer from a kind of "moral nausea," threatening to vomit as soon as they are told to open their mouths. This extreme irritability can be overcome by methodically accustoming the parts to the contact of foreign bodies, as it is often requisite prior to surgical operations on the palate. I remember reading that bromide of potash has the power of lowering the sensibilty of the pharyngeal mucous membrane; it might deserve a trial in very refractory cases.

In general, however, the irritability of uvula and soft palate will be found very inconsiderable, so that they can be raised and pressed against the posterior wall of the pharynx without any inconvenience to the individual experimented upon. In Professor Traube's clinic I have seen an individual sitting for nearly ten minutes with the larynx-speculum applied to the fauces, so that fifteen medical men who were present could successively examine the reflected image of the glottis without any reflex phenomena supervening to interrupt the observations.

In this case the mouth of the patient was held open by a very convenient instrument, devised by Dr. Levin. The handle of the larynx mirror is attached by a ball-hinge to the upper bar of the mouth speculum, so as to admit of the larynx mirror being easily adjusted for the purpose of demonstration.

In the fifth chapter, Czermak details his method for obtaining a view of the posterior surface of the velum, the nasopharyngeal cavity, etc., and he represents the image obtainable by rhinoscopic investigation, the commencement of the Eustachian tubes being also rendered visible. Wilde has already investigated the latter by a similar method.

To obtain an image of these parts, a speculum must be introduced under the velum, with its reflecting surface turned obliquely upwards, so as to illuminate the nasopharyngeal cavity. A speculum is proposed for this purpose, to which a sliding wire-hook is attached for the purpose of raising the velum.

Examinations of this kind are, of course, surrounded by numerous difficulties, and can only be expected to succeed if a combination of favorable circumstances obtains.

The auto-laryngoscopic observations instituted by Czermak for physiological purposes, are mainly confirmative of the results obtained by Garcia's celebrated investigations, and his work will amply repay perusal to those who are

interested in the important questions involved in the study of the mechanism of the human voice.

The pathological observations which conclude the work, twenty in number, illustrating most varied and interesting forms of laryngeal disease, as revealed by the larynx speculum, are calculated to convince the most sceptical of the great advantages which must accrue to the practioner from the adoption of this method of investigation.

The possibility of the eye serving as a guide for the hand in the topical treatment of affections of the larynx and deep parts of the pharynx, is also proved by some of these observations. You must permit me to reserve my detailed statement for a future communication. Two of these cases, the first and third, during the course of which laryngotomy had to be performed, on account of steonsis of the larynx, are of particular interest, being the first in which, by a novel adaptation of laryngoscopy, the glottis was investigated from below. This was affected by introducing a small mirror attached to a suitably bent handle, with its reflecting surface turned upward, into a fenestrated tracheotomy tube. By illuminating this speculum with a concave reflector, the most brilliant and accurate images of the lower aspect of the glottis, etc., were obtained, and the nature of the pathological changes affecting the parts clearly ascertained. This method promises to be of great importance for the diagnosis and treatment of deep-seated affections of the larynx, particularly in cases of laryngeal tumors, which cannot be attacked from above. By reversing the reflecting surface of the mirror introduced into the tracheotomy tube, the deep parts of the trachea might also be explored.

Raw Meat in Chronic Dysentery. By J. D. Willis, M. D., Royalston, Mass.

The patient was a child eighteen months of age. He was one year old when first attacked with dysentery. He was eleven months when weaned; immediately after weaning, he began to decline. I was first called to see him September 17th, 1850. I found him very much emaciated, and unable to help himself much, with skin so shrivelled that he appeared like a little old man. His abdomen was protuberant, and presented all the symptoms of tabes mesenterica, which appeared to follow as the sequel to muco-enteritis. His appetite was capricious; and what little he did

eat, was either undigested in its passage or vomited. There was diarrhœa, with frequent discharges of pus and blood, attended with feverishness and atrophy. Hard and irregular lump were perceptible in the abdomen. Various remedies, which are usually recommended in like cases, were tried, but with very little benefit. As a last resort, I ordered him to have the palp of raw beef, as suggeited by Dr. Weisse. He took one tea-spoonful of the pulp once in four hours. It set well on the stomach; the patient soon began to improve in strength and flesh. The dejections diminished in number, and became more healthy. This was the only treatment, with the exception of Dover's powders and McMunn's elixir of opium. For some time the stomach would not bear any other diet; but the last time I saw him, Jan. 24th, 1860, he was able to eat the same food as did the family. He has become very fond of the raw beef, and weighs many pounds more than which I first called to see him. He acts lively and appears quite healthy. After the stomach became able to bear it, I gave cod-liver oil, and the syrup of phosphates twice a day.

[*Boston Med. & Surg. Jour.*

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1. *Advantages of the Use of Glycerine in Surgery.*—M. Demarquay, a distinguished hospital surgeon of Paris, has used, and recommends, glycerine in ulcers and fistulous tracts along which latter it should be injected to fulfill the the following indicates—viz: to diminish excessive suppuration, cleanse the secreting surfaces, modify the noxious properties of the pus, prevent the stagnation of fluids, or simply to excite the pyogenic membrane, and bring about cicatrization.

Glycerine may be advantageously used in deep absceses connected with diseased bone, and in such cases the author combines glycerine with iodyne, because the former is, alchohol excepted, the solvent of the latter, and penetrates very powerfully, reaching to a great depth. Glycerine may also be employed in the dressing of scorbutic, scrofulous, syphilitic, and atonic ulcers, either alone or as preparatory to another kind of treatment—viz: compression with straps of adhesive plaster. When used for ulcerated chilblains, glycerine should be extremely pure, because it is apt, when not quite free from foreign substances, to excite very painful inflamation—*Drug Circular.*

EDITORIAL AND MISCELLANEOUS.

An Air-Plug for the Speculum Uteri. By Henry F. Campbell, M. D., of Augusta, Ga.

Any one who is at all familiar with the use of the Speculum in the diagnosis and treatment of uterine and vaginal diseases, cannot have failed to feel the extreme inconvenience and embarrassment which often attends the introduction of this instrument in almost any of its various forms. Many Speculums are of such material and construction as to admit of a *plug* at the uterine extremity, which greatly facilitates their entrance into the vagina. This plug is generally made of some dense wood, fitted to the opening and attached to the end of a wire—I have always found, even these, inconvenient and liable to become deranged from their adjustment, running the risk of pinching the folds on the walls of the vagina. The *glass Speculum*, however, that which is now most in use and preferred by a large majority of practitioners for ordinary purposes, is, from the brittle nature of the material, without a plug or any other efficient means of facilitating its introduction into the vagina. The slight prolongation or *lip* on the lower edge of the uterine end, is certainly a very poor substitute for a *plug*, provided one could be constructed which would be perfectly safe and at the same time efficient. However carefully or skillfully the instrument may be applied, it will sometimes happen, even in the most practiced hands, that the upper edge of the rim will press painfully on the clitoris, or become entangled, causing great pain and distress to the patient. A proper plug, fitting well into the end of the speculum, and covering the hard rim, is certainly, then, a great desideratum. Such an addition to the Speculum I have, at last, devised, and the following brief description shows its construction and mode of application :

This very simple apparatus consists of an elongated India rubber bag, with a tube of the same material at its posterior end. This tube may be eight or ten inches in length ; must have an air-tight stop-cock in the end. The bag is put into the Speculum in a flaccid state, protruding a little beyond the uterine end—just enough to produce a somewhat wedge-shaped rotundity when fully blown up. At the point where the uterine

end of the speculum would form a ridge, there is a slight elevation or crimp on the bag; so that when the plug is blown up, the edge of the Speculum is buried in the India rubber, and completely protected from coming in contact with the delicate soft parts of the vulva or vagina. The bag being properly adjusted in the Speculum, is now fully distended with air from the mouth of the operator, and the stop-cock closed. The whole instrument is now lubricated with oil and introduced in the usual manner, when the stop-cock may be turned and the air allowed to escape. The bag of course becomes flaccid again, and can be easily removed by pulling on the tube, when the Speculum may be adjusted so as to bring into view the os uteri and any other parts to be examined.

The air-plug can be adjusted to metallic speculums by a little change in the shape and plan of construction, and will be found to possess many advantages over those now in use. It is more particularly, however, for the glass tubular Speculum that we at present suggest it. Most of these glass Speculums now in use are shaped *obliquely* at the uterine end—air-plugs made for these Speculums will therefore require that *crimp* near the fundus of the bag to be made to pass *obliquely* over it, corresponding with the direction of the edge. If the air-plug should come into general use, however, all glass Speculums should hereafter be made *without* that obliquity at the uterine end. The adjustment of the plugs then, will be, of course, very much simplified. With the use of the air-plug, the lip is no longer necessary.

Messrs. George Tieman & Co., No. 63 Chatham street, New York, the Charrieres of the American continent, will furnish these instruments, neatly made, to all who may apply. These gentlemen have also, under our direction, made a convenient Speculum case, containing all the implements necessary for the local treatment of uterine affections, as engorgement, inflammation, ulceration, &c.

The above little invention I take pleasure in presenting, feeling only too happy in connecting my name, in any useful way, with an instrument so constantly in the hands of my professional brethren.

Augusta, Sept. 26th, 1860.

Twenty-Ninth Session of the Medical College of Georgia.—As will be seen by the Annual Announcement, published under cover of a former issue, the Twenty-Ninth Session of the Medical College of Georgia will begin regularly, on the first Monday in November. The Preliminary Course, commencing on the 15th of the present month

(October,) will be found highly interesting and instructive to those students who may be able to arrive at that time.

The prospects for a large class are very encouraging. The advantages of Augusta, as a place where the Southern student may acquire the most thorough instruction, both theoretical and practical, adapted to his future wants in a Southern field of practice, are too well known to require further presentation by us. We know too well, that diligence in teaching, and the heretofore indefatigable labor of its Faculty for the benefit of the Profession, are far higher claims to a continuance of prosperity than anything which the most enthusiastic advocates of the College can effect.

Students arriving in Augusta will find the Registrar, Dr. Charles Palmedo, at the College Library, who will take pleasure in assisting them in finding comfortable board for the winter.

New Needle for Sutures.—We have received the advance sheet of the Nashville Journal of Medicine & Surgery, containing a description of this valuable invention of Dr. Paul F. Eve. It will be found entire among our selected articles of the November number.

Year Book of American Contributions to Medical Science and Literature.—Dr. O. C. Gibbs, of Frewsburg, New York, has sent us his Prospectus of the above valuable and patriotic work. The paper comes to hand too late, however, to receive at this time a more extended notice. We will do ourselves the pleasure of giving the work our best attention in the next number.

Fifty Years Ago.—The following letter, from our old and highly respectable practitioner, will be read with interest, both because it presents a clear statement of an embarrassing case, often met with at the present day, and also because it revives the past, ever pleasing to recall, and not unprofitable, for from the light of the past, we may here and there find a ray to illumine both the present and the future. It is true, we would not give up the advanced progress of the present to retrograde into the imperfections of the past, but lessons of practical wisdom, and many valuable suggestions, may be sometimes gleaned from a consideration of its ways and its expedients; all inferior as they professedly are, to the ways and expedients of the present day. *Now*, we cure fever and all its complications readily, almost certainly, with quinine. Calomel is,

by many, regarded a poison, and the lancet an instrument of destruction. *Now*, improved views of pathology enable us to recognize the neuropathic element in fever, and treatment is addressed more directly to *locale* of the disease. *Fifty years ago*, the humeral pathology still held almost undisputed sway, fever was regarded as a humor, and the "obstructed liver" as the sole offender in the "body corporate." Pelletier & Caventou did not give us quinine till 1820, and calomel and the lancet were the most reliable means, throughout the whole Southern country, for controlling the fearful paroxysms, now so amenable to anti-periodic treatment. The lesson we may draw from this may not be altogether valueless. If calomel and the lancet were *once* the *sole* reliance of the practitioner, certainly they may sometimes even now, be useful when the more ordinary means prove inefficient. Our venerable correspondent tells us, he gave the child, seven years of age, near twenty grains of calomel in divided doses—practitioners of the present day would condemn the practice as hazardous, nay, destructive; but that was *not* of the present day, but a note of practice taken *fifty-one years ago*. The patient did not die, but was cured.

"Men change with centuries, principles with times."

Mr. Editor:—I do not know that it will be amiss to make you a report, taken from my note book of the 9th November, 1809, of the first case of sickness I attended in my youth on my own responsibility. I will preface it with the introductory, that I am a Virginian, the son of a true Buckskin—a hater of secession, but a lover of my State and country. I studied at Charlotte Court House, Va., under those excellent physicians Drs. Elliott and Jameson, and while at the North, was taken with a teazing cough, and threatened with a pulmonary affection, and, by the advice of my medical friends, was induced to come South and spend one winter, but I fully intended to return to Charlotte C. H. the next spring. On my arrival at Augusta, I was advised to go down to the "Four Mile Branch" neighborhood, and stop with Capt. R. Hankerson, a clever man of that settlement. In a few days I left Augusta for Capt. H.'s, in Barnwell District, S. C. My attention was soon called to a severe case of sickness just in the neighborhood, which was said to be despaired of by the two attending physicians. Now, Mr. Editor, for the report, I presume I spoke something of what I knew—so it was soon known there was a young doctor in the neighborhood, and on the 4th day after I arrived, I was called on by Mr. Buckley, the father of the child, who, after conversing with me some time, told me that he had a very sick child, and that he wished me to see it, remarking that its

physicians had left it as a hopeless case, still it would the better satisfy him in its loss, if I would go and see it. I then asked him a few questions, and, after a little, consented to ride down in the morning and see his child. My patient was as handsome and suffering a little child, from five to seven years of age, as ever excited a physicians sympathy or claimed his efforts for its relief. The little girl was laboring under, as I supposed, an aggravated case of Aphthous sore mouth, accompanied with high bilious fever, and from my examination, I discovered the following complication of symptoms, viz: Sore mouth, which spread to the lips, and almost over the entire face. There were strong indications of Hepatic derangement. The aphthous affection had doubtless affected the intestinal canal throughout, and had formed on the two nates and around the anus.

What, Mr. Editor, could be expected from a young and inexperienced physician in such a case? After looking at, and considering well the case, it occurred to me, that if I could reduce the fever then present, the cause of all the external appearances, the continuance of which, also induced the bilious appearances, there might be some chance, consequently my first prescription was 1½ grs. Calomel and 1-16 gr. Opium, administered in soft sugar to allay the irritability of the stomach, and finding that it answered my purpose, I left 6 powders, consisting of 1½ grs. Calomel and ½ gr. nitre, given every three hours until I returned, unless they commenced to operate more than 3 or 4 times. Then I directed one to be given every 4 or 5 hours and to drink tepid sage tea. On my return, the next day, to my great astonishment, they had not operated, and now, what I have told you, that I was a Virginian bred, and in my locality 12 grs. Calomel and 3 of Nitre would operate on a child of the size of my patient almost unto death: and what to do now, I was entirely at a loss. Away from friends, in a strange land, deprived of the advice of learned preceptors, for one minute's interview with either of whom I would have given my horse. Well! on a little reflection, it occurred to me that there was less sensibility about the southern stomache than the northern, owing to the papillae thereof being more obtunded and less sensible. Having been brought to this conclusion, my second prescription was 3 grs. Calomel and 1 of Nitre, to be given at intervals of three hours, unless they appeared like operating more than three or four times in twenty-four hours, then even four, five, or six hours.

On my third visit, I found that the second prescription had had a most happy effect only giving four powders. and operated four times,

discharging a quantity of very fetid and grumous looking bile. The word was, my child is better—"see, the fever is much abated, and the mouth, face and nates discovered a disposition to cicatrize." My mind was also so elucidated that I could see my way without the assistance of my preceptors. The last of the four operations from the second prescription was not so fetid and grumous as the first, and consequently. my third prescription was the same, but given at longer intervals, that I might effectually deobstruize and clense the liver, which I was to know by the fæces becoming less offensive, less grumous and more yellow.

On my fourth visit, I found the little patient much better—being clear of fever, and the ulcerations rapidly healing. I had only to direct one of the powders left on my third visit to keep the bowels in a soluble state. On my fifth visit, I directed for the sixth day, small portions of sulphate of magnesia, and took my leave, and still, Mr. Editor, fifty-one years thereafter, you find me in Barnwell, now an old man, having completed to the full, my three score years and ten.

I am, dear sir, respectfully yours,

SAMUEL J. BAILEY, Sen.

Four Mile Branch, Barnwell Dist., So. Ca.

Thirteenth Annual Meeting of the American Medical Association.

THIRD DAY.—CONCLUDED FROM SEPTEMBER NUMBER.

A communication from the Clinton County Medical Society of Iowa, to which was appended a catalogue of the College, was read.

This communication charged the Western Reserve College with having exceeded its rights and privileges, in conferring the degree of the doctorate upon one Freeman Thompson, who had not come up to the requirements of their curriculum, who had not been examined by the professors in the presence of censors, and who had not been in attendance on lectures since the session of 1848–9 a single day. It stated that at one time the Western Reserve College acknowledged the truth of the above charge, and at another time denied it.

They called the attention of the Association to this case, and desired that the Western Reserve College be refused representation in the Association. Various papers were appended to the communication, substantiating the truth of the facts mentioned.

A motion was made to refer the whole subject to a select committee of three, to be appointed hereafter by the Chairman, who should report on the same at the next annual meeting of the Association.

Mr. Davis, of Illinois, reminding the mover of the existence of a permanent Committee on Medical Ethics, created for just such purposes, on motion was altered to refer the matter to the Committee on Medical

Ethics, with instructions to report at the next annual meeting, and carried.

A communication was read from the Legislature of Connecticut, stating that the Judiciary Committee had under consideration their memorial on criminal abortion, and asking, in order to further the matter, that a committee be appointed by the Association, to frame a bill meeting the exigencies of the case, to be presented for due consideration of the Legislature.

It was moved and carried, that the chair appoint a proper committee to draw up such a bill as would meet the views of the Association, and present the same to the Legislature of the State.

A motion was made to alter the time of meeting from June to May, so that if the Association desire to meet in 1862 in New Orleans, they could do so before the time when yellow fever occurs. This being an amendment to the constitution, was laid over for one year.

On motion of Dr. S. W. Butler, of Philadelphia, it was resolved that this Association request the Convention of Medical Teachers to be perpetuated in connection with the American Medical Association, and meet in conference the day previous to the annual meetings of the Association, and report to the same.

On motion, the same committee appointed last year was continued, any vacancies occurring to be filled by the President.

On motion of Dr. J. L. Atlee, of Philadelphia, the chairman of the committee on the memorial to John Hunter, was empowered to fill any vacancy which may occur in that committee.

A motion by Dr. Mason, of New York, that a committee of five be appointed to prepare rules of order for the Association, and to report them at the next annual meeting, was laid on the table.

A communication from Elmira, N. Y , was read, advising the offer of a prize for the best essay on the application of mechanical contrivances in the practice of surgery, having reference to the cure or alleviation of hernia, stricture of the urethra, stone in the bladder, fractures, dislocations, &c., was referred to the Surgical Section of next year.

A vote of thanks was passed to the retiring officers, for the efficient manner in which they had performed their duties.

A resolution was passed to the effect that the thanks of the Association are due to the Faculty of Yale College, the medical profession, and citizens of New Haven, for the elegant hospitality tendered to the Association; and to the proprietors of the different manufactories, for the generous manner in which they welcomed the delegation to inspect whatever of interest their factories embraced; to the railroad and steamboat companies, who have reduced their fare on the respective routes, in favor of the delegates to the Association.

Various amendments to the constitution, laid over from last year, were called up and indefinitely postponed.

Dr. Lewis A. Sayre, of New York, offered a resolution that the Smithsonian Institute be asked to collect all the medical literature that has appeared in this country, and is scattered in various journals and

periodicals, and collect it in a general library for the purposes of the profession.

On motion of Dr. Davis. of Ill., the Association went into a committee of the whole to consider the report of the Committee on Medical Education, Dr. Askew, of Delaware, in the chair. An animated discussion ensued as to the extent of preparatory qualification, which ought to be exacted from young men designing to commence the study of medicine, but no conclusion being arrived at, the committee rose, and reported that they had considered the above report, but had no suggestions to make to the Association, and recommended the resolutions to the Committee on Publication.

Dr. Hamilton, of Brooklyn; N. Y., moved the adoption of a resolution to devise a plan for the organization of a College, or Board of Examiners, to be called the College of Physicians and Surgeons of the American Medical Association, in order to arrest all legislation which has reference to medical schools, and to determine what shall be the pre-requisites to a degree of doctor in medicine. Said College to consist of one member from each State, and to meet annually, immediately before the annual meetings of the Association.

Dr. S. W. Butler, of Philadelphia, stated that the whole plan in detail, only under a different name, had been brought before the Association at a previous meeting.

Dr. Cox, of Maryland, was exceedingly surprised at the idea of such a suggestion, and spoke against it in bitter terms, though at the same time he urged the necessity of a proper preliminary education for medical students.

Dr. Thompson, of Ohio, said that the asserted pre-requisites for a degree in reference to preliminary education, established twenty years ago, were always disregarded in his State.

After some general discussion on this subject, the Association, on motion, adjourned *sine die.*