YELLOW FEVER;

NATURE AND EPIDEMIC CHARACTER

CAUSED BY

METEOROLOGICAL INFLUENCES, VERIFIED BY THE EPIDEMICS OF SHREVEPORT AND MEMPHIS IN 1873, BY THAT OF SAVANNAH IN 1876, BY THE GREAT EPIDEMIC OF THE MISSISSIPPI VALLEY IN 1878, AND (IN THE APPENDIX) BY THE ONE OF MEMPHIS IN 1879.

BY

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"*Ignorat naturæ potentiam, qui illi non putat aliquando licere, nisi quod sæpius facit.*"—SENECA.

"In science, whenever truth and established facts are to be made known, no regard to custom is justifiable, even if cherished preconceived opinions are to be demolished."—BREHM, THIERLEBEN.

"By the convincing method employed by modern investigation for truth, the necessity is recognized, since the days of Copernicus, that from the facts of observation in detail, the deceitful external covering must be removed, and the general *causal nexus* ascertained. And this must be accomplished by a constant correction of all obtained results of observation, and by extending the research to the ultimate units of harmony, forming the links of causal connection, where unbiassed reasoning will be forced to yield to conviction and recognition of ultimate truths."

LICHTHORN.

NECESSARY ERRATA.

Page 41, note 2, third line from bottom, read: 52.6 and winter.

Page 45, eleventh line from bottom, read: acquired,[2].

Page 56, third line from bottom, read: one-third. (Com. Manuscript.)

Page 83, second note, read: Physiol., Vol. I, part 1, p. 363,

Page 101, Remarks, second line, read: Virginia side the "Kanawha Ridge."

Page 109, last line, read: 12th of July.

Page 119, second line from top, read: 50 miles.

Page 125, third note, read: 1878.

Page 200, first line, read: In fine, the list, etc.

CONTENTS.

PREFACE.

As the preeursor of this treatise I published on the same subject, in 1874, a brochure on the epidemie of Shreveport, La., and Memphis Tenn. With the facts then at hand rational ideas could be inferred, and the correctness and validity of those ideas could be sustained as to the nature and eauses of the disease. It was possible to show also the vanity of the theory of infection and the prophylacties based on it. The scientifie points that were indieated are now verified and corroborated as they are praetieally realized under immediate observation, and the evidence thus obtained is of the greatest magnitude and force.

The potency of their foree is presented in this essay by the eolleeted data of the epidemies of yellow fever that occurred within the United States since 1873 (incl.), as the meteorological data ean now be addueed in full since 1872, and thereby the law of causation, proving preeisely the same in every epidemie, is irrefutably demonstrated. Originally it was my aim to have this treatise published in the winter of 1878–79, but insurmountable obstacles incidental to professional eallings, also public duties as a member of the Board of Public Schools, caused delay, particularly as in drawing up the statistieal data a great portion of the time was eonsumed and the meteorological reeords for 1878 required to be eopied from the Daily Bulletin of observations. During the past summer and winter failing health interfered. Further when yellow fever again appeared in Memphis, my work on this treatise was suspended in order to gain the opportunity of adding an account of this epidemic to the others. The object was not to submit a mere narration of chronological abstracts, but to assoeiate them with the bearings of scientific evidences now arrived at by a more correct study of the laws of nature.

The task thus apparent was also in its full extent appreciated in former periods, and efforts were ventured, in various forms,

to arrive at some valid conclusions, based upon the immutable laws of nature in the explanation of the etiology of disease, particularly of those affections of an epidemic character. By the indications of scientific inquiry by Alexander von Humboldt the study of biology, and the etiology of disease, was already brought in conformity with general science, as far as then revealed, and names of a Fuchs (Medicinische Geographie), Muehry (Klimatologische Untersuchungen), Armand (Climatologie General du Globe), and others are found among those thus investigating, but since by the great Briton Darwin the veil of obscurity is entirely removed from the processes in the organic world: that evolution and transmutation are brought on by physical influence, and consequently the forms of life manifestations (archebiosis), and that of regression (necrobiosis?) are demonstrated as fixed resultants in the realm of organic phenomena (and in disease not as a *vita praeter naturam*). Supplementary facts have been derived from modern investigation, and the labors of a Hoppe-Seyler, Jolly, Paul Bert and others have contributed largely to clear up all ambiguity. Dr. H. C. Lumbard was therefore enabled to complete his recently published fundamental and great work, "Climatologie Medicale," where the facts, derived from scientific inquiry, are employed in elucidating and to explain the *modus operandi* of the development of disease, and which prove as positive and acsolutely requisite in the study of the etiology of disease as the key-note in the study of harmony.

There we find the physical laws expressed (in Vol. I. p. 221 *et seq*) which determine health and disease, and the facts that afford to prognosticate special shadings of the maintenance of health or in the development of disease according to the potency of the influences of those laws. Upon this basis in section II. under the head of morbid anatomy and histo-chemistry, in this treatise, we have ventured to indicate the origin and nature of the coloring material which stain the vomited matter black and the cutis yellow, and although the views given are rather of an advanced standpoint in comparison to the positions held by Fre-

richs and others in explanation of the occurrence of icterus, yet by basing the occurrence and termination of the phenomenon yellow fever upon the operation of the fundamental laws of nature, and on the facts of physiological research, we are now enabled to state, to the consolation of the doubtful mind, that our views were not premature,but that they are sustained by the facts related in the standard and most recent work on physiology, edited by Prof. L. Herman (see fifth vol. first part). The occurrence of icteric discoloration is therefore nothing else but a pathochemical process or a process of decomposition and chromatic opalescence which may originate under a variety of circumstances. It was one of the main parts of our task not alone to prove the fallacy of specific infection, but to produce the scientific evidence in support of every point advanced, and thus to supplant hypothesis and error with positive knowledge and verified scientific facts. This was one of the most difficult tasks and required for every step of progress the production of strong proofs in order to weaken the hold of an implicit faith in the dogma of infection, and to cause it to expel presumption from the realm of reality, in which serene truth only can prevail. To *believe* in the dogma, is easy, but knowledge can not be obtained without decided mental effort. For that reason superficiality and stupidity despise the reality of things, and in the easy chair of official position, the motto prevails, "*point d'argent point d'honeur.*" *Scientific* inquiry is there found laborious and "unprofitable," and under insidious counsel it occurs that legislation creates enactments exclusively in favor of crafty individuals under the pretext of providing against the evils of epidemics, and claiming to have thus guarded against the spreading and the returning of epidemics, because, as the assertion is made, the fever originates from a specific poison which is imported in every instance.

Having been actively engaged in the battle for reality against fiction, or in the effort of proving to the United States Legislative Authority that physical influences are the sole causes of

yellow fever epidemics, and in demonstrating their nature of etiological reaction against which decrees and quarantine restrictions would prove vain measures, it may, therefore, appear not only pertinent, but rather imperative to allude here to the acts of the United States Legislative and Executive Authorities and the mode in which they were brought about; when fiction (the hypothesis of infection) prevailed and reality being overruled, verifying the motto of Alex. v. Humboldt: "Great truths are not realized by the multitude simultaneously." Some of the documents on this subject will be found in the appendix of this essay.

The law of biology is no longer a mystery, veiled in impenetrable darkness, but is now made lucid and comprehensible since the studies of natural philosophy and natural history are pursued on the basis of evolution and gradual development, and in connection with the physical influences upon which life manifestations are dependent; both as to duration and character, or biostatic, or morphologically.

In this place it would behoove us to give expression of most profound obligation toward the United States Government for the wisdom and foresight of having established, years ago, meteorological stations all over the nation and on such an extensive scale numbering over 150,as we see them to-day in operation, for the reliable records of meteorological data thus obtained, and for the liberality with which they are made accessible by the signal service. Although these observations were originally intended to benefit commerce and agriculture only, the scientific inquirer on the etiology of disease, has discovered, through their aid, the immediate demonstration of those physical influences, whose reactions force yellow fever epidemics into existence. In view of these facts, the true object of this treatise will be found a proof, by which the axiom of specific infection is invalidated, and a proof of incorrectness of those regulations, laws and other measures, that are enforced for the purpose of prevention, and having for their basis the hypothesis of the existence of a "specific infecting poison." Moreover it will afford a direct

demonstration of those physical influences and the natural laws above already indicated, on which the occurrence of yellow fever epidemics is exclusively dependent.

Hygienic measures and general sanitary precautions can be recognized as correct only when brought into conformity with the provisions of these physical laws. And they can have no other object in view than simply to promote health in general, and thus to increase "the force of resistance."

Before closing these preliminary remarks I take occasion to express my profound obligation to Dr. A. Litton, Professor of Chemistry, Physics, and Pharmacy, St. Louis Medical College, for kind aid and advice in the solution of scientific problems, by means of which the natural law, forming the basis of the argument in this treatise, was freed from all obscurity and ambiguity in meaning.

To Wm. T. Harris, A. M., L. L. D., Superintendent of the St. Louis Public Schools, and to Wm. M. Bryant, A. M., Ph. D., Principal of the Madison School, St. Louis, for critiques and suggestions in literary research.

To Hon. Anthony Ittner, late member of Congress, for the introduction of my statements to the Yellow Fever Commission, and for zealous efforts in securing attention to them; also for the transmission of many and most valuable official documents which were essential for the completion of the object in view.

To Gen. Albert J. Meyer, Chief Signal Officer, U. S. A., and First Lieut., H. W. Howgate, U. S. A., Assistant Signal Officer, for furnishing, at my request, copies of all the Annual Reports from 1872 to 1877 (incl.) and the Daily Bulletin for the year 1878, also the meteorological records for Memphis of 1879. By means of these important records, I was enabled to prove the law of the physical causation of yellow fever epidemics.

For other important local information I am indebted to the courtesy of Sergt. J. H. Weber, in charge of the signal station of this city. They were obtained by permission from the Chief Signal Office at Washington, which afforded me great facilities in

the study of the local meteorological influences in connection with the prevalence of yellow fever here, and in that of the essential meteorological conditions causing sunstroke, in the alarming great number which occurred here in the month of July, 1878.

To the Surgeon General of the United States Marine Hospital, for transmission of the Weekly Bulletin of Public Health, for the year 1878, by means of which facilities were afforded to make many corrections in the mortality list of the yellow fever.

To Commissioner J. B. Killebrew, of Nashville, Tenn., Chief of the Bureau of Agriculture, Statistics, and Mines, for sketches of geological surveys of Memphis and vicinity; for other valuable statistical documents, and for many personal favors, aiding me matarially in the compilation of geological and statistical data of those cities that are located in the State of Tennessee.

To Chas. G. Rathmann, A. M., Professor of Philology, St. Louis Educational Institute, for volunteer services in the computation and completion of the meteorological tables.

To the Board of Managers and the Librarian of the St. Louis Public School Library, for allowing unrestricted use of important books and atlases, and extending material aid in bibliographic research, thus enabling me to obtain corrected general statistical, topographical, geological, and climatological data, as they are submitted in the text.

To Friedrich Kuester, Esq., of Memphis, for topographical maps of the city of Memphis, and for indications of local distribution of the inhabitants by classes. Through these documents the information was obtained as to local influences, probably favorable to the development of yellow fever.

To the publishers of the *Anzeiger des Westens*, of this city, for publishing (by request) regularly, all reliable statistics of the epidemic in 1878, from its commencement to its termination; for, in conjunction with other statistics, they have formed the basis of the tables of all the cases, and of mortuary statistics, and I have thereby been enabled to correct discrepancies in the total numbers exhibited by other statistics.

AUTHOR.

ST. LOUIS, MO., May, 1880.

NATURE AND EPIDEMIC CHARACTER

OF

YELLOW FEVER.

SECTION I.

CAUSES.

ETIOLOGY AND PATHOGENY.

In the investigation of the causation and modus operandi of the development of yellow fever epidemics, it appears essential to obtain a full view of the chronological occurrences and topographical distribution of epidemics, but here to enter into a complete history of yellow fever, as far as reliable records are accessible, would be beyond the limits of this treatise. Here the intention is, only to produce so much positive evidence as will lead to a correct judgment of those influences that are favorable or conducive to the indigenous origin and propagation of yellow fever. This evidence is to be based on the data accessible in this locality and bearing corroborating proof of the virtual causation of this disease, and these are derived from the history of the epidemics of Shreveport, La., and Memphis, Tenn., in 1873; of Savannah, Ga., in 1876; and those of the great epidemic of the Mississippi Valley in 1878; (also from that of Memphis, Tenn, in 1879. See appendix.)

The facts thus obtained are fully in conformity with the axiom, that yellow fever epidemics occur and prevail during the hot season and in hot climates, but they prove the incorrectness of the statements of a class of writers, namely, *that the fever does not occur elsewhere unless the annual mean temperature ranges from 64° to 67° F.* (23° to 25° C.)[1]

The data of the epidemic in 1878 prove, as to territorial diffusion and annual mean temperature, that the fever originates and prevails under the 54th isothermal line, however, that only places that are favorably located are orographically affected in

1. Comp. Ziemssen, Handbuch d. sp. Pathologie Vol. II. p. 473.

this thermal latitude owing to local climatological perturbations and to peculiar topographical configurations.

As a fundamental law, the conclusion is reached from the data of those epidemics and especially supported by the comparison of the meteorological data of the free years, that climatic extremes prevail during the period of the epidemic, and have preceded it during the summer of the previous year or during the spring season, and early part of the summer of the same year. Of the meteorological conditions forming climatic extremes (or the basis of atmospheric variations favorable to the etiology of epidemics in general) are the following elementary influences, viz.: Reduction of atmospheric pressure (barometrical minimum), elevation of temperature, and diminution of rainfall. The other atmospheric conditions, such as relative humidity, direction and velocity of the wind, clearness or cloudiness of the sky, percentage of positive electricity or ozone, are of secondary importance as they are dependent upon the three first named.

At a locality or in a region where an epidemic originates and prevails (in our point of view here yellow fever) either all three of the above-named elementary influences may supervene, or two combined, but one of them is always found and is consequently of proportionate intensity. True all the localities or the yellow fever area of those epidemics, with which we have to deal here, are found within the indicated degrees of latitude, viz.: On the western hemisphere 43° north and 33° south latitude; on the eastern hemisphere 42° north and 8° south latitude,[1] for we find Cincinnati, O., the furthest point north and is still in 39°.07 latitude. But upon casting the view a little beyond the line of limitation that bounded our field of observation, then those statements as to the geographical area are also found lacking accuracy or reliability. On the western hemisphere Quebec is the point furthest north where yellow fever ever pervailed, and its latitude is 46°.50. On the eastern hemisphere Swansea, England, is the furthest point, so far as historical data are at our command, and its latitude is 51°.37 north of the equator. In south America Buenos Ayers is found to have yellow fever visitations, and the latitude is 35°.20. By tracing, however, the outer point of yellow fever area by isothermal latitude a far more south-

1. Ziemssen l. c.

ern character of the climatical conditions is ascertained. With reference to the season in which yellow fever originated in the United States in those epidemies which we have named, there will be observed a perfect correspondence as to the usual point of occurrence of those epidemics; here also it was the latter part of summer and first part of the autnmnal season.[1]

The epidemie of Shreveport, La., 1873, was manifest on and immediately prior to (i. e. one or two days) to the 10th of September and lasted to the end of October. The origin and duration of that of Memphis, Tenn., of the same year, is reported from the 14th of September to the middle of November. The epidemic of Savannah, Ga., 1876, dates its origin from the 31st of August and terminated in the month of November. The great epidemie of the Mississippi Valley in 1878 originated at New Orleans, La., earlier in the season than at any other locality, and lasted longer there than elsewhere. The first ease was manifested on the 12th of July and the last case is reported on the 6th of December, hence the period of duration embraces about five months.

Another point, of the greatest interest and of vital importance, is that of diffusion, simultaneous or conseeutive origin of the fever at various other and remote localities. Doctrinarians are at any moment prepared to explain sueh an oceurrence upon their ereed of the existence and portability of the "specific poison of infection," and hence the assertion is ventured — with some reservedly, with others, to whom nature's laws is yet a terra incognita, innocently and boldly,— that by means of the commercial highways (navigation, etc.,) the "poison" is carried from the centre of infection (to which again it had been imported by means of a vessel from some foreign port) to other localities, and thus yellow fever is a malady of the valleys and plains, incapable of reaching high elevations by river crafts.[2]

However, with the evidence at hand, such puerile assertions must be rejected as not in accordanee with natural philosophy, natural history and the medical science in special. If, for instance, river boats could have earried the "poison" from New Orleans up the river, why then was not yellow fever spread in 1878 on the west side of the river between New Orleans and St.

1. Comp. Beranger Féraud, La Fiévre jaune, table of the beginning of various epidemics upon Martinique p. 77.

2. Comp. Ziemssen l. c. p. 474.

Louis, as there are a great number of landings and the boats do land there at every trip? And why was the "poison" not carried to Nashville, Tenn., by way of the Cumberland river and the many railroads which centre there and are directly connected with all southern points; and the altitude of this place is 142 feet less than that of Chattanooga, Tenn?[1] Our answer to the question is: There is no yellow fever poison, and consequently it cannot be "imported."

Elsewhere we shall have occasion to indicate that yellow fever prevailed in an altitude of 14,000 feet, where commercial highways were lacking. In accordance with the general statements of topographical distribution of yellow fever epidemics, the fact exhibited by those epidemics which it is our province to treat upon in this essay, are found to represent corresponding peculiarities. The area of these epidemics in reference to latitude, still admits high summer temperature, and the altitudes are limited — they do not reach a zone of freezing temperature. The geological formations are in the great majority of instances of that kind which are prone to be intensely heated by the sun rays and give out noxious gases as terrestial exhalations, and contribute to change the normal (healthful) state (composition) of the atmosphere at the locality into that of morbific reaction. These facts of observation are sustained by the following statistical data: The area of these epidemics lies within the space of the 29°.75 to the 39°.07 of latitude, and 81° to 94° of longitude (W. Greenwich.) The altitude ascends from 10 feet (New Orleans) to 450, (St. Louis), 550, (Cincinnati), 600, Galiopolis), and 675 feet, (Chattanooga.) The geological formation is nearly exclusively alluvium at the places where yellow fever prevailed, excepting at St. Louis and at Galiopolis, where the formation is carboniferous and permean; at Cincinnati and Chattanooga, canbrian and silurian; at Louisville, devonian; at Holly Springs, tertiary, and adjacent to alluvium.[2]

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1. How was the "yellow fever poison" carried to Morne — Rouge on the West India island, Martinique — 1869, located 1575 feet above the surface of the sea and in precipitous declivities where there is no navigation nor railroad connection? The travelers that arrive there within a circumference of 3 to 4 miles are large land and sea fowl. (Comp. Beranger—Feraud, l. c. p. 266.)

2. Comp. Stieder, Handatlas. Walker Statistical Atlas. Blodget, Climatology. Ratzel, Die Ver. Staaten von Nordamerika.

In the subsequent pages the general laws and the facts of observation of the demonstrable natural influences causing and generating yellow fever will be stated in full, especially of the epidemic form, which are above already alluded to, though in a broad and general observation; and, in this place, we cannot avoid adverting to the doctrine of "specific infection," which has for its basis nothing else than hypothesis and an arbitrary assertion, namely, that of the existence of a "specific infectious poison." Of this "poison" (of whose nature not a single person upon the earth's surface has even a trace of knowledge), it is unhesitatingly announced (notwithstanding the perfect ignorance about it[1]), that it is capable of self multiplication — by germination — and disseminates by transportation. But there is one more source of perplexity attending the assertion of "specific infection," namely, the mode of action of such "poison" on the system. The reply to this proposition is tantamount to the knowledge infectionists have of its *nature*. In such a dilemma, can't even "Samuel help!"[2]

If there is no other motive than a true scientific inquiry for ascertaining the actual nature of phenomena, designated yellow fever epidemics, "infection" is totally rejected, as it is devoid of all scientific support; but there are other and interested motives by which its advocates appear to be actuated, and which are in harmony with the inferences of the dualistic doctrine in general, but are diametrically opposite to the universal law of unity in nature, and in the conventional organisms of society and State.

With the doctrine of "specific infection" opportunities will be available for enforcements of arbitrary and tyrannical rules and measures by the crude police-State government, as an aggrandizement of the vain glory of this institution, founded upon metaphysical abstractions. There are existing, and will be created, official positions, enticing to ambitious aspiration and amply compensating worthless labor by its acceptable dotation. There are the organizations of tumid commissions, the supervisions and publications of their endless but carefully prepared reports, and the wide field of operation in letting a great many and extensive contracts for disinfectants, etc. Thus this doc-

1. Comp. § 2 of Conclusions of Board of Experts, authorized by Congress for investigating the yellow fever epidemic of 1878.

2. Comp. Handbuch d. Allgemeinen Pathol; pp. 814–848.

trine has of late, in official quarters, many more enthusiastic admirers, and in its behalf there has been secured sufficient professional and dialectic aid, proportionately well paid, to answer for *practical* purposes.

Owing to the general indorsement of the "specific infection theory" as being correct by *civilized* nations, governments that boast to be at the head of civilization have adopted special laws, probably in good faith, under the appellation "prophylactics," but they have thereby resorted to measures that are now with the rational inquirer, and will be stigmatized in subsequent periods of time by the great majority as arbitrary, barbarous, and destitute of a scientific foundation.

Let, however, the minority of realistic investigators, at the present, be ever so small, yet it cannot condescend to contaminate clear knowledge with captious phrases, and to subject science to the pretention of gross willfulness, ignorance, and to the speculations of a merciless selfishness. It only recognizes that to be the true basis of scientific inquiry where the nature of the facts that are or may be collected is compared with that of other facts of which we possess positive knowledge, and of which the operation of their laws is understood. Rational inferences which are thus understood, as to the nature of the object for inquiry, are brought in strict conformity with these premises.

On subsequent pages, when the "Genius-Epidemicus" is under consideration, the law will be submitted in the above indicated manner, cleared up and substantiated, that meteorological influences are the essential conditions for determining the character of formations in the morphological processes of nature, particularly in the animal economy and in the morbid metamorphoses in man, leading to the development of specialized and widely diffused (epidemic) diseases. But, in harmony with the nonenity of "specific infection," a mere hypothesis — a BELIEF — is needed to form the basis of inquiry, and the scientific (?) substratum for logical conclusions and inferences, the adherence to customary routine and obsolete interpretations, is required. Certainly science cannot be held responsible for the perpetuation of such self-conceit, gross abnormities, and frivolous refusal to recognize and to comprehend nature's reality.

That the development of a yellow fever epidemic is caused by the intensity of the variations of the weather during the hot

season grows fully apparent from the data of the meteorological tables (given further on), exhibiting the extremes for the summer months (July, August and September), and that its spreading over an extensive area, following the same law, is demonstrated, beyond controversy, by the history of the great epidemic of 1878. Hirsch, a prominent historo-geographer in pathology, could not forbear to acknowledge similar facts.[1] There is most constantly a marked deficiency of rainfall during the period, and at the locality where the disease prevails, and during the period of predisposition.

Other infectionists can also not refrain from recognizing surrounding conditions and physical influences as etiological moments in the development of yellow fever epidemics, although they are unwilling to acknowledge anything else but the "specific infecting poison," their dogmatical creed and carefully trained discipline is coercive in its bearings — *the doctrine of infection must be believed in* — but there was occasion for confessing the utter ignorance[2] of the nature of that poison." Nevertheless the attempts are continually made to give support to the doctrine of "specific infection," but having for its basis[3] nothing but an hypothesis. In reference to the origin of the epidemic of 1873 of Shreveport and Memphis, the admitted correctness of the infection theory was then substantially contradicted or disproved, but since evidence of the greatest force is obtained which demonstrates, on purely scientific grounds and by irrefutable statistical data, that the assertion of the existence of an "infectious poison," to which the predicate of an "endogenic" and "ectogenic" origin, portability, and the bilge-water being its "favorite lurking place," is extended, its entire vacuity is demonstrated, and hence it must be rejected from medical terminalogy.

In the United States the fever originates and spreads with the same conditions that it does in the West India Islands. Here, as there, are series of years where a perfect "immunity" is observed; and, on the contrary, there are years in which yellow fever cases spontaneously manifest themselves, ending in a destructive epidemic. These facts are conclusively dem-

1. Ziemssen l. c.; p. 473.
2. Board of Experts, l. c.
3. Comp. the otherwise most valuable work of Samuel, op. c., article Infections Krankheiten.

onstrated by the data of most carefully prepared tables of mortality and cases of admission at Martinique, by Bèranger Fèraud.[1] These records embrace a period of seventy-five years, from 1802 to 1877, inclusive, and exhibit intervals of two three, five, seven, eight and nine years where there was an entire absence of the fever. The law upon which these facts of record are dependent can now also be demonstrated, proving, however, not to be owing to the pretentious police and quarantine regulation, or to the asserted "importation of the poison," but within the United States (meteorological records of necessary extent for Martinique are not at hand), the healthy or free years are coincidental with the normal state of the weather of any or respective locality; whereas, those years in which epidemics prevail (here in point of view yellow fever) are characterized by marked variations in their meteorological mean.

The autochthonic occurrence of the yellow fever epidemics of Shreveport and Memphis, in 1873, of Savannah, in 1876 (and of Memphis, in 1879), exhibit a most remarkable similarity, aside from all probability indicative of importation with the facts recorded for Martinique, even of the great epidemic of the Mississippi Valley in 1878, no other testimony is derived than a conformity and repetition of the same facts, although this epidemic was diffused over a great area subsequent to the date of its origin at New Orleans.

Admitting for a moment the existence of the "specific infecting poison," for the sake of argument, then the question demands answer: Where did the "poison" come from by means of which Shreveport and Memphis were "infected" in 1873, and where did it go to? What explanation is now at hand of the origin of the epidemic of Savannah, in 1876, after the investigations conducted by Surgeon Woodhull, U. S. A., have elicited the fact that by the disembarked ballast (then looked upon as the source by which the "poison" was imported) of vessels arrived in port from Cuba and other West India Islands, the fever was not brought there?[2]

Adverting now to the alleged origin of the yellow fever epidemic of the Mississippi valley in 1878, namely, by means of

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1. L. C. pp. 73–77.

2. Comp. American Journal of the Med. Science, July, 1877, p. 38.

"importation," as it is found stated, and the steamship Emily B. Souder arriving in the port of New Orleans on or previous to the 25th of May, should have brought the "yellow fever poison" into port. It should be remembered in connection with the facts here stated, that the first case of yellow fever at New Orleans originated as late as the 12th of July—more than seven weeks later than the arrival of the suspected vessel—that the "yellow fever poison" is said to be a germ endowed with vitality, and its period of "incubation" would last only from 2 to 6 days, that the "poison" after this period was harmless, and the bilge-water "being its favorite lurking place."[1] Now, the "poison," said to be a germinal substance, immersed in water at an atmospheric temperature of 82°.3 F., monthly mean, and then not to germinate, must consequently lead to the inference that it is possessed with another "endowment," namely, that of passing its period of incubation at will. Certainly science could not be more grossly misrepresented than by such fabrication.

Further on the law will be indicated in accordance with which nature is *forced* to respond to action whenever it is in operation, although being in advance of the season or the ordinary cyclical period. Thereby is demonstrated that in nature nothing is of self-determination, but everything subject to the reaction of immutable physical laws. If the intensity of their reaction remains within the limits of vital elasticity, the product is archebiotic action, but by transgressing the boundary line of the biological sphere, necrobiotic or regressive action is made to follow, which in its incidental but fixed shadings constitute the causes of the type representation of transitory morbid phenomena.

Upon the supposition that New Orleans was "infected" by the steamer Souder, this locality has been since pronounced the original center of infection, and the subsequent occurrence of the fever at other inland localities, has in every instance, direct or indirectly, been traced back to New Orleans for its origin. The arguments, in behalf of the doctrine of "specific infection," could not be better supported than by the accident of a river towboat, John Porter, coming from New Orleans, and having some of her crew suffering from yellow fever; three of whom were landed at Vicksburg, where two died and were buried, (July 26-

1. Woodworth, Quarantine, p. 10.

27, the first indigenous case occurred in the week from the 3d to the 9th of August), and another three were landed at Arkansas City, but no yellow fever cases at that locality and its vicinity have subsequently been reported.

On the 29th of July the boat landed at the "President's Island," the quarantine station of Memphis, and 12 miles south of the city. At the wharf of Memphis the boat was not permitted to land, owing to most rigid quarantine regulations that were enforced, for river and railroad communication from the 27th of July. Subsequently, after quarantine examination, the boat was permitted to steam up the river, but not to touch the city, to proceed to Cairo and St. Louis, from whence she arrived at Louisville, August 13th, when again several of her crew were taken down with yellow fever. Here the captain had the boat "disinfected" with carbolic acid and with fumigation of sulphur, when, on the 15th of August, the health officer of Cincinnati examined the boat and pronounced her: "In a fairly good condition."[1]

Examining now the evidence whether the steamboat "Porter" brought the "poison of infection" to the various cities located along the river, and "disseminated" it in the valley of the Mississippi and the Ohio river, the first discrepancy in that fanciful narration is met with in regard to the date of the origin of yellow fever at Granada, Miss., (an inland city about 90 miles distant from Memphis, in a s. e. direction.) Here yellow fever prevailed from the 25th of July, hence four days in advance of the arrival of the boat in this region. Another, is the fact that the fever occurred in Memphis, on the 13th of August, fully two weeks later of the passing by of the "Porter," whereas, the asserted period of incubation is only from 2 to 6 days,[3] as was further above already mentioned. Morever, Memphis was rigidly quarantined (now claimed to be an infallible means of prevention,) by river and land communication two days previous to the approach of the "Porter," and yet this locality was nearly devastated by the subsequent occurrence of the epidemic. On the other hand, opposite Memphis, on the Arkansas shore, no yellow fever prevailed, although the "Porter" landed there three of her crew suffering from yellow fever. These few facts may bear conclusive testimony of the *contradictio in adjecto* involved

1. Comp. Yellow Fever Report, Cincinnati, Nov. 1878, p. 23.
3. Woodworth.

in this notion, New Orleans having been the "center of infection" and river transportation the vehicle of the "dissemination" of the "poison," but as subsequent to the landing of the vessel "Porter" at Gallipolis, O., August 20th, the occurrence of yellow fever there was regarded a direct demonstration of the "importation" and "dissemination" of the "poison" by river vessels.

When, however, the aspect of the various localities and regions, where yellow fever originated and prevailed, comes under consideration in reference to physical geography and topographical configuration, the natural influences that are peculiur to Gallipolis will be made apparent, and to which the occurrence of the fever there is only to be attributed. It only needs be mentioned in this place that in the latter half of the month of September, about one month after the arrival of the "Porter" at Gallipolis, cases of yellow fever were reported from this place and vicinity "that could not be traced to the 'Porter.'"

It is further claimed that the fever can be imported by means of railroad travel, but no stronger proof is needed in refutation of such assertion than the facts already mentioned in regard to the city of Nashville, where, on the 20th of August, the authorities issued a proclamation to the effect that no quarantine restrictions should be observed, and extended hospitality to all refugees from the South who would make Nashville their abode.[1]

Thus an unusually large number of refugees arrived there, chiefly by railroad, many of whom were already stricken with the fever, though as it may be seen the city remained entirely unaffected!

According to the dogmatical creed of specific infection the axiom must be acknowledged that the "poison" is possessed with inevitable force, and that pursuant to its attributes, with mathematic precision, it disseminates its deadly effects at once (i. e. after a period—2 to 6 days—of incubation) in the locality to which it is conveyed. Its growth and reproduction are rapid when exposed to the access of the atmospheric air. (This, however, has never yet been demonstrated or made evident to the

1. This act leaves testimony to the generosity, high mindedness and superior enlightenment of a noble people. In the moment of peril, refuge and direct aid was offered to the sufferers upon the basis of humanity and intelligence.

human senses.) Thus also it is further asserted, even without hesitation, that the "infectious poison of yellow fever" is transported aeross seas and oceans in steamships and in sailing vessels; on the eontinent in steamboats and other river crafts; in railroad ears and other vehicles; in the baggage of travellers. Moreover (as an example of a remarkable acknowledgment of the inefficieney of preventives for which wonderful efficacy is claimed on other occasions) it is stated that the "infectious poison of yellow fever" clings to (infested) sea-vessels and boats with wonderful pertinacity in spite of all the methods of ventilation, disinfection and purification. Again, contrary to the statements of others who are in general received as authority and by whom it is expressed with positiveness that the "poison of infection" is not disseminated "from person to person" but through things. Yet it is maintained that the most frequent agency in the dissemination of yellow fever from place to place is found in yellow fever patients, and that more epidemies of yellow fever have resulted from the introduetion of persons sick with the disease, or taken sick after arrival, than from all other eauses.[1]

No greater incongruity can be found than this between the evidence of the recorded facts of observation, and the assertions above stated, which are based exclusively upon supposition. We find that where "infection" should have taken place (at Nashville) aecording to the BELIEF in "specifie infeetion" there was none at all; where all means of "protection" were employed (at Memphis) the disease originated and raged most destruetively; and that the indigenous origin was in advanee (at Granada) to the elsewhere required dissemination and importation (and at Memphis in 1879 when the disease spontaneously sprang up again, no possible opportunity was then available for attributing this to importation and dissemination—except by resorting to another supposition, namely, *that some of the germs had survived —hibernated—from the year previous.*)

Phrases and didactieally interpolated paraphrases (immunity, dormancy, hibernation, etc., etc.,) are no longer adapted (the pretensions with which they are urged notwithstanding) to act as substitutes for science. The realistie investigator rejects them in toto as sources of deception which he is always ready in contributing to eradieate.

1. Comp. Conclusions 1, 2, 3, 29, 30, 31 and 32, of the Board of Exports, Washington, January 29, 1879.

The evidence has now been adduced disproving even the probable tenability of "specific infection." Moreover the tortuous course of the asserted validity of its diffusion, by "importation," "emanation," "dissemination," etc., etc., has been shown,and that in support of the imaginary entity of the "poison of infection," no evidence in natural history can be adduced. Its fanciful attributes flourish under an aggravated hebetude which submits to external authority and crude power rather than to the will of science and culture. With unshaken faith it is proclaimed on the one hand that "yellow fever is a specific disease, produced by the introduction of a specific poison into the human organization."[1] On the other hand where from a general recognition of actual science the laws of nature can not be ignored with impunity there, with facile versatility compromises are offered admitting in part an indigenous origin of yellow fever, and in part attributing it to "importation" and to "dissemination."[2]

The purity and serenity of science peremptorily demands the rejection of such efforts, particularly as they are aimed only to lend support for the execution of arbitrary measures in quarantine restrictions.

As regards the word "infection" and its construed meaning, no direct definition is found stated, but from its employment in nosological discussions the inference must be drawn that it means the activity of the hypothetical entity "infectious poison." Of this it is said that it produces and transmits disease, itself being developed, outside (ectogenous) of the human organism. It adheres to fibrous textures and is transported from locality to locality, from continent to continent, where again it finds access to the human body in which by germination and fermentation (incubation) and produces one of the "specific" epidemic diseases. To investigate this subject again, appears requisite, but the necessity is avoided to some degree by the facts already submitted and by the conclusive evidence advanced in essays formerly published by the author, in which he has disproved the theory that primitive organisms (bacterii bacilli) are the causes of disease, and has produced evidence to show that *these bodies are nothing else than products of morbid processes*—or of the pro-

1. Comp. Conclusion I. of Board of Exports l. c.

2. Comp. recent writers: Beranger Feraud, l. c. p. 103. Samuel, l. c. p. 852, where an "amphigenic" origin is admitted with reference to the entogenic and ectogenic origin.

cess of decomposition. But as nearly all modern medical writers assume "infection" a *fait accompli*, (the proof is, however, always cautiously postponed to some future period; and even a rationale of reaction can not be suggested) legislatures guided by such advice, have not hesitated to pass so-called "*sanitary laws*" under the presumption of their entire legitimacy, but of which some of the results in their execution are totally at variance with the dictates of science, culture and humanity, (e. g. the incineration of dwellings, garments, currency, etc., quarantine molestations, and disinfection.)

All this demands a re-investigation of the subject, which in this place, however, shall be but cursory.

It is more than a decade since the assertion of the existence of the "specific infectious agency" was proposed, "admitting *almost* of an actual demonstration," and various primitive organic forms of regressive metamorphosis were indicated as the actual "specific infectious germs." But when subsequently the crucible of a test was applied, the fact was discovered that these things were illusions, and the supposed woeful significance of those bodies was as rapidly doomed to oblivion as their heralded momentary destructive significance. At present there are but two species left of the long list of formerly asserted "infecting agencies," namely, the Shreaddy Bacterium, and the Globulated Bacterium. The former is to explain "infection" collectively, and the latter to account for specialized "infection," among which yellow fever is probably enumerated. Of the latter there are now defined two varieties of which it is asserted with apparent positiveness that the one, Bacillus Anthracis, produces anthrax,[1] and the other, Bacillus Malariæ, produces "miasmatic" fevers.[2]

But on closer examination it is found that their presence in the blood, either in the living or dead blood, is devoid of any specific indication. This fact is proved by the experiment instituted by Koehler.[3]

When healthy fibrous and putrid substances were injected into the blood, subsequently forms of the kind here named were

1. Comp. Samuel l. c. pp. 855–61.

2. Klebs & Tommasi-Crudeli, Researches on the Nature of Malaria, vide St. Louis Clin. Record, Spt. 1879, p. 168.

3. Febrinfermente pp. 105–9.

found among the various products of decomposition produced by different material.

It should be borne in mind that these bodies (shreddy and globulated bacterii) appertain to regressive metamorphosis and are thus favorable to decomposition, consequently when they are directly introduced into the blood in a sufficient or large quantity, a decomposition of the blood may thereby be caused to such an extent as to extinguish life.

Such results are fully experienced by every surgeon in cases where putrid matter is absorbed, and by students of medicine from the effects of dissecting wounds.

Further it should be noted that any particular variety of the species of primitive organizations of the regressive series is devoid of the generative power of specific type representation, or of producing specific phenomena—the truth of which is sustained by the evidence that they transmute from one form into another when the nutrient substrata and surrounding conditions are changed.[1]

The universal law, that in the relation of objects exists the nature of their phenomena, is now fully recognized by every scientist who is not biased with inferences connected with metaphysical abstractions; life and death, hence, are physical phenomena, and health and disease can therefore not be conceived to represent any other significance than being conventional resultants of the transition of those phenomena. It is with propriety suggested that we should admit this law as the basis for etiological research. But on the contrary it is unhesitatingly stated that, "the cause of an epidemic disease is an absolute specific substance everywhere, which alone is capable of exciting its specific form of disease." Further: "an autochthonic origin of those diseases has never (as yet) and has nowhere been observed. That nobody can dispute the fact, as a matter of observation in natural history, that scarlatina, rubeola and small-pox have ever otherwise originated, except directly descending from each of these diseases respectively."[2]

1. Comp. Karsten, Chemismus d. Pflazenzellen. Faeulnisserscheinunger. Hilgard, vide Both, Small-pox, 2 edt. Supplement to "Conversations-Lexicon" 11 edt. Vol. II. p. 15.

2. Samuel, l. c. p. 844. In explanation of these strictly doctrinary assertions it may be remembered that this author is not independent of "royal grace" and that ex-cathedral endorsements of good intentions and faithfulness are not unwelcome, but excite gratitude in return toward the alma mater.

Could it be proper, only for a moment, to admit the existence of a "specific infecting agency," what answer must be made then to such an objection as the following: Where did that agency originally come from? Or, have all "specific agencies and forms" been called into existence outside of natural substrata? In that case, how remote from accomplishing their object would be the great truths demonstrated by the naturalistic interpretations of the process of evolution and transmutation! for their object is to show that nature's reality is to be recognized everywhere! and how decided ought then to be the victory of the philosophy of a Cuvier, Agassiz and others, over nature's revelation as presented through an Alexander von Humboldt, E. Haeckel and the great Briton, Charles Darwin!

Hitherto infectionists have been most assiduously engaged in tracing up or in demonstrating the "specific poison" of epidemic diseases; but, in spite of their strenuous efforts, they have signally failed. The globular bacterii, for which now only "infectious" property is claimed, are recognized as protoplasmatic spheroids, and are met with under various forms in small-pox lymph or pus; in vaccine virus; in fluids extraneously putrefying, and in other processes of decomposition of which they are found *incidental products.*[1] Decomposition is a physico-chemical process and precedes all life action[2], whether of the progressive or regressive variety, for in healthy blood are seen small granules in a "dancing" motion, which cannot be distinguished from micrococus (analogous to shreddy bacterii)[3].

1. Comp. Colnheim, Embol. Processe, p. 102; Entzuendung, pp. 67–67; Koehler, l. c., p. 111; Author, Variola, 1878, p. 70.

The realistic inquirer finds no occasion to accede to the supernaturalistic attributes of the undemonstrable "infectious poison," neither to nominalism: — in his sphere of research everything is *substantially* proved. The efforts to convict naturalists of inconsistency on the grounds that spontaneous origin of organic forms is argued by them, is a gratuitous procedure; whereas, in reality, the course is to be reversed, as for the "infectious X" no material substrata can be indicated.

What is claimed by spontaneous generation is only the morphological transformation of matter, and for which the physical laws are admitted as the essential conditions or causa movens. In primitive developments the parentage of represented forms is but a representation of the castings and

2. The law was enunciated more than a score of years ago by the late Prof. Watters (St. Med. Coll.), that disintegration is the antecedent motor of life action.

3. Comp. Eidam Mycology, p. 212.

The innocuousness of bacterii, when finding access only to the respiratory and digestive organs has been ascertained by the author in his own person[1] more than five years past. If bacterii are dissolved in water they may even be injected into the blood, *they remain harmless if no other septicle substance is simultaneously introduced*[2]. Hence a mere catalysis is inadmissible (as in the fancy of metaphysicians with regard to an immigrated soul actuating the otherwise dead body) in explanation of etiological or morbid action. The ground-work of morbid processes is chemical action, and of which physical conditions can be recognized as the ultimate causa movens, and their shadings as the determining influence in the development of special from in general morbid processes (the nature of an epidemic disease). Here, as in the universe, no twofold (dualistic) modus operandi (arbitrary and forced) can scientifically be inferred, and by all final issues nature's unity (monism) is indicated. In (cell) life there is no spiritus rector (Virchow); in the universe is found an inseparable embodiment of matter, force and form, as a self-evident fact (Hæckel).

If the physiological processes in the human organisms are caused to deviate from the normal standard, owing to influences detrimental to health, and to the degree with which the line of demarkation of healthful (progressive) action is transgressed, then, in general morphology, regressive action takes place, the system of persons thus exposed, whose abdominal glandular organs are undergoing structural changes, represents the "locus minoris resistentiæ," and a morbid constitution of the circulating and nutrient fluid (lymph and blood) must take place, as healthful functions of those glands are suspended, by which the normal composition of the fluids is regulated. The

mouldings of protoplasmatic nutrient substrata. For these bodies, pretended to be "*specific* infectious agencies," the origin and nature is indicated. [Comp. Samuel, l. c., p. 846, and subsequent logics, pp. 860–72. In natural history they are classified as form representatives of the regressive metamorphosis, and they are hence *the products of decomposition, and not the causes*. Their impetus of life action is nothing more than the force of the physical laws in operation, similarly to the realm of phenomena where everything is dependent on it. The doctrinarians of "specific infection" fail to see the grandeur of nature's unity, and, with few exceptions, they only find relief, philosophically, [?] in a contracted sphere of dependence.

1. Comp. St. Louis Clin. Record, Sept., 1878, p. 141.
2. Samuel l. c., p. 858.

subsequent forms of disease, by which those morbid processes are manifested, have obtained in medical nomenclature certain appellations that are expressive of their outward characteristics, and "yellow fever" is therefore designated as such, owing to the patients having a yellow discoloration of the cutis and suffer simultaneously from fever.

In response to the inquiry why individuals are differently affected who are equally exposed — as some die, others recover, and some remain unmolested — attention need only be invited to the difference in the scope of the biological sphere of different persons; some would not have survived at any rate, but in a nosological sense the difference is owing to the structural or form development in the glandular system (the biological laboratory) of every individual in the process of growth, as life force is determined by an approximate degree of the maximum of healthful glandular action.

Mortality, recovery, and eupathy, will rate with the degree of the altered state of the abdominal glands, as the circulating fluids derive their composition from the products of the actions of these glands, and upon which life manifestations are — or the continuance of health is immediately dependent. Therefore, in persons whose glandular biological actions rate with the minimum or medium scale under the reaction of morbific influences, there the "locus affectionis" is met with, whereas in those whose glandular physiological action rate with the biological maximum the "locus 'majoris' resistentiæ" prevails, and health is uninterruptedly enjoyed.

The error of the inference that the alteration of the glandular structure, very markedly exhibited by the morbid anatomy in yellow fever, was but a consequence of an à priori "infection" and decomposition of the circulating fluids, and thus the morbid lesions were the sequelæ of the introduction of an extraneous "specific agency," said to be the sporules of bacterii (bacteridien), has further above already been refuted. Here it may suffice to indicate the fact that *globular bodies* (globular bacterii (?), bacilli (?) or protoplasmic spheroids of most primitive organizations) are always generated by the spleen and liver, and are imparted to the blood. When these glands are structurely altered, those bodies are generated on a large scale, and if they are not eliminated again in a converted form, they lead to a serious contamination of the blood, owing to their proneness to

decomposition from their regressive nature. Hence the proof that these bodies are not the cause of the structural alterations of the glands, but that they are the products of their morbid actions.

In the blood of yellow fever patients, those globulated bodies are found very numerously;[0] "in severe cases, especially after black vomit has occurred, there was a large increase in the number of white corpuscles, the proportion frequently being as one white to five or ten red corpuscles,"[1] changing to a greasy appearance.[2]

In the morphology of tissue elements, these bodies, like others of loose albuminous constitution, e. g., sporules of bacterii, and of yeast,[3] vigorously absorb oxygen and ferment if suspended in a fluid of elevated temperature, 20°–40° C. (=68°–104° F.) If the fluid contains saccharine matter, they ferment at a temperature of 18°–25° C. (=64°–77° F.,) and the stormy upward fermentation (Obergaehrung) takes place, but at a temperature of 0°–7° C. (=32°–44.6° F.,) the downward fermentation (Untergaehrung) ensues.[4]

In the process of germination the same law is observed.[5]

These crude physico-chemical actions, however, bear admissible analogy to the processes in the blood of the human organ-

0. The segmented rod-like bacterii are not excluded.

1. Marvin, Amer. Practitioner, Louisville, Ky., Nov. 1878, p. 299.

2. Beranger Feraud, l. c., p. 327.

3. From the most recent investigations, the facts are derived, that fermentation is brought about merely by absorption of oxygen by fermentable bodies (albuminates), and by the experiments thus instituted it is demonstrated that "zymogen" is an albuminate with hydrolytic properties, formed in the pancreas of living animals, and is converted into "trypsine"—an active ferment—under access of oxygen, but whose action by various chemical reagents and if its per cent. of oxygen is reduced the fermentative properties are suspended; "trypsine" is reduced again to "zymogen."—Comp. L. Hermann, Handbuch der Physiologie, Band v. pp. 188–9.

These facts further prove that fermentation is not dependent upon the access of dust particles of the atmosphere (acc. to Pasteure), nor upon the "miasms of zymotic diseases," said to be conveyed by the air, neither upon the "ectogenic specific poison of epidemic diseases," but that physiologico-chemical action can be transformed into pathologico-chemical action by changing the chemical synthesis of the normally component parts of the organism.

4. Comp. Gorup-Besanez, Lehrbuch d. Chemie, vol. II, pp. 54 and 384.

5. Comp. Claude Bernard, Lecons sur les phenomenes de la vie, aris , 1878, pp. 76–79.

ism designated, in medical nomenclature, fevers, and prove, simultaneously, that the external (physical) requirements are in both cases precisely the same.[1] The chemistry of fevers is therefore, quite allied to the physico-chemical action here indicated, and fevers of a "high" course, such as yellow fever, bilious, congestive and remittent fevers, etc., may therefore with propriety be regarded analogous to that kind of fermentation first named, and those of a moderate degree of intensity, in which, probably, also a lesser quantity of saccharine matter is converted, such as intermittent fevers, etc., to that named secondly. But in fever the "ferment" is of endogenic origin, as has above been indicated, and so is the saccharine (glycogenic) matter, essential for determining the character of "fermenting" processes, by the action of the liver.

The augmented elaboration of this substance follows the stasis of the hepatic circulation, which is brought about by the prevalence of physical influences that will be specified further on, but which always prevail there, where fevers supervene in an epidemic form. Thus, to the mind free of incumbrance, but of scientific training, it must be fully comprehensible that the elements giving rise to the phenomena of regressive action, designated fever, are generated *only* within the human organism, and the causes of those actions are physical causes, cosmical (meteorological) and terrestrial.

An absolute, self-generating and self-determining force—automatism—can not be conceived and can not be recognized in the universe, the causa movens are thus only found in the relativeness of things.

Subsequent phenomena of morphological action are charac-

1. As to the increase of the absorption of oxygen and augmented elimination of carbonic acid in fever, and again rather proportionately according to the degree of its intensity, in explanation of the presence and transformation of globular regressive bodies and saccharine substance is indicated by the following data:

	Absorption of Oxygen.	Elimination of Carbonic Acid.	Temperature of Animals experimented on in the Rectum.
Normal Condition...	948.17	872.06	37.1
Weak Fever.....	1134.03	949.05	38.5
High Fever.....	1242.06	1201.59	39.7

Comp. Hoppe-Seyler Physiologishe Chemie, Berlin, 1879, p. 585.

terized by the specialized state (predisposition), in which objects are related to the influences of the surrounding conditions. If the influences are of an homologous kind, and the object (man) is in an homologous state—physiological healthful action—that of development and growth (progressive metamorphosis) follows; but if the constitution of the object is morbidly altered, heterogeneous to the normally prevailing influences, but homogeneous to heterogeneous influences, morbid action (regressive metamorphosis) only can take place.

The correctness of these axioms is well illustrated by the meteorological influences prevailing at St. Louis during the spring, summer and autumnal season in 1878.

In the spring vegetative action was nearly an entire month in advance, in comparison with other years, but general mortality did not exceed its ordinary bounds, owing to the intensity of meteorological reaction in that season. In the month of April, the extremes were the following: Bar. — .25; Ther. + 11.2; Rainfall + 3.87. The force of expansion was relieved by .25 of its condensing force, and was aided by an excess of temperature of 11°.2; but had there been a deficiency of rainfall, these two motor powers would have exceeded in tension the degree of elasticity (biotony) expressive of growth and development (progressive metamorphosis.) The nearly three-fold amount of rainfall for that month not only neutralized the destructive influence of the force of the other two motors, but "vitalized" organic nature, and thus constructive action only could transpire. In the month of July, when 138 cases of sunstroke occurred in one week, barometric pressure was reduced, temperature increased, and rainfall diminished; and so in the latter part of summer, and in the fall, when yellow fever cases occurred, entirely heterologous to the sanitary homology of the locality.

The phenomenon, yellow fever, therefore, is found to prevail only at localities where and when the variations of meteorological conditions represent such a degree of intensity, under which general morphological actions must assume a heterologous character in comparison to the normal hygienic mean, and when the preceding meteorological irregularities have changed the system of susceptible persons regressively (predisposed) to such a degree as to yield only morbid actions, under potentialized irregular meteorological influences. The facts here expressed will be

found demonstrated by the tabulated data submitted under the head of "Genius Epidemicus."

The regions where yellow fever is apt to prevail within the United States are nearly exclusively found on low and alluvial soil, and the localities where the fever is most liable to re-occur are allied to the climate of the subtropical zone, and by extending our view to foreign localities and regions where yellow fever is indigenous, they are also found either in the tropical or subtropical zones or climate allied thereto, but simultaneously also upon low and alluvial soil. Not alone in North America[1] is this feature found verified, but also in Central America, Europe, (Spain and Portugal), and in Africa, (Cape Verde, Senegal and Senegambia.)

In South America, it appears, there is an exception to this law, at least in the Andes. Yellow fever epidemics are reported to have infested Cerro Paseo and Cuzco in Peru,[2] although both places are located within the tropics, but nearly adjoining the snow line. Both cities are placed in the rainless region where slight atmospheric variations, owing to the rarefied state of the air, cause in (at least) the human organism great disturbance as the force of expansion is only counterpoised by two-thirds of atmospheric pressure. If the rainfall in the rainy season (July, August and September,) or the season in which yellow fever occurred, remains below the mean, the temperature varies above the mean and thus constituting extremes. Under such influences the portal circulation is retarded (as in plains and valleys of little

1. In the West India Islands (upon Martinique) only at one locality (Morne-Rouge) it is reliably reported, that in an altitude of 1575 feet yellow fever occurred epidemically in 1869.—Beranger Feraud, l. c. p. 260.

2. Comp. Transact, Clin. Soc. London, 1878, p. 199. These localities are situated under the 12th and 15th degrees of south latitude and 13,395 [correctly] and 11,000 feet altitude respectively. At Cerro Pasco the summer maximum temperature is 44° F., and at Cuzco 65° F. The barometer registers 20.00 [Eng. inches] and at 15,000 feet 16.7 mean. The boiling point being there 187.25 F. and the mean temperature 5° R. = 43.25 F. At Cerro Pasco the temperature during the months of July, August and September, [the rainy or winter season, corresponding with our January, February and March,] is 43.25 F. in the day time and 34.25 F. at night, and one of the prevalent illnesses is the "Tabardillo" [a putrid or typhoid fever.]—Muehry, Grundzuege der Klimatalogie, 1858, pp. 311-12.

The standard of atmospheric pressure is 30.06 at Washington, D. C., hence at Cerro Pasco there is a diminution of one third.—Comp. Armand, Climatologie general du globe, pp. 38 and 84.

altitude) leading to the development of "lateral pressure" of the liver cells which they do not bear for maintaining healthful action of that organ. Thus it appears evident that the surrounding physical influences, and the structural morbid alterations of internal organs, developing the "ferment" and the base (saccharine matter) within the system largely engaged in the process of decomposition of the circulating fluids (fermentation?) under favorable external conditions, are supervening and reacting there proportionately with the same precision and intensity as elsewhere. True fully recorded meteorological data are not accessible, yet from analogy the inference can safely be drawn that the same law of causation of yellow fever has proportionately there been in operation as we have in part already indicated, but shall fully demonstrate further on.

As facts of personal observation and the evidence of local records consulted by Dr. C. A. Logan,[1] however, submits testimony of a contradictory tenor, by stating that in those regions south of Callao no epidemics of yellow fever are known ever to have occurred, and Cuzco is located by two degrees south of the latitude of Callao, hence the discrepency of the reports.

Otherwise the conditions congenial to yellow fever are fairly represented, and may be periodically prevalent there, at Cuzco, owing to topographical position, and at Cerro Pasco, to habitation and custom. Cuzco is situated on a plateau (or in a valley) having (apparently) humus or alluvial soil; Cerro Pasco, on the contrary, has (apparently) rocky soil, as the place itself is dependent on its silver mines, and the near surroundings are designated "a barren country." But in reference to Cerro Pasco it is further stated that the inhabitants do not observe sanitary rules about their premises and dwellings, and they are largely addicted to inebriation. The liquids consumed are the "Pisco"[2] and an alcohol made of rice and sorghum. Both liquors are taken

1. Physics of the Infectious Diseases. Chicago, 1878, pp. 102 and 163. The epidemic of yellow fever is reported to have supervened—1855, Transact Clin. Soc.. London, p. 199.—Dr. Logan further states that Hydrophobia even has lost its significance there! This is quite corroborating testimony of what we have stated elsewhere of the non-specificness of the syphilitic-lyssa-viper, etc., virus. Comp. authors essay on Variola. 1878, p. 78.

2. Comp. Armand, l. c. p. 758.

in large quantities but do not exert an actual intoxicating influence,[1] owing to the climatical peculiarities.

The predisposition to affections of the liver (viz.: the interruptions of and encroachments upon its function[2]) is also at Cuzco and Cerro Pasco liable to occur, and the system of the inhabitants there whose liver actions have become materially interrupted, require but slight meteorological variations to force the action of the liver into that morbid state of which yellow fever can now consistently be classified as one of the natural resultants.

There remains one more locality which requires here to be alluded to, and especially for the purpose of elucidating the influences peculiar to the locality and congenial to yellow fever, but which appertain, topographically, to a more southern latitude. In 1865, in the month of September, as is stated,[3] twenty-two undoubted cases with fifteen deaths, and six doubtful ones with one death of yellow fever, occurred at Swansea, England, "the highest northern latitude yet reached" in Great Britain, being 51°.37 north. The report states further: "The disease was imported by an infected vessel, the *Hecla*, from Cuba," and the intimation is thus ventured that this high north latitude can not afford protection against the poison unless duly quarantined.[4]

In explanation of these wholly visionary remarks, attention must be called to the physico-geographical peculiarities by which the locality is characterized. Isothermically this point is not further north than 39°.18 north latitude, or that of the city of Baltimore. Both places have 53°.6 (54) F. mean annual temperature, and (at Baltimore) a summer extreme of 90° F., the winter extreme being 10° F.—rather corresponding with the extremes of Memphis,[5] where yellow fever is liable to occur.

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1. Comp. Muehry, l. c. pp. 283 and 298.

2. Regarded a sine qua non for the development of yellow fever. Comp. Beranger-Feraud l. c. p. 327.

3. Clinical Soc. Transact. l. c. p. 199.

4. These assertions are rather repetitions of the allegations made by the London Epidemiological Society to the effect that "the infectiousness and portability of yellow fever could only appear doubtful to those who from prejudice are incapable to form a judgment on such questions, but, fortunately, there are now not many any more of that class." Comp. Oesterlen, Die Seuchen, p. 533.

5. Comp. Armand, l. c. p. 855. Ratzel, l. c. p. 635. Stieler, Atlas, Plate vi. Walker, Statistical Atlas, Plate viii.

The climatical peculiarities of Swansea are those of a moderate oceanic climate; in the month of January the temperature does not sink below 42° F. The city is located on the shore of the Bay of Bristol upon low ground, but where the moderating influence of the currents of the gulf stream give rise to an equalized oceanic climate. As these currents carry with them a high rate of atmospheric moisture, it is observed that on the southwest coast of England rather a maximum quantity of rain falls, rating[1] for the summer months 7.71 and for the autumnal months 10.83, (leaving for September approximately 3.60.) But in comparison to these normal states of the climatical features of Swansea an important fact is mentioned, namely: In 1865, during the month of September, the temperature exceeded the normal mean by 5° F. (60° is the normal mean, and 65° mean was the extreme) and "there was scarcely any rain and but little wind."[2] Before, however, the topographical configuration of this place, upon which the occurrence of meteorological ex-

1. Comp. Mueller, Lehrbuch der Physik, Vol. iii. pp. 448, 472 and 656. By this eminent author it is further stated that the prevailing wind blows from the S.W. and that with this wind the atmospheric pressure reduces 0.16 inch when the mean temperature rates at 74°.79 F. The importance of these facts may be estimated by remembering that yellow fever only requires for its occurrence 70° F. [Fuchs, Medicinische Geographie, pp. 98, 102 and 103.] The same author, at p. 105, § 174, submits an axiom as to the metabolic character of disease caused by the morbific influences which again accrue from the directions the prevailing wind is blowing, and, moreover, in consequence of which the climatical conditions of a given locality represents the "continental" or the "oceanic" peculiarities, we can safely subscribe to, as its correctness is found verified in a number of instances of personal observation. He says: "If [in Europe] the northeasterly winds prevail then the continental state of climate follows, and the long cold winter gives rise to catarrhs, which in the spring gravitate into influenza, in the summer into dysentery, cholera and yellow fever; intermittent fevers change into remittent fevers."

2. The latter could consistently have been inferred from the physical law, that under extremes of temperature there is a deficiency of rainfall, diminution of atmospheric pressure, and for the time being calmness. The normal monthly means of temperature at Swansea are the following: January, 42.0; February, 39.5, March, 43.7; April, 50.6; May, 56.6; June, 62.2; July, 62.8; August, 62.7; September, 60.1; October, 52.0: November, 45.8; December, 40.4 F. By season the following means are recorded: Spring, 50.3; Summer, 62.6; Autumn, 32.6, and Winter, 40.6. The latitude is 51.36; longitude. 3.55; altitude, 0. Comp. Blodget, climatology, 1857, pp. 54 and 55.

tremes are chiefly dependent, may be alluded to, the geological formations of the soil may be mentioned, which have their analogue on this continent at St. Louis and Gallipolis, where yellow fever has prevailed. They are stated to be of limestone and carboniferous strata.

The topography of Swansea and near surroundings is fully adapted to favor the development and accumulation of morbific influences that are in a great measure peculiar to the "dysenteric region." The mountain ranges half inclosing the district of that city is of sufficient altitude, from 1000 to 2500 feet, to shield the region against sudden and intense ingress of refrigerating winds, as they extend over the continental semi-circle from north-west to the south-east, but at the same time, they decidedly interfere with the oceanic—the warm and moist currents of air, from north, south-west, south and south-east, to sweep over the region, for the ascending currents are reclined, and terminate in a circuitous movement of the lower strata, and contribute in rendering the atmosphere warmer and sultry, frequently with marked extremes of temperature.[1] The reason why the isothermal line of 53.6 (or 54) F. of Baltimore, or of the 39°.18 of north latitude, elevates here to 51°.38 must be fully apparent, and the facts here developed fairly indicate that Swansea is liable to a visitation of diseases peculiar to a southern climate, as also invalidating the argument that "an infecting poison" must have been "imported," capable to disseminate under 51. north lat. We thus expose its negative character and the stronghold of the theory, viz: sheer declamation, upon the basis of plain science.

In so far as by scientific inquiry the evidences have been revealed in proof of nature's reality, investigators, however, whose minds are preoccupied, and who base their inferences on metaphysical abstractions, who prostrate their mental faculties by mere velleities and vague reasoning of speculative philosophy, will always fail to gain an insight into the activity of nature's loboratory, in order competently to discriminate between hypothesis and reality.

Further above it was already stated that infectionists require the dualistic "specific poison"—a necrobiotic entity, a "*self-determined* being" (!), (?)—in order to justify their illusive aberra-

1. Comp. Lyell, Elements of geology, p. 467. Reclus-ule, Die Erde, vol. I., p. 25 and chart.—Stieler, Atlas, plate 46.

tions in the effort to clothe the "poison" with independence of physical laws, and that, to the contrary, that they are subsidiary to its automatic force. Infectionists are assiduously engaged, therefore, in discovering the "germ of infection," their Prometheus of epidemic diseases, in a process to which the collective term "Zymosis" is given, and by which, it is fervently hoped, the object of the inquiry shall virtually be accomplished!

In the realm of objective phenomena an "ectogenic zymosis" as the incipiency of a species of diseases designated "zymotic diseases" and potentiated by the attribute "infectious," can nosologically not be realized; but the material largely engaged, and which is essential to the morbid process of the blood denominated by conventional phrases "fermentation" or "zymotic disease" is of systemic origin. Further, "fermentation" is not an act of "vital" activity produced by an extraneous "catalytic" agency, but it is simply a physical process of decomposition, of which the manifestations assume special form owing to the relativity of the ingredients therein engaged is brought about, and the surrounding conditions comply with the requirements that are essential for the accomplishment of the process. Fermentation has been hitherto looked upon as too occult to admit of a rational explanation, and the leptothrix cells were regarded as possessed with the power to produce this process, and merely by their presence. But since Pasteur succeeded in bringing about fermentation by means of the ashes of burnt yeast,[1] and Hofmeister simply by mixing mannit, chalk, and cheese, [2] a little more latitude has been required and the process is viewed from the chemico-physical standpoint: as a matter of consequence the view is adopted that "fermentation" is one and the same process where ever it transpires. The elements engaged in it are in their ultimate character one and the same, and so the products in their primitive combinations; only in the process of cleavage for final synthesis the products assume different characters, for the accomplishment of which essential conditions must be fulfilled. Elsewhere we have already indicated that sporules of bacterii, and those of the globular white bodies generated by the liver and the spleen in the human body, have all similar properties and obey the same law, as those of the leptothrix cells, viz:

1. Comp. Oesterlen, Seuchen, p. 61.
2. Comp. Physiologische Botanik, p. 350.

that of decomposition, and when they are in admixture with albuminous, starchy, and saccharine matter fermentative actions will result owing to an increased absorption of oxygen. Carbonic acid is eliminated, and as the "ferment" is nitrogenized matter, the albuminous, saccharine (glycogenic), and starchy matter is changed into dextrine, mucinous and fatty substances. The processes transpiring in the grain when "germinating," and the conditions under which they take place, are altogether analogous to those of fermentation.[1] In putrefaction, also the same facts are observed.

By the application of warmth and moisture the albumine of the protoplasma is expanded and swelled (by way of endosmosis, etc.) and oxygen energetically absorbed. The original synthetical forms of the substrata are then broken up, and no analogous forms are subsequently developed if the chemical reaction of the process is not homogeneous and the nature of the surrounding influences essential to them; slight differentiations of the chemical and physical conditions lead to form developments appertaining to the regressive metamorphosis.

Characters of a typical aspect represented by the products of the actions just enumerated may, à priori, be dependent upon the synthetical chemical constitution of the preceding form representations, on their morphological nature, and on the plasticity developed in the processes of transformation. The forms through which the synthetical ingredients, or chemical substrata, passed of subsequent form representatives bear cast of their moldings in the constructive (progressive) metamorphosis; in regressive processes the results are most frequently desultory.

The actions here involved can, bon grè, mal grè, be considered but mechanico-physical and chemical, analogous to the action of oxygen on phosphorus in ignition by "lightening" a match. The attenuation of the mass to be acted on is accomplished by greatly enlarging its surface, and the enlarged surface in the human body is produced by the multitude of surfaces of the myriads of formed cells, whose surface is exposed to the access of oxygen, and whose contents of hydrocarbons and suboxides energetically attract oxygen for oxidation, of which the products will be fæcal and desultory (regressive) when the access of the requisite percentage of chloride of sodium is inter-

1. Comp. Claude Bernard, l. c. pp. 65. to 124.

rupted or excluded. For the gratification of phrasiological taste these actions are denominated "vital manifestations," and by subsequent microscopical investigations formed (organic) bodies that are noticed and pertain to the regressive variety, are then announced by the recent savants (?) of infectionists as the newly discovered nosological corpus delicti, or the "ectogenic and zymotic agency" — the imported cause of an epidemic.

Under these wide spread impressions, based on error or speculation, the belief is assiduously nurtured by distorted reports and spurious advice that the "poison of infection" (i. e., the etiological causes) is not of indigenous origin, and that the native born, of whom especially the negro race and children possessed "immunity" from the "poison" here of yellow fever. Upon these assertions another misrepresentation is ventured, namely, that "foreigners have brought the germs from the West India Islands,"[1] and that thence the "germs" have been transported to other localities on the continent, where an epidemic at subsequent periods prevailed. But foreigners are looked upon as safe after acclimatization (by which apparently it is the intention to say, that they have passed the ordeal of "zymotic infection," and "immunity" may then have been acquired[2], similarly as by the claimed protection of vaccination (or by an actual attack of variola) against small-pox.

However, as all illusions prove but a self-deception, the reality emanating from the history of yellow fever and small-pox epidemics bear too sad testimony to the very contrary, as to warrant further refutation of trivial parlance and vanity. The facts, proving the potency of physical influences to react upon individuals nearly alike, in whom systemic healthful (biological) action, the normal functions of the glandular system, have declined, and are consequently suffering from a contaminated state of the blood, are fully made apparent by the following statistical

1. In the West India Islands the inhabitants charge others again, in a mood of the same timidity, to have brought the "poison" to their shore.

2. Comp. conclusions of the "Board of Experts," p. 15, where to the comparative mortallty of yellow fever at New Orleans and Memphis is referred in the following effusion of marvellous philosophy: "In New Orleans, for instance, the relative number of children taken with yellow fever was much larger than in Memphis, which was due, doubtless, to the fact that in the former city the adults were more thoroughly protected against the disease by a previous attack.

data, exhibiting that all elements of the population have contributed their quota to the mortality list :

Shreveport, in 1873, with an estimated population of 4,000 — 3,200 whites and 800 colored — had a mortality of yellow fever numbering 759, of which were 639 whites and 120 negroes.

Savannah, in 1876, with an estimated population of 30,000 — 16,000 whites and 14,000 colored — where 896 died of yellow fever, 771 whites and 121 negroes.

Memphis, in 1878, with a population according to the United States census of 1870, of 40,226 — 18,000 whites and 6,780 foreigners; hence, whites, 24,784, and 15,442 colored, where, by calculation, 4,966 died of yellow fever, 4,081 whites and 885 negroes — the actual grand total of yellow fever deaths was, according to daily reports, 3,005.

New Orleans, in 1878, with a population of 191,418, according to the United States census of 1870. (In 1876 the population ranged thus : Whites, 161,000; colored, 54,000; total, 215,000.) From the returns of this city we learn the following facts : Among the number of 466 deaths of yellow fever to August 10 there were 19 negroes and 121 children under 10 years. For the week ending August 25, there were 398 deaths, 18 of which were negroes. Of 49 deaths on August 27, 8 were children. Of 72 deaths, September 4, 15 were children under 6 years of age. Of 86 deaths on 5th of September, 33 were minors and 22 children under 7 years of age. Of those dying of yellow fever for the last three days, September 17, were 59 children under 7 years of age. Of 40 deaths, September 22, 13 were children under 7 years of age. The weekly report from September 17 to 23, inclusive, states that the total number of deaths from yellow fever for that week was 408, and of which 291 under 15 years. As to native and foreign born, the following intercsting data are reported pro 1,000 of the inhabitants : Germans, 3¼; Irish, 3¼; Freneh, 5⅛; Italians, 21¼; native born (i. c., of Louisiana), 28 per cent, of which the greater portion were creoles and mulattoes.[1]

In connection with these data another interesting fact may

1. No more decided refutation of the phrases : " The negro race is endowed with certain immunity, and the mixed races are proportionately protected, as the negro type is represented by them" (Samuel, l. c. p. 837, and Bèranger Fèrand, l. c. p. 273–4.) could be adduced than the data of negro and mulatto mortality here reproduced from the records.

well deserve here to be mentioned, as it directly disproves the asserted infection and necessity of acclimatization, namely: On the 28th of October, the ocean steamer "Frankfort," from Bremen, landed at New Orleans, with a crew of 116 and 85 emigrants, and, although the fever was still prevalent, yet none of these persons ever took it.

Upon the supposition of "infection," a question would naturally suggest itself, namely, why an epidemic recedes from its climax to extinction? particularly so if the disease is so widespread as yellow fever was on this continent in 1878, and represented by such an uncommon numerical potentiality?[1] The dogmatical creed of infection has an answer prepared in the allegation that the material was used up, the replenishment of fresh supplies prevented by quarantine efficacy, and the "germs" are destroyed by "disinfection" and by the reduction of the atmospheric temperature to the freezing point. According, though, to the natural causes and the true nature of yellow fever, the explanation is different. As there are no "germs of infection," and there is no "contagious and infectious effluvium," the reactions of frosty weather and other physical neutralizing influences, as nature's antidotes against yellow fever are explained, and proved, further on, upon the basis of the immutable laws of nature. Here it needs be said that at various places the fever subsided long prior to the arrival of frost, and at other places the fever continued, although diminished in frequency, after frost had set in; but in particular the fever continued in defiance of the quarantine "preventive" and "protection" of "disinfection" (*e. g.*, for the first class, Natchez, in 1878, and for the second class, New Orleans, 1878, and Memphis, 1879), sufficient consideration, probably, may have been devoted to the vexed question of "immunity" and "liability" in these pages, and ample evidence may have been adduced for invalidating the asserted specific import of the meaning of the phrases. But as nearly all modern writers on yellow fever appear captivated by the dogmatical phase of the question, and readily reproduce the obsolete statements that the negro race is almost exempt from, and the other part of the population not denizens (acclimated) more liable to an attack of the fever, it can hence not be avoided to revert to the question once more.

1. The grand total of cases was, according to the records at our command, 51,737 and that of mortality 12,151.

In yellow fever, as in cholera, the law appears identical. Those who are exposed most to the intensity of the reaction of prevailing physical influences contribute mostly to the casual and mortality list; this class of the population is formed of those who are from twenty to thirty years of age, and by manual labor are most actively engaged in the pursuits of their vocations. As a rule, this class is represented most numerously by the native-born.

Statistical data domestically accessible in illustration of these points apply only to cholera, and embrace simply the admissions of cases to the City Hospital in 1866.

From 1 to 5 years of age	8
From 5 to 10 years of age	10
From 10 to 15 years of age	20
From 15 to 20 years of age	59
From 20 to 30 years of age	.312
From 30 to 40 years of age	.142
From 40 to 50 years of age	59
From 50 to 60 years of age	53
From 60 to 70 years of age	11
From 70 to 80 years of age	5

With regard to nativity of the cases admitted, the following rate of percentage, deduced from the data as they were recorded by the city census of the same year:[1]

United States, whites	0.145
United States, colored	1.072
Irish	0.800
German	0.280
French	0.150
English	0.330

In the statistics of yellow fever the same facts are found verified. A table reproduced from Circular I, 1868, Surgeon-General's office, (U. S. Army) in reference to the age of the person afflicted in the epidemic of yellow fever in 1867, records the following data:[2]

1. Comp. for both table *St. Louis Medical and Surgical Journal.* No. 1, 1867, pp. 39 and 41.

2. Comp. Beranger Feraud's minute and elaborate work, already cited, pp. 277 and 278.

Under 10 years of age	340—13.2 per 100
From 10 to 20 years of age	297—11.2 per 100
From 20 to 30 years of age	1,036—40.2 per 100
From 30 to 40 years of age	519—30.2 per 100
From 40 to 50 years of age	228— 8.9 per 100
From 50 to 60 years of age	96— 3.7 per 100
From 60 to 70 years of age	27— 1.1 per 100
From 70 to 80 years of age	16— 0.6 per 100
From 80 to 90 years of age	3— 0.1 per 100
90 and over	1 (an old lady, 90 years old)

In South America, at Rio Janeiro, in the year 1876, the facts as recorded by M. Rey [1] fully correspond with those indicated by the above table; they are as follows:

Under 10 years of age	7— 0.4 per 100
From 10 to 20 years of age	565—29.1 per 100
From 21 to 30 years of age	595—44.5 (?) per 100
From 31 to 50 years of age	296—23.6 per 100
From 51 to 60 years of age	25— 2.0 per 100
From 61 to 70 years of age	4— 0.3 per 100

Pursuant to the data of these tables Beranger Feraud has computed an additional one as to the per centage of the age of those afflicted by yellow fever. This illustrious author obtained the following quota:

Under 10 years of age	8.6 per 100
From 10 to 20 years of age	21.4 per 100
From 20 to 30 years of age	40.0 per 100
From 30 to 50 years of age	26.0 per 100
From 50 years of age and over	4.0 per 100

We are further informed by this author (p. 277) that there is no difference as to the per centage of the male or female sex; both sexes are stated to suffer alike as regards the number of cases or the mortality of yellow fever.

Another view is frequently admitted, namely: The suffering proletary being the largest contributor to the morbidity and mortality list, which as a general rule, is from all evidence correct, and this element of the population being usually the substratum of the (alpha and omega of an) epidemic, but when the causal

1. Comp. Beranger Feraud l. c.

influence supervene in their intensity, all classes of the inhabitants become nearly similarly affected. Some notes bearing on this point will be submitted further on.

One of the classes most apt to suffer from yellow fever, owing to the nature of their pursuits, their exposures to inclemency of the weather, and extremes of climatical influences, their great privations in a sanitary sense and highly injurious irregularities in dieteties, are the mariners. Those of the crew, during a sea voyage, or on a river trip, are most exposed to influences enumerated, and after landing excesses are most frequently indulged by them, leading to most serious interruption of all digestive functions. The attendants of their selected abodes in the greatest number of instances, do not materially differ in character from that of the customers, and the localities are most always found in close proximity to the landing places—hence in a sanitary sense located most unfavorably.

Mariners and mariners' inn-keepers, therefore, are frequently among the first that fall sick with yellow fever, but according to the "infection and importation" theory, the "poison," it is asserted, was brought into port by the mariners and the inn-keeper were "infected" by them.

However, facts that are gathered from the history of the epidemic of the Mississippi valley in 1878, directly bear proof to the contrary, namely, that the disease originated simultaneously with others who never were in contact with mariners and their associates. Also that all classes of the inhabitants suffered nearly alike, owing to the *intensity of the reaction of the morbific physical influences.*

Infectionist, highly enlightened by implicit faith, heroically asserted that in the city of Memphis the origin and subsequent spreading of yellow fever was demonstrated by the case of Mrs. Kate Bionda, a keeper of a house for mariners, and whose establishment is located on Fremont and Adams streets, (rather in the center part of the city), who was taken with the fever on the 13th (Tuesday) of August, but the telegrams of the 14th of August, report that George Burgmann, a prominent tobacco dealer, had been sick with the fever since the "commencement of the week." It must also be remembered that at Memphis, quarantine restrictions had been most stringently enforced since the 27th of July, preventing the arrival of mariners for seven-

teen days already, exceeding the period of "incubation" (from two to six days) by eleven days.

Previous and simultaneous to the origin of yellow fever at Memphis, the fever occurred in inland cities and towns, where mariners had no access whatsoever. At Grenada the fever began to prevail on the 11th of August, and at Canton and Winona on the 13th of August.

Analogous to the mode of the origin of yellow fever at the various localities of the vast yellow fever area of 1878, persons resident at such localities and representing all classes of society, were simultaneously affected, although sharing most variously in the comforts of life, whose dwellings were remote from the "centers or foci of infection" and many of whom never were in contact with any one afflicted. A few selections from the records of some of the cities of the yellow fever area of 1878 may therefore here be adduced, and suffice to exhibit a fully apparent similarity in the occurrence and prevalence of the fever, owing to the similarity of the operations of the general causes.

At New Orleans there died of yellow fever on the 11th of August at the Hotel Dieu Rev. Lamey, President of the order of the Lazarists. On the 17th of August there died three daughters of the family of a Mr. Black, and Mr. Hansell and daughter, both families of prominent merchants. On the 21st of August there died Governor Pascal M. Hermandez, late of San Louis Potosi, Mexico, Col. Fred. H. Strout, Maj. J. C. Austin, Walter Farrant and Lewis Alcus, all persons surrounded with the comforts of life and not specially exposed.

At Memphis there died of yellow fever Prof. Decker, on the 13th of August, J. G. Cairns, Ex-Secretary of the School Board, Mrs. Lavigne, Mr. Henry Decker, and Mrs. Zanora on the 17th of August. On the 22d of August Gen. W. J. Smith, Vice-President of the Howard Association, was taken sick; also Captain John D. Elliott, Mr. Marsh Miller, and Burt Ayer, telegraph operator. On the 23d of August Dr. John C. Rogers died, Mr. Adolph Thumel, teller of the German National Bank, and Rev. Maher, taken sick. All these persons also enjoyed comparatively full comforts of life.

At Vicksburg on the 22d of August Drs. Robbins and Balfour were taken sick; also Dr. Booth on the 23d. Mr. Wm. Rockwood, President of the Howard Association, was taken critically sick on the 23d of September.

Of the physicians engaged by the Howard Association, and distributed all over the yellow fever area, were reported by the 22d of September sixteen that died of and thirteen taken sick with yellow fever.

Of the clergy officiating at the bedside of the sick and dying, fifty-six died of yellow fever until the 1st of November, of which thirty-one were of the Protestant, twenty-four of the Roman Catholic and one of the Israelitish denominations.

Limited as the facts here enumerated are, yet they bear sufficient evidence to force a recognition of the law, *that yellow fever originates and prevails among all classes of the population with uniformity, when the physical influences react proportionately, similarly, or with a uniform intensity*, and the native born are not "proteeted" against those influences; on the contrary, proportionately with the extent of the exposure agrees the numerical frequeney of cases, and the rate of mortality, being, *caeteris poribus*, an index of the intensity of the causa morbi epidemically operating.

GENIUS EPIDEMICUS.

The old-fashioned and eustomary maxims are as yet strictly followed by a large number of prominent and seientific writers. Their philosophieal conviction is still based on transcendental interpretations of nature's phenomena, or on metaphysical speculations and abstractions, and the conclusions thus arrived at are unhesitatingly held out as true descriptions of the actual state of things. Metaphysical interpretations have, however, a dualistic basis, and submitted deductions of nature's morphological processes, resting on such a basis, are but moldings of those patterns that were, propably, adequate in times past, but modern science has arisen, like a Phœnix, anew out of the cinder of obsolete form representations. A course of reasoning, or attempts at demonstrating *ad ocolos* nature's mode of activity, still resting on the old basis, are mere efforts in repelling inquiry to conform with the dualistic inferences, although no other support is available for them than being supported by preeonception and dogmatisms. But as physical phenomena can now be, as a rule, consistently explained. and the law of causation fairly be demonstrated, owing to the present higher standard of scientific attainments, a mere glance over the state of our knowledge obliges us at once to recognize the fact that physical force, the resultant of the relativity of matter, is the impetus

of all phenomena in nature (nature's unity monism) and that hence the supposed "vis vitæ" per se, either in an archebiotic that or necrobiotical sense, is no longer admissible. Inferences rest on hypothesis only, however strenuously broached and conclusions therefrom derived, are intrinsically but a *contradictio in adjecto*, and must peremptorily be rejected in whatever phase they are presented.[1]

In that degree of hebetude, which follows only the old walks of custom, no willingness can be expected for the recognition of nature's pure reality, as reality constantly outgrows those conventionalized forms that are employed to mystify the understanding of nature's activities, frequently under the pretext of scientific research, however, for more interested motives. The doctrine of "specific infection" rests on no other basis, and the purports of its application bear no other testimony than the facts of its history have verified, viz.: that of speculation and compulsion by brute force, which is then presented to an honest credulity as revealed science, and, in the majority of instances, in recompense for a few shekels, and with the most brilliant polish of dialetic versatility.

The mere assertion of "specific infection" may here not require to be to any great extent dilated upon, as probably it has obtained sufficient attention under the head of pathogeny and etiology, and its pretended nature may there have been fairly exposed. It was there already learned that fungoid growths and forms are incidental products of the process of decomposition, and decomposition is produced by *physical* force and surroundings; yet, by means of "zymosis," it is claimed "specific infection" is produced pursuant to a "vital force," resulting in a multiplication of the "infecting germs, sporules, and fungi." But, as is now known, primitive histological formations, on the the plane and scale of regressive (necrobiotic) actions, require the same law (only a reaction of different potency), as is the *sine qua non* of the origin of form representations in the progres-

1. The inferences which Claude Bernard derived from the experiments on the phenomena of germination in the eress-seed for sustaining the doctrine of the "vis vitæ" afford no proof to the contrary. The analysis of the processes in the seed, and they account for the *requisite surrounding conditions* to develop those processes, bear conclusive evidence that the metamorphosis in the elementary substance of the seed, were, originally at least, no other than simply chemico-physical processes. Comp. l. c., p. 73.

sive (archebiotic) metamorphosis, and the reason why the "vital destiny" of their form representations in the process of transmutation is on an inverse ratio of physiological (constructive) action, as they recede from the boundary line of progressive metamorphosis, is found in their chemical constitution; in it exists the "inherent" power of species characteristics, and that of generical variety in the physico-mechanical surroundings.[1]

There is no neutral or an adiaphorous link by which the activity in nature's laboratory could be coupled into a trinity. "Paludism," "miasm," "infection," are terms employed to cover a prevailing perplexity, but which are stoically held out as an answer for an analytical and synthetical account of the causes, origin, and mode of spreading of epidemic diseases.

Most aptly Gœthe's words (in Faust) find here their significance:

> "For just where fails the comprehension,
> A word steps promptly in as deputy,
> With words 'tis excellent disputing;
> Systems to words 'tis easy suiting;
> On words 'tis excellent believing:
> No word can ever lose a jot from thieving."[2]

Before, however, proceeding to examine those physical influences that can scientifically be recognized only as the causes of diffusion of disease, and in reference to yellow fever epidemics in particular a cursory survey of the climatological or physical laws may first be resorted to, indicating general hygiene and chorological morbility to be dependent upon them.

Of everything of interest the fact appears of the greatest importance, namely, that no breathing living being can dispense with the access of air, even for a moment, unless suspending the individual vitality. Respiration, hence, cannot be otherwise

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1. The utterance: "Das 'Mittelglied' der *chemischen Stœrung*, welche der Pilz hervorruft (?) ist noch voellig unbekannt"—Samuel, l. c. p. 871—is in one respect a candid acknowledgment of the deficiency of "our knowledge;" but, on the other hand, it is an expression of marked (individual) incapacity to study nature's phenomena objectively. Chemical substrata alone decidedly change the individual character in the transformation of regressive growths. Comp. Gornp-Besanez, Organische Chemie, fifth edit., p. 449; Karsten, Faeulniss und Ansteckung; Hilgard, Zymotic Fungus; Karl Vogt's Sarcasms, Pilzstudien, in reference to the natural history of a variety of "peculiar fungi" and their vicious influence in the origin of plagues and other miseries of suffering humanity.

2. Bayard Taylor's translation, Vol. I, p. 80.

regarded as the very first and last physiological process of individual life manifestation. When respiration fails to take place the new-born child is noted as still-born, and in venerable old age death cannot be announced before respiration has ceased. Respiration (i. e., the pulmonary ingress and egress of atmospheric air) can hence consistently be received as *paramount* to life, and uninfringed to that of biostatical (hygienic) force ; the axiom pronounced by Lombard : "*Aër pabulum vitæ*," is, therefore, fully indorsed.[1]

In so far as human life and health is dependent on or identified with a normal state or an essential relativity of atmospheric surroundings, the general mean required to be ascertained, principally for the reason that the greater mass of the human population of the earth's surface inhabits regions that are of nearly corresponding altitude to that of the surface of the oceans. The sea level is therefore admitted as the great and universal basis to which atmospheric norms are reduced ; also, in the study of meteorological influences favorable to morbid phenomena.

It cannot be said, however, that our physical (instrumental) means of measurements of atmospheric composition and oscillations are even approximately adequate to indicate all differentiations, for the human and other organisms experience impressions of atmospheric differences which are not expressed by the limited sensitiveness of our instruments. We must, on this account, feel contented, for the purposes here contemplated, merely with indicating the irregularities of atmospheric pressure, temperature, hygrometical oscillations and "state of the weather." The measurements of ozone and electricity, the indications of the number of thunder storms, velocity and direction of the wind, and other phenomena, are omitted, from the fact that they were not embraced in the records, and were not regarded essential to the subject matter of this study.

By the most recent writers on yellow fever[2] the fact could not be left unnoticed that an extreme elevation of temperature is requisite for the development of the fever, and the fact is fully corroborated that such a temperature prevails prior to and during an epidemic.

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1. Oyxgen is consumed for producing muscular and "psychological" action. Comp. Preyer, Ursache des Schlafes, p. 13.

2. Hœnisch, Ziemssen's Handbuch d. spec. Pathol. Vol. I, p. 473. Bèranger Fèraud, l. c. p. 86.

In conjunction with these observations it is worth remembering that an increase of atmospheric temperature is accompanied with a reduction of barometrical pressure, and with a deficiency of rainfall, hence also with an augmented degree of relative humidity, owing to a hightened state of evaporation.

If attention be devoted to climatological influences upon the health of man in general as they cause a deviation from the hygienie or biological standard, or, on the contrary, as they correct morbid processes, the fundamental law presents itself to the notice of every thoughtful observer that the meteorological conditions, which prevailed previous to and during an epidemic of yellow fever at the respective locality or region, cause in every individual a deviation from health, forming the individual predisposition—the *locus affectionis* of the abdominal glands—but in persons in whom the predisposition—*locus minoris resistentiæ*—is overcome is owing to the fact that the circulating fluids (blood and lymph) could be freed from retained C. O_2 by an uninterrupted action of other organs (lungs and skin) and rendering their reaction approximately normal again.

Proportionately atmospheric pressure recedes from the normal mean, which is at Paris, France, and at the level of the sea, 760 millimeters[1] (= 29.944 American inches) or at Washington, D. C., 30.060 inches,[2] toward the barometrical minimum (which would be at Washington 28.40, as 1.66 is about the average range) health declines, owing to the fact that the process of respiration is lessened in frequency and C. O_2 proportionately retained. Moreover that in an inverse ratio the force of expansion extends as the atmospheric pressure is reduced (quite detrimental to health) the thermometer rises, evaporation (relative humidity) increases, and precipitation (rainfall) diminishes. Again that in a state of weather of this kind the exhalations of C. O_2 by the lungs is proportionately interfered with,[3] and calorics are given off only to one-twelfth[4] of the normal quantity in high temperature and a maximum degree of relative humidity. A fever temperature then ensues in man as cell "life" recedes from the

1. Lumbard, Climatologie medicale, Tom. I. p. 291.

2. Annual Reports, Chief Signal Office U. S. A. from 1872 to 1877 inclusive.

3. Comp. Lumbard, l. c., Tom. I. p. 221. Panum, on compressed air, Pfluegers Archiv, Vol. I. pp. 146 et seq.

4. Pettenkofer, Papulære Varlesungen.

standard of healthful action, and the cells enter into a fatty degeneration,[1] constituting the primary but fundamental morbid alterations of glandular structure in disease in general, but in those of epidemical occurrence in particular. The insalubrity thus already prevailing is augmented if the suffering localities are situated upon humus—alluvial—or sedimentary soil, particularly on a plano-surface.[2]

The fact, however, that in a height of 14,000 feet well populated cities are found in the Andes,[3] where the atmospheric pressure is reduced to two-thirds (20.17) and the soil upon which they are founded (e. g. Cerro Pasco) is rocky, does not invalidate the correctness of the theory here advanced, for the native born, and too frequently the travellers, suffer from "Sorocho" and from other afflictions of the respiratory organs (interruptions of the circulation of the blood) owing to the hightened force of expansion and evaporation which must be endured there in consequence of the rarefied air, but under slight fluctuation of temperature abdominal complaints will ensue, leading to the formation of abcesses of the liver, typhoid fever, and sometimes yellow fever. Such are the observations made in Peru, (at Cerro Pasco), in Ecuador, (at Quito), and at other places,[4] and sudden fluctuations of temperature do occur there.

At Morocha, where the boiling point of water is 185° F., there is frost mostly every night, yet the mean temperature at noon is 47°.75 F., and at Tocora, Bolivia, in an altitude of 13,300 feet (Paris measure) the temperature at noon, in the month of April, rises to 63° F., thus exhibiting a fluctuation of 54.5 F.[5] We see thereby that the force of expansion is great and sudden there, and must react proportionately injurious to the health, producing hepatic stasis from retention of C. O_2 as the atmospheric pressure is lowered.

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1. Samuel, l. c., pp. 334, 335 and 737, 738.

2. Muehry, l. c., pp. 105, 115. The exceptions to these observations, claimed by Summers, Yellow Fever, p. 10 for Holly Springs, are not sustained, although the surface soil of that place is sandy, yet the geological formation is tertiary and close to river alluvium.

3. Morocha, 10° south latitude, is said to be 15,000 feet high, being the highest inhabited locality in the Andes.—Muehry l. c. p. 282.

4. Comp. Armand, l. c., p. 758. Muehry, l. c., pp. 247, 310. Logan, l. c., Chap. II., pp. 86, 96. Samuel, l. c., pp. 751 et seq.

5. Muehry, l. c., pp. 282 and 286.

Stasis of the liver must there be one of common occurrence, owing to the proneness to and frequent interruptions of the circulation of the blood; hence the "lateral pressure" upon the acini of the liver must be greater than can be borne by that organ for healthful action or performance of life functions. Hydrolytical processes (cleavage) indispensable for the formation of glycogen and mucine, are in consequence thereof too greatly impaired, and the liver also will suffer from fatty degeneration, the ordinary morbid product.

In this connection it should be remembered that normally glycogen (a suboxide) circulates through the pulmonary tissue,[1] and energetically attracts oxygen from the air (the cause of respiration) thereby setting C. $O_{\bar{2}}$ free for exhalation. Mucine, a nitrogenized substance, normally enters into the formation of bile for assisting digestion, but if retained, in consequence of hepatic stasis, suspension of hydrolysis, and retention of C. $O_{\bar{2}}$, hæmoglobin will in part suffer decomposition, owing to displacement or prevention of the access of oxygen, and if carried to the cutis an icteric discoloration ensues. When from physical causes (sudden and extreme elevation of temperature and increase of relative humidity—common to those localities in the Andes we have alluded to—) the accompanying fever heat is forced to a maximum degree, the disease then prevalent is by general phraseology designated yellow fever, and if by the mortality thereof the usual standard of mortuary statistics is exceeded, a yellow fever epidemic.[2]

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1. After death, following upon tetanic convulsions, the decomposition of saccharine matter in the blood was found diminished. P. Bert, vide Hoppe—Seyler, Physiol. Chemic., p. 544.

2. Of the etiology of yellow fever the incipiency, i e., the origin of the systemic morbid cause, as we have seen, is found in the retention of $CO_{\bar{2}}$, from which subsequently arises the stasis in the hepatic vein, leading to fatty degeneration of the glandular structure and to the development of "fever heat," which reciprocally augments the process of decomposition of the blood, and the typical character of which is assumed according to the nature of the surrounding physical influences—the genius epidemicus. The "pathogenesis is thus clear" as the fundamental causes (Grundstoerung) is fully apparent. Com. Samuel l. c. p. 339, and further on pages 740 and 741, where this author enumerates morbific influences that are directly to be attributed to the effects of the season, but the morbid alterations of the liver and circulating fluids—blood and lymp—resulting from the effects of the estival season, especially in southern climates, are (accidentally?) omitted from mention.

Cognizant of the fact that on an inverse ratio C. O. ^{2} grows predominant in the system as the atmospheric pressure and the access of oxygen is reduced, an ascension into great altitudes would hence endanger life by suffocation. The theory that the barometrical minimun on an inverse ratio is paramount to a morbific maximum would at a mere glance appear contradicted, by the fact, to which attention was invited in the first publication of this treaties in 1874, namely that the vulture condor of South America ascends from the Llanos to the summit of the loftiest mountain peaks (over 20,000 feet,)[1] far above the snow line, and vice versa, and thereby traverses all the climates—from the torrid zone to the region of polar frigidity—without, as is stated, being in the least impressed by it. But, according to the general law, warm blooded animals that have a respiratory apparatus analogous to man would not bear such extensive and sudden transition, unless being provided with artificial accessibility of condensed air in high altitudes, or they must undergo gradual acclimatization.

In the anatomy of the condor there is found an adaptation for such emergencies.[2] From the lungs extend enormous pneumatic pouches under the wings, which are filled with air in the strata of atmospheric density (at 20 perents of oxygen) and in strata of high altitude—or in greatly rarefied air where the requisite quantity of oxygen is deficient, this deficiency is replenished by forcing dense air into the lungs by motions of the wings.[3] In a similar manner aeronauts must be provided with apparatus containing condensed air (of 40 per cents of oxygen) which they breathe with the other air at high ascensions. When descending to the sea level the condor expells the surplus of retained dense air, which it no longer needs, to make room for a new supply in case of another ascension, and in this manner this remarkable bird arterializes its blood, prevents an accumulation of C. O. $_{2}$ in the circulating fluids (the Sorocho ?) in high altitudes, and avoids the subsequent hepatic stasis. The

1. 7000 meters = 22,925 feet of altitude, and equalizing about 15 inches of barometrical pressure. Comp. Brehm, Thierleben, vol. v. p. 48.

2. The anatomical adaptation to conform with the requirements of physical surroundings is also well exhibited by the native born at Cerro Pasco, they are short built persons with a disproportionately large thorax. Muehry, l. c. p. 266.

3. Comp. Claude Bernard, l. c. p. 120.

flow of blood in the vena cava is not encroached upon when soaring in warm climates, and a regurgitation in the hepatic vein, leading to structural alteration of the liver cells, is consequently avoided.

By the anatomy and physiolgy of the condor we are lead to understand, on most rational basis, the causes and the modus operandi of the origin of the hepatic disorders that are characteristic to southern climates (high temperature and low atmospherical pressure,) constituting the pathologico-anatomical predisposition and premonition—the elementary basis—of yellow fever. The peculiarities and intensity of reaction of these precursors are produced by meteorological oscillations, which the liver circulation is unable to overcome for correction as such a forced degree of "lateral pressure"[1] (counter pressure upon the hepatic vein) entirely counteracts the contractile power of all hepatic tissue.

In consequence of the great attainments of modern investigation this fundamental law of nature stands now far above even a shadow of doubt; it has been tested in the physiological laboratory, and is verified by direct experiments. Some of its prominent features are indicated by the following synopsis:[2]

"Cold augments the exhalation of carbonic acid, while heat exercises an inverse influence. Cold diminishes the exhalation of azote (nitrogen) and increases its absorption, while in elevated temperature there is more of it exhaled. Moisture of the air (fog, dew, and rainfull ?) acts in a similar way as cold, and dryness similar to that of heat;[3] the first augments the exhala-

1. Niemeyer, Lerhbuch der spec. Pathol, und Therap. 6th edition, vol. I p. 659.

2. Lombard, l. c., vol. I p. 221.

3. Some of the isolated facts of this law gain still more in their special significance when they are compared with the data indicating the seasonal prevalence of relative humidity. At Halle, Germany, they are quoted for the month of January, 4.17 m. m., for April, 6.08; for July, 11. 55, and for October, 7.87. Mueller, Kos. Physic, p. 644. The law, therefore, that the summer mean of relative humidity exceeds that of the winter by nearly two-thirds, is a strong indication of the potency of the morbific influences that arise therefrom in improportionate relativity, especially when it is remembered that in regions approximating in temperature that of the torrid zone, when the minimum prevails in the middle of the day, and at night the vapor is condensed forming the dew point, then suddenly and sensibly refrigerating the atmosphere of which the reaction proves congenial to the development of yellow fever, owing to the wide oscillations of temperature thereby occurring, and heat and dryness co-existing during the daytime.

tion of C. O. ^{2} and the latter diminshes it. High barometrical pressure exercises an influence corresponding with that of cold, that is to say it increases the absorption of oxygen and augments the exhalation of carbonic acid; a feeble atmospheric pressure acts directly to the contrary."[1]

A law so potential in its significance and universality, verified by the natural history, in its entire scope, of chorological vege-

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1. Samuel, l. c. p. 753, quoting from Vierodt, states: Barometrical pressure varies at a given place but slightly, about 4 centimeter or 1-18th of the total sum (the mean of the grand total, which further above is already alluded to, is 760 m. m., or 29,944 in. of which 1-18th equals 1-66 in.) When the barometer indicates 749.02 m. m., the average frequency of the pulse is found to be 70.9 per minute, and of respiration 11.58. The volume of air exhaled 6121 c. c. m., containing 275.5 or 4.45 per cent. of CO^{2}.—When the barometer indicates 761.10 m. m., the frequency of the pulse is 72.2, and of respiration 12.32. The exhalation of air is then 6607 c. c. m., and containing 271.1 or 4.14 per cent of CO^{2}. This discrepancy is at once corrected by adducing the statements given by Flint—Physiol, vol. Respiration, p. 441—which are: In low temperature, 37.5 to 59, F., the quantity of air taken in by respiration is slightly increased when compared with elevated temperature, 60.5 to 75.5 F. In low temperature the absolute quantity of CO^{2}. exhaled per minute is 18-27 cubic inches, and in high temperature 15.73.—These data have their explanatory bearing in the fact that low temperature rates with high atmospheric pressure and high temperature with low atmospheric pressure. Further, on the same basis, most powerful evidence may be adduced, the results of most extensive and most recent inquiry.

Absorption of oxygen in one hour, in high temperature 1134.3, c. c., in low temperature 1643.4.—Elimination of carbonic acid for same period, in high temperature 992.8. and in low temperature 1457.1.

Absorption of oxygen at 3.64° [R?] 1856.5, and at 26. 21° 1118.5.—Exhalation of carbonic acid at 3.64°, 1554.8, and at 26.21°, 1057.4. Or further, at a temperature—3.2 absorption of oxygen in 6 hours 21.39 grams, and exhalation of carbonic acid 25.03. At a temperature of +12.3 absorption of oxygen 17.71, and exhalation of carbonic acid 17.63. At a temperature of +29.7, absorption of oxygen 13.91, and exhalation of carbonic acid 12.81.—Comp. Hoppe—Seyler, Physiol, Chemie, pp. 562-563-564.

In the presence of such evidence Samuel does not hesitate to assert that pathological results cannot be inferred therefrom. Evidently that author acknowledges his inability (unwillingness?) to understand, that pathological results must and do follow continued and wide ranges of meteorological irregularities, even if the differentiations are of less extent. Corroborating facts, in this behalf will be found further on in the meteorological tables of some of the localities where yellow fever epidemics devastated the population.

tative and animal life,[1] can no longer be disregarded in the etiology and pathogeny of epidemic diseases, and attempts yet to lend to the "specific infection theory" a probability by arguing in behalf of the obsolete view of specificness of species, etc., can only be designated as arbitrary, or as an expression of total inability to realize nature's actuality or unity.

Athough the law of the physical causation of epidemic diseases is indicated upon the basis of a gross generalization, yet its natural philosophy is now well founded, and its correctness is made incontestible by an abundance of general verifications, but in particular by the tests that were applied to it in the physiological laboratory. Still there remains for scientific ivestigation an endless task, not only to refute untenable and obsolete doctrines, but to sustain and prove up the universal law by facts ascertained in detail that the "vital" and morbid phenomena are dependent upon the relativity and reactions of physical surroundings, and that specialized or individual characteristics, designated "specifics," are their fixed resultants. Yet the utterance of Samuel, l. c. p. 382, that "the theory in medicine and in natural philosophy has done its duty by indicating the unity of ascertained facts under one ruling law, and by frankly acknowledging its defectiveness in the mode of inquiry, the direction is indicated and the ways are cleared leading to a more complete understanding," is here also indorsed.

The facts that are here to be submitted in reference to the the yellow fever epidemics of the United States in 1873, 1876, 1878 and 1879 should therefore not be received as a complete account of their causes, but that they may be regarded as a fair exposition of the law therein involved; those facts are in reality a complete verification of the law, in its effects, as it was ascertained by direct experiment, and as it is expressed in the copied synopsis of Prof. Lumbard's fundamental work.

The inference drawn from the morbid alterations of the liver, kidneys, spleen, and other glands, as they are revealed by post mortem research, in accordance with the "specific infection theory," the assertion is always repeated that those changes are the immediate consequences of an acute intoxication of the blood

1. Comp. Alex. V. Humboldt, Kosmos. Griesebach, Die vegetation der Erde. Carus, Handbuch der Zoologie. Brehm, Thierleben. Hœckel Natuerliche Schoepfungsgeschichte. Ratzel, Sein und Werden. Reclus Ule, die erde.

by the "poison of infection," the solution of the arithmetical problem is then attempted in what length of time from date of "infection" such structural alterations are to follow. The great fact, however, is usually overlooked in every epidemic that only such of the population suffer in whom the force of resistance inclines to the minimum and is developed long prior to the prevalence of an epidemic, but by way of phraseology is then designated "receptivity" (in contradistinction to "immunity.")

Pursuant to the doctrine of "infection" investigation does not need to go further than convenient phrases are admitted in lieu of science, but by the term "receptivity" a deviation from the biological or normal state (as to health) is implied, and it designates a condition which may be regarded as identical with an older term, viz: "predisposition"—the result of structural alterations of those organs whose proper performance of function is essential to the maintenance of health and life—a more accurate and extensive inquiry appears therefore demanded.

In the great laboratory of nature, whether in the organic or inorganic world, the law prevails that nothing transpires spontaneously, all phenomena prove to be the effects of precedent causation; and processes that thence ensue corroborate the testimony of a gradual development.

In the process or the gradual development of yellow fever, or in the development of its predisposition, this law of nature is signally verified; the meteorological influences of the year previous decidedly exhibit marked variations at those localities subsequently suffering, causing in the constitutions of "susceptible" individuals structural changes of the glandular system and an altered state of the blood and lymph upon which the irregular meteorological conditions (of the year and season of the epidemic) react destructively, of which, as an anlogon, the sudden transition of inhabitants from a colder to a hotter climate serves an apt illustration. Still whatever fault critiques and skepticism may find with the law here expounded, yet of its grand total not an iota can be obliterated, and its conciseness can neither be disputed. At the first sight apparent discrepancies may be discovered by comparing the prevailing influences of the various localities involved, but those influences can not be compared with anything else than with their own local and normal mean, and on the same principal an explanation is only admissible if biological or morbid action manifest external sim-

ilarities, although the localities concerned are situated orographically and chorologically widely different.

The law is therefore this: In the range of meteorological irregularities prevailing at the localities involved, the origin and prevalence of an epidemic (in this case yellow fever) is caused and regulated by a corresponding degree of intensity or percentage in the reaction of the variations as they deviate from their local normal means.

The morbid effects on the human organism of those influences are above indicated in a great measure, but they will be more fully presented under the heading of morbid anatomy and histochemistry.

Of the localities of which there are perfected records of meteorological data and liable to have yellow fever in their midst, or others of which also the meteorological records are complete, also placed within the yellow fever area, and yet remain entirely or periodically exempt, may be mentioned as representative localities—of the first class, New Orleans, Shreveport, Memphis, and Savannah; of the second class, Nashville, Mobile, Charleston, and St. Louis. To those of the first class the epidemics of 1873, 1876, 1878, and 1879 apply also to those of the second class, but some of them furnish the contrasting evidence of meteorological differentiation although geographically in close proximity to some of the first class, and having had during the epidemics an uninterrupted commercial intercourse with them, yet remained entirely exempt. Before the meteorological variations of the localities here named, and by which the law of the physical causation of yellow fever epidemics is demostrated can be correctly understood, the normal means should be indicated first, and embrace the annual means and those of the summer months (July, August and September) of atmospheric pressure, temperature, and rainfall. They are therefore enumerated in the following table:

LOCALITY.	BAROMETER.		THERMOMETER.		RAINFALL.	
	Annual Mean.	Mean of the Summer Months.	Annual Mean.	Mean of the Summer Months.	Annual Mean.	Mean of the Summer Months.
New Orleans.....	30.06	30.02	68.6	80.8	5.71	5.60
Shreveport.....	30.05	30.00	65.0	80.9	4.40	3.17
Memphis.....	30.07	30.06	60.7	77.7	4.25	3.19
Nashville.....	30.06	30.00	57.9	76.8	4.10	3.64
Savannah.....	30.10	30.06	65.8	79.2	4.48	6.02
Charleston.....	30.08	30.05	65.4	79.3	5.28	7.48
Mobile.....	30.09	30.04	66.4	79.8	5.37	6.61
St. Louis.....	30.03	29.98	54.2	75.1	3.37	4.10

NOTE.—The barometer and rainguage are expressed in inches per month; the thermometer in the Fahrenheit scale. These standards apply to all subsequent tables.

Adverting now to the irregularities of the meteorological condition for the year of the predisposition (i. e. the year previous) and of the prevalence of the epidemic, we find in 1872 and 1873 for Shreveport and Memphis the following data recorded:

SHREVEPORT—1872 AND 1873.

	BAROMETER.				THERMOMETER.				RAINFALL.			
Year.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.
1872.	30.05	normal	29.99	—.01	64.2	—.8	82.3	†1.4	4.25	—.15	1.64	—1 53
1873.	30.06	†.01	30.03	†.03	64.8	—.2	79.6	— 1.3	4.36	—.04	2.40	—0.77

MEMPHIS—1872 AND 1873.

	BAROMETER.				THERMOMETER.				RAINFALL.			
Year.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.
1872.	30.11	†.04	30.06	normal	59.0	—1.7	79.0	†1.3	3.66	—0.59	2.79	—0.40
1873.	30.07	normal	30.22	—.04	55.0	—5.7	76.0	—1.7	4.68	†0.43	2.96	—0.23

These tables exhibit the temperature of the summer months of 1872, or the year of the predisposition at Shreveport and Memphis to be extreme, and the rainfall deficient, which are as we know essential conditions for developing the "predisposition." The summer months of 1873, the year of the epidemic, do not exhibit an excess of temperature, but a marked deficiency of rainfall. The meteorological conditions were therefore also summer extremes, or those of a continental climate of hot regions, and which are, as we have seen further above, essential influences for the development of yellow fever.

If the normal quantity of rain had been precipitated, or an excess, the morbific influences of those extremes would have been counteracted at both localities, and they would have been spared the visitation of the epidemic. Regressive action would have been turned into progressive action or constructive metamorphosis.

This law grows fully apparent from the facts which the meteorological data demonstrate that are recorded for two other localities for the same period, and which are in rather close proximity to the former, namely: New Orleans to Shreveport and Nashville to Memphis.

In New Orleans, particularly, in addition to this the general hygienic conditions were at a low standard, owing to an extensive inundation occurring in the fore part of the summer in 1873 in the valley of the lower Mississippi. Also the meteorological means of the summer months of 1872 exhibited variations of extremes.

Although a few scattered cases of yellow fever were reported from New Orleans in 1873, yet strictly speaking there were, perhaps, no more yellow fever cases there in that year[1] than the number of sporadic cases apt to be there every summer. From Nashville no cases were reported at all. For New Orleans the meteorological records for 1872 and 1873 read thus:

	BAROMETER.				THERMOMETER.				RAINFALL.			
Year.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean	Variation.	Mean of the Summer Months.	Variation.
1872.	30.07	+.01	30.03	+.01	67.6	—1.0	81.3	+.5	5.08	—0.63	4.09	—1.51
1873.	30.06	norm	30.03	—.01	68.2	—.4	80.7	—.1	5.54	—0.17	5.92	+0.32

For Nashville, in the years 1872 and 1873, the following data are recorded:

	BAROMETER.				THERMOMETER.				RAINFALL.			
Year.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.
1872.	30.12	+.06	30.07	+.07	58.3	+.4	79.9	+.1	3.25	—.85	2.5	—1.09
1873.	30.06	norm	30.03	+.03	52.0	—5.9	76.8	norm	4.19	+.09	2.93	—0.71

The exhibit of these tables afford the proof, when in the state of the weather the principal variations of summer extremes are not embodied, for the year previous and during the one of the fever, that yellow fever can not develop; the essential conditions for its origin are counteracted by the equalization of the climatical influences to correspond with their local means. Yellow fever could, for these reasons, not prevail at New Orleans in 1873 because the means of the summer months are found to correspond with the normal means, and the rainfall even being slightly

1. Said to have been 226 deaths. Comp. Proc. Louisiana State Med. Assoc. 1879, p. 113.

in excess.[1] At Nashville was a deficiency of rainfall during the summer months of both years, but the barometer indicated a slight excess and the thermometer did not exceed the normal mean. The effects that could have arisen from the deficiencies of the rainfall were thereby counteracted and the climatical conditions equalized.

If now the meteorological influences may be analyzed and compared that prevailed and characterized the summer months of the year 1875 and 1876 at Savannah, where in the latter year a yellow fever epidemic devastated the population, the law further above indicated is again verified, with the same precision and with a still higher potency as it was found in operation at Shreveport and Memphis in 1872 and 1873.

The following data are copied from the meteorological records of Savannah for the year 1875 and 1876:

	BAROMETER.				THERMOMETER.				RAINFALL.			
Year.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.
1875.	30.09	—.01	30.06	norm	66.0	+.2	79.2	norm	4.08	—.40	3.86	-2.16
1876.	30.07	—.03	30.03	—.03	65.1	—.7	81.5	+2.3	5.67	+1.09	5.20	—.82

The variations of the year 1875, or the year of the "predisposition," would appear counteracted in so far as there were normal means of atmospheric pressure and temperature for the summer months, but owing to the marked deficiency of rainfall the summer temperature reacted more intensely, and thus the prevailing climatological conditions appertain to the summer extremes. In the following year, or the year of the epidemic, there prevailed summer extremes in every respect, viz.: By diminution of atmospheric pressure, marked excess of temperature, and diminution of rainfall. The reaction of these influences upon the human organism was destructive and the origin and prevalence

1. The evidence of these facts forcibly tend to invalidate the other idea of infection, rather recently promulgated, that from source of *septical decomposition* "zymotic infectious bodies" would originate and produce yellow fever. Here decomposition transpired in an augmented state and the per centage of the number of yellow fever cases vanishes in comparison to Shreveport or Memphis. On the basis 33 per cent. of mortality there were hence for New Orleans but 3 per cent of the number of cases, but for Shreveport 56.9 per cent., and for Memphis 14.8 per cent. of the total population.

of the yellow fever epidemic was one of the natural consequences. The importance of these facts requires to be fully recognized, and their bearings duly appreciated.

In order, however, to present these facts, or the fundamental law, more prominently, the meteorological data of Charleston are also adduced, as Charleston is a locality climatologically identical with Savannah, and geographically in close proximity. Yet while Savannah was devastated by a severe yellow fever epidemic, Charleston remained almost entirely free.[1]

The meteorological means of the summer months in 1875 at Charleston present at this historical and eventful period a decided character of variation, namely: Temperature extreme and rainfall alarmingly deficient, forming influences of potential reaction in the development of the "predisposition." Moreover the temperature of the summer months of 1876 was also extreme, but in consequence of the excess of rainfall the morbific influences were neutralized and the standard maintained.

The record of Charleston for the years 1875 and 1876 inform us of the following highly important facts:

	BAROMETER.				THERMOMETER.				RAINFALL.			
Year.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.
1875.	30.09	†.01	30.06	†.01	65.1	—.3	79.8	†.5	4.21	—1.07	**2.20**	**-5.28**
1876.	30.08	normal	30.03	-.02	65.7	†.3	81 3	†2.8	6.54	+1.26	**9.23**	**†1.75**

The interesting data of these tables demonstrate the evidence that both summers were dangerous for Charleston, as most potential morbific influences for the development of the "predisposition" prevailed in 1875, and in fact in 1876, favoring the breaking out of the epidemic; in 1875 there was an excess of temperature and *more than two-thirds deficiency of rainfall*, and in 1876 an excess of temperature. Owing, though, to the high rate of precipitation for the summer months of 1876, as the

1. At Savannah died of yellow fever from August 21 to November 30, 1876, 896, which would equal 2,688 cases at the rate of 33 per cent. of mortality. At Charleston died of yellow fever from September 1st to November 30th, but 30 = 90 cases at the same rate of mortality. The population of Charleston was then [according to U. S. census of 1870] 48,956, and of Savannah 28,235. The data of mortuary statistics of Charleston are copied from Ann. Report of Health Department, and were kindly tendered by Dr. Hutson Ford, of this city (St. Louis).

rainfall was by 1.75 in excess or three times as much as in the summer previous, the morbific influences of summer extremes were counteracted, and the law again markedly verified, namely: When the meteorological conditions represent the state of the local means regressive action cannot prevail, and a yellow fever epidemic cannot occur.

The facts as we have them gathered from the history of the two epidemics of 1873 and 1876 sustain the other law, and appear sufficient to demonstrate it, viz.: That only meteorological influences are the causes of yellow fever epidemics.

The law, however, will be further demonstrated by the facts derived from the meteorological records in reference to the great epidemic of the Mississippi Valley in 1878, which eminently contributes in elucidating its potency by the far greater number of localities afflicted, and by the simultaneous spreading over an unusual wide range of territory (from 29th to the 39th parallel, and from 81st to 92d meridian west of Greenwich).

If the tables of the yellow fever area of 1877, or the year of the "predisposition," and those of 1878, or the year of the epidemic, may be submitted for comparison, although embracing only some of the representative localities, and those of some of the localities within the same range remaining comparatively or entirely free—for the purpose of contrasting—the facts there made available afford the evidence that the same law, as before, is again demonstrated; here, however, exhibiting a terrible potency and magnitude. Yellow fever is also here found to have originated and prevailed in regions, at localities and in periods, where and when essential meteorological influences were prevalent.

The nature and degree of intensity of the prevailing influences of those two years may fairly be judged by comparing them with the normal annual means, and with the normal means of the summer months. The kind and range of the variations characteristical for the origin of yellow fever, is thus readily brought to recognition and comprehension, and the force of their reaction upon the health of the population is well understood by the law, a synopsis of which we have already submitted, translated from Prof. Lumbard's work. But to abstain, in conformity with the indications of this law, an opportunity to compare the meteorological conditions, upon which the origin of yellow fever is now proved to be dependent, with those under which health

does not decline, tables are submitted at the end of the volume of the monthly means of the entire year and including a series of years from 1872 to 1878 inclusive, as far as the recorded uniform observations afford available facilities. The importance of the bearings of their data is at once perceptible, when the years in which no epidemic prevailed are compared with those in which the population of certain localities was devastated by yellow fever epidemics (e. g., 1872–3, and 1877–8 at Memphis, the predisposing and epidemic years, with 1875, and average healthy year.) The localities embraced in the list of those tables are the same that are enumerated in the table of the normal means, already submitted above. Of the localities indicated, and which exhibit the principal bearings on the object of this inquiry, we have selected New Orleans, Memphis, and St. Louis, in view of illustrating the meteorological conditions causative of the prevalence of yellow fever, and Shreveport, Mobile and Nashville, in contrast, as these localities were in part and totally free of the fever. In the following tables those meteorological data of principal interest in our point of view may be found indicated:

NEW ORLEANS.

	BAROMETER.				THERMOMETER.				RAINFALL.			
Year.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer months.	Variation.	Annual mean.	Variation.	mean of the Summer months.	Variation.
1877.	30.04	—.02	29.97	--.05	68.5	--.1	81 7	+.9	5.25	--0.46	7.38	†1.78
1878.	29.94	—.12	29.97	-- 05	69.0	+ 4	80.2	--.6	5.69	-- .02	4.75	--.85
MEMPHIS.[1]												
1877.	30.05	--.02	30.00	--.06	61.1	+.4	76.4	--1.3	4.16	--.08	5.12	+1.93
1878.	29.99	--.08	29.95	--.11	62.1	+1.4	79.5	† 1.8	4.05	-.20	2.00	--1.19
ST. LOUIS.												
1877.	30.02	--.01	29.97	--.01	55.5	+1.3	74.4	--.7	3.43	+.06	3.01	--1.09
1878.	29.96	--.03	25 95	--.03	59.0	+4.8	76.2	+1.1	3.45	+.08	3.91	-- .19
SHREVEPORT.												
1877.	30.06	+.01	29.97	—.03	65.1	+.1	80.4	--.7	3.97	-.43	4.16	+.99
1878.	29.98	--.07	29.96	--.04	66 0	+1.0	80.8	-.1	4.90	+.50	3.35	+.18
MOBILE.												
1877.	30.06	--.03	29.98	--.06	66.9	+.5	81.4	†2.4	5.72	+.35	7.03	+.42
1878.	30.08	--.01	29.99	--.05	97.2	+.8	81.2	†1.4	5.35	-.02	6.27	--.34
NASHVILLE.												
1877.	30.05	--.01	30.00	norm.	59.9	†2.0	76.3	--.5	4.13	+.03	4.27	+.63
1878.	30.00	--.06	29 98	--.02	60.2	†2.3	77.7	+.9	4.03	--.07	5.15	†1.51

1. The apparent discrepancy expressed by the data in the table for Memphis, as this place sustained a most destructive epidemic of yellow fever in 1878 and having had no "predisposing" influence in the year pre-

By a comparison of the data of these tables the fact is amply proved that when the effects of the variations of the preceding year are not neutralized in the subsequent year, either by the normal height of atmosphereic pressure, reduction of temperature, or, and which is most important, by the normal quantity (or an excess) of rainfall, yellow fever will occur and prevail, and in proportion to the magnitude of those variations the intensity (numerical increase) of the fever will remain in a corresponding ratio. The tables of New Orleans demonstrate this law fully, especially when contrasted with those of Shreveport and Mobile.

At New Orleans, as will be noticed, variations markedly prevailed of all three influences specified in the table; at Shreveport none of them prevailed, neither in the year of the "predisposition" nor in that of the epidemic. At Mobile the "predisposing" influences did not supervene with great intensity, and the variations during the summer of the epidemic were also of a moderate degree. It may, therefore, readily be perceived that at New Orleans, naturally, from the 12th of July until the latter part of the autumn the fever could prevail, numbering to 16,802 cases with a mortality of 4,062 (25.35 per cent.,) whereas Shreveport remained entirely spared. At Mobile 294 cases occurred, having a mortality of 82. The first case occurred there in the period from the 17th to the 23d of August.

Examining the tables of Memphis, and contrasting them with those of Nashville, the law again is found verified and with great precision. Although the rainfall for the summer months in 1877 of both places exceeds the normal mean, yet an excess of temperature and reduction of atmospheric pressure at Memphis, for the same period, "predisposed" that locality to some extent, and in the summer of 1878 (and almost during the entire first part of the year) these morbific meteorological influences remained in excess. At Nashville, on the contrary, scarcely any "predisposing" influences prevailed in 1877, and in 1878 the slight summer extremes of barometrical and thermometrical indications, were fully counteracted or neutralized by the excess of rainfall.

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vious, because the rainfall was 1.78 in excess, will be found accounted for in the succeeding pages under the head of "Histo-chemistry," where the data of the abnormal meteorological influences for the first five months of 1878 are enumerated. The high potency of the influences of those variations reacted as the predisposing causes for the summer of the same year.

At Memphis, hence, the epidemic broke out, lasting from the 13th of August until late in the autumn, and attaining the number of 12,140 cases with 3,025 mortality.[1] Nashville, in contradistinction, remained totally unaffected, notwithstanding being overcrowded with Southern refugees, of whom many brought the fever with them and died there.[2]

At St. Louis the same law is also found to have been in operation, although this place is the farthest northern station of the yellow fever area in the Mississippi Valley. The meteorological irregularities, during the summer months of 1877, were of the "predisposing" nature, as in addition to the deficiency of rainfall a diminution of atmospheric pressure prevailed; in 1878 the variations exhibited a chain of summer extremes, and thus the morbific influences of the year previous were not neutralized, but, on the contrary, were aggravated; the yellow fever, hence, could originate and prevail.[3]

The total number of cases occurring, from the 24th of August to the 25th of October, were 75 with 39 deaths, of which about 30 cases were of indigenous origin.

The facts so far adduced may still gain in significance when the lists of the number of cases and deaths (appended with the

1. The quota of the number of cases is produced by calculation on the basis of 25 per cent. mortality.

2. Subsequent reports state the total number of cases at Nashville to have been 96 with 18 deaths—all refugees. At Memphis, number of cases 17,600, and deaths 5,150. Comp. History of yellow fever, pp. 95 and 94.

3. There being no locality in close proximity to St. Louis with which the meteorological data of 1872 and 1873 could be contrasted, it may hence be proper to reproduce them here when a yellow fever epidemic devastated Memphis and St. Louis remaining entirely free. The data are the following:

	BAROMETER.				THERMOMETER.				RAINFALL.			
Year.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.	Annual Mean.	Variation.	Mean of the Summer Months.	Variation.
1872.	30.03	normal	29.96	-.02	51.8	-2.4	4.57	-.6	2.55	-.82	2.93	-1.19
1873.	30.01	-.02	30.01	↑.03	54.1	↑.1	74.2	-.9	3.74	↑.37	3.01	-1.07

The morbific influence of the deficiency of rainfall for the summer months of both years was in 1873 counteracted by the excess of atmospheric pressure and reduction of temperature, whereas in 1878 nothing but extremes prevailed, and even the annual mean of temperature was 4.8 in excess.

general tables of the meteorological data) are consulted. An additional fact, of no less importance, will there be found indicated, namely: the rate of morbidity and mortality is coincident with the intensity of reaction of the meteorological irregularities.

The area over which yellow fever was diffused in 1878 was of an uncommonly great dimension, and apprehensions were entertained on that account by the laity and dogmatical professionals, that scarcely a "safe place" would remain, owing to the "dissemination of the poison of infection" by "importation" to any and at every place. But from the meteorological records the highly interesting data are obtained by which the law is at once *scientifically* explained pursuant to which yellow fever was spread over such a large area simultaneously. These data are the marked diminutions of the annual mean of atmospherical pressure over the entire area. But those localities within the area and remaining exempt, yet at them the atmospherical pressure having been below the annual mean, were visited by another meteorological influence counteracting the effects of the diminished pressure of the air, (barometrical minimum) namely, with the normal quantity (or an excess) of rainfall.

Of the principal localities within the yellow fever area of 1878, where the barometrical variations remained below the annual mean, the following quotations may be adduced:

New Orleans	—.12
Shreveport	—.07
Memphis	—.08
Nashville	—.06
Savannah	—.08
Charleston	—.05
Mobile	—.01
St. Louis	—.07
Cincinnati	—.08

The actual importance of these data, in a nosological sense, can be fully comprehended when it is born in mind that diminution of atmospherical pressure implies a prevalence of the wind from an equatorial direction, and that polar currents coincide with high barometrical rates. Further: the atmosphere contains a lesser per centage of oxygen under equatorial currents, and a higher per centage of that element under polar currents.

The fluctuations may attain to nearly 0.5 per cent., as has been ascertained by direct measurement by Jolly, and is demonstrated by the data of the ensuing table: [1]

DATE.	Percentage of O.	Direction of Wind.	DATE.	Percentage of O.	Direction of Wind.
June 13	**20.53**	W.	October 15	20.83	E.
" 18	20.95	N.	" 16	20 75	E.
" 24	20.73	N. E.	" 21	20.84	E.
" 27	20.65	N. E.	" 23	20.84	N. W.
" 31	20.69	N. E.	" 27	**21.01**	N.
July 3	20.66	E.	" 31	20.85	W.
" 17	20.64	S.	November 2	20.91	N. E.
" 19	20.56	S. W.	" 10	20.56	S. E.
" 27	20.75	N. E.	" 13	20.67	W.
October 12	20.78	E.	" 20	20.65	N. W.
" 14	20.86	N. W.			

Pursuing this study to some extent further, namely from the local confinement to the general geographical or chorological distribution of yellow fever epidemics, the law of the meteorological causation of yellow fever is again, and with mathematical precission, verified and sustained. Within the tropic of cancer and north temperate zone all the regions where yellow fever prevails are found in the regions of the summer rains or in the sub-tropical zone or that of dry summer, but that the yellow fever occurs there in the later part of the summer and during autumn when the season has become rainless (i. e. great diminution of rainfall) or dry. In North America, the east coast of Mexico, the Antilles, the Atlantic coast of the United States and Mississippi Valley are found thus located and characterized, and on the West coast of Africa, Cape Verde, and Sennegal as well.[2] In the tropic of capricorn and its sub-tropical zone, where the seasons (i. e. those of the southern half of the globe) occur in the reversed order in comparison to those of the northern half, the law of the meteorological causation of yellow fever is found here in operation with the same precision as it was found in the corresponding regions of the northern half. The fever chiefly prevails in the months of March, April and May, the proof of which may grow evident by the data of the

1. Comp. Zeitschrift fuer Meteorologie, June 1879, p. 229.

2. Comp. Beranger Feraud. Fievre belieuse melanurique, p. 242. Armand, Climatologie general du globe, p. 613.

following table stating the mortality of yellow fever at Rio de Janeiro for a period of nine years :[1]

December...223	March... 999	June.....513	September...112
January.....522	April....1141	July 241	October.....104
February....649	May..... 800	August...164	November...120
Summer....1394	Autum...2940	Winter.. 918	Spring..... 336

In the Andes, at Cerro Pasco, already alluded to further above, it is stated [2] that yellow fever raged there in the months of July, August and September (1855 ?)—quite contrary to the general law—although these months pertain there to the winter and spring seasons, but the rainy season coincides with the hottest season in tropical climates, and so here. The rainy season sets in with the month of October, and extends to the month of April, hence in those months in which yellow fever prevailed at Cerro Pasco, or in the Puna region, the dry season supervened in which, as a general rule, the temperature is at noon oppressively hot (13° R. = 62°.2 F. daily mean—i. e. for the daytime—which is extreme as the barometer does not rise higher there than 20°.17).[3]

At the coast of Portugal and Spain, in the north temperate or sub-tropical zone, where the rainy season begins in the autumn, the fever sets in earlier, viz: in the summer months, and again coincides with the dry and hot season.[4]

Inasmuch as having succeeded to prove by specifying the physical causes of the origin spreading and final termination of yellow fever, there is established at the same time, the proof of

1. Comp. Lumbard, l. c. vol. I. pp. 477 and 478. In 1878 the fever was epidemically prevalent there in the month of February. Comp. Transact of Lond. clin, soc. 1878, p. 187.

2. Transact of Lond, clin. soc. 1878, p. 199.

3. Comp. Muehry, l. c. p. 241.

4. Comp. Lumbard, l. c. vol. III. p. 202, where is stated that the epidemic of 1857 at Lisbon originated in the month of July, and that of 1871 in August. With the facts of observation correspond those relating to New Orleans, where the climatical conditions are differing to any extent. In 1853 the epidemic began in June, and was most intense during July and August, and in 1878 we have seen that the first case of yellow fever occurred on the 12th of July, also earlier than elsewhere in the United States.

The data of the epidemic in 1853 stating simply the mortality are reported by Barton to be the following.

June...31 | July...1521 | Aug...5133 | Sep...982 | Oct...147 | Nov...28 | Dec...4

Total for the year, 7849.

the same law from the generalization of this cursory sketch, and yellow fever, like all other phenomena of nature, corresponds in its occurrence to the reaction of the physical laws, and in the realm of phenomena its nature is determined by the same influences of special conditions which, however, only take place within a sphere of definite limitation. So far by observation[1] the evidence is gathered that the areal boundary line can be drawn as follows: Beginning North at Quebec, [2] and thence following a line east to Livorno, thence south to Rio de Janeiro, [3] from this point a line west to Vera Cruz, and from there north to Quebec again, describing a topographical area 70 parallels by 105 meridians. In reference to altitude in which yellow fever has been found to originate the range may be thus described: In the equatorial regions, from 0° to 11° S. Lt., 14,000 feet; on the tropic of cancer and capricorn and their sub-tropical regions not over 4,000 feet; [4] in the temperate zones from the level of the sea to 600 feet. The latter is the ordinary range and embraces all such localities where so-called miasmatic diseases are indigenous.

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1. Embracing a period of nearly four centuries. It is inferred by Alex. V. Humboldt that the disease, designated "Matlazahuatl" [Fuchs. Med. Geographie, p. 55] by the original inhabitants of Mexico, was yellow fever.

2. Swansea, Engl. in regard to physical geography, is further south than Quebec; its isothermal line denote 53° F., or that of Baltimore, whereas that of Quebec 41° F., or that of Stockholm.

3. Bucnos Ayres, 34°.30 S. Lat., is reported to have had yellow fever. Comp. Dr. J. Alston, vide Transact. Lond, clin. soc. 1878, p. 200.

4. In the West India Islands yellow fever is not known to ascend higher than 1,600 feet [Canstatt, l. c. vol. I. p. 393;] in 1879, on the island Martinique, further above already alluded to, the fever reached the village Morne Rouge, 1575 feet alt. [Berenger Feraud, Fievre, Janue, p. 266.]

SECTION II.

NATURE.

PATHOLOGY.

In natural history, or in the process of development of the organic world, according to our point of view, the law is found demonstrated by the revelations of the processes of evolution and transmutation in constructive (progressive) and regressive metamorphosis, that there is nothing "specific" — i. e., no absolute "self," or an *ontos per se.* — but all form representations being transitory phenomena which emanate from the relativity of matter, and by the nature of physical surroundings species and individual characteristics are determined, on a broad scale, by the proportionate intensity of reaction of physical influences. Yellow fever, consequently, cannot be claimed as a self-determining entity, but common logic already must place it in the group of choloses that are specificated by the intensity of reaction of the physical surroundings and which again are characterized by their chorological limitation and geological location.

But specificists and infectionists are unwilling to admit the unity of nature in general, and in the etiology of fevers in particular. Their basis of inference is the specific poison, and all pathological alteration found post and ante-mortem are endeavored to be demonstrated as the subsequent product of the "poisonous infection." Lighter shadings of an epidemical morbidity, or of any febrile disease, are admitted by them as the results of a special kind of the specific infectious poison," and every variety of symptoms and of the morbid conditions observed in an ensuing epidemic are strenuously pointed out, and, with an effusion of eloquent phrases, designated "specific" differences. Parallels are thus drawn to contrast yellow fever with bilious melanuric fever, with bilious typhoid, or typho-malarial fever; with typhus icterodes, and with the relapsing fever. With all these forms of so-called special or independent diseases, however, and, strictly speaking, in conformity with the laws of morphology, yellow fever is identical, and is only the most potent form of them.

True, characteristic differences are observed in the course and ultimate issue of these fevers, but they are strictly categorical,

and are the results of the *potency* of reaction of the general physical influences that cause differentations in the synthesis of systemic reaction (i. e., in the morbid morphology) under the modifying influence of local variations. The ultimate elements engaged in the process of morbid action in the system are of the same kind in all of the fevers named, and differences that are conceivable must rest in atomic or equivalent proportion of the meterial substrata, analogous as SO_2 will form salts of different characteristics with the same base as SO_3; both reagents consist of the same elements, and only differ in equivalent proportion. There is not one symptom and sign, or any morbid alteration which can be received as pathognomonic of yellow fever; only collectively, and by the degree of intensity they give expression of that morbid condition nosologically designated yellow fever.

Observers of an older date, of whom the names of Osgood Perkins, Cooke, O'Halloran, Gillkrest, Eisenmann, Chervin, may be mentioned, rejected the doctrine of contagion and infection, because they failed to discover the "specific poison." True, their investigations were not aided with those ample means that are available to the investigator at the present day, but their judgment of the nature of yellow fever proves to be truthful, as they reckoned on the basis of physical laws and on the unity of action in the process of nature's morphology. Infectionists, on the contrary, who cannot dwell on anything but the barest assumption, viz.: on the exclusively hypothetical "specific infectious poison," of whose existence and nature not a trace of evidence is discovered upon scientific investigation. Still, with obstinacy, audacity, and in open violation to all facts scientifically and statistically established, it is claimed that the pathological process constituting yellow fever is dualistic in kind, as a healthy organism is said to be poisoned by a *deus ex-machina* = the great unknown "X" of infection — and that in consequence thereof yellow fever sprouts forth!

If metaphysical abstractions must now be rejected as nugatory and inadmissible in the interpretations of natural philosophy, and the principles of homœopathy refused as vague delusions and vanity in medicine, the doctrine of "specific infection" must likewise be refused, as it is of the same nature, and is based simply on error and willfulness; its maintenance must prove a crude imposition on medical science and on all established facts

in nature's history. Inferences based thereon, as to the nature of yellow fever, can only tend, therapeutically, to perversities, and prophylactically, to barbarity. The morbid condition of the system to which by nomenclature the term yellow fever is applied shall not here be alluded to in detail; it will be more fully analyzed under the head of morbid anatomy and histochemistry. In this place it may suffice only to invite attention to the fact that the altered state of the circulating fluids, which gives rise to the characteristic discolorations in yellow fever, is a sequel of previous structural changes in the large glands of secretion, manifested under essential irregularities of physical influences. The material engaged in producing the yellow discoloration is, therefore, no other substance than that which previously formed normal component parts of the human organism, and physiologically serving in the production of life manifestation. In the morbid state their synthesis is only changed and their intensity of reaction is augmented by the degree of the variations of meteorological conditions. They hence gave rise to special or peculiar form representations (choloses), of which the localization (*locus affectionis*) expresses presses their ultimate individual character, viz., yellow fever.

There is no "*specific ectogenic*" material, to the reaction of which the general yellow discoloration could exclusively be attributed, but the material engaged in and essential to the development of this discoloration, is of "endogenic" origin, and can consistently be traced, primarily and subsequently, to an excess of CO_2 in the circulating fluids. By means of this agency, chemically and mechanically, hæmoglobin of the blood corpuscles is decomposed from this, and in combination with biliary matter, imparted to the blood from the liver circulation, the phenomenon of the yellow discolorations ensues, the action, namely, of CO_2, sulphuretted hydrogen, and ammonia (the latter two arising from the imparted biliary matter) on hæmoglobin, produce a melanotic dusky and well expressed yellow-green stain (D and E in the spectrum).[1]

1. Comp. Hoppe-Seyler, Chemische Analysen, pp. 219-221. Preyer, Pflueger's Archiv fuer die gesammte Physiologie, vol. 1 [1868], p. 419-22; also, p. 454 and plate ix, fig. 15.

MORBID ANATOMY.

YELLOW DISCOLORATION.

Of all the morbid conditions, by which yellow fever is recognized, the yellow discoloration of the integument has excited great interest and attention, for the reason that its presence is admitted as prima facie evidence of the existence of the fever. But in the realm of phenomena it has been found difficult to discover the material substratum from which the yellow discoloration has emanated, and forming the pigmentary substance. The morbid anatomy of the cutis does not afford a clue; no particular lesions are met with. The evidence could hence not be produced of what the coloring matter consists, which, by virtue of the "specific poison of infection," should have been deposited there, and even the attempts have not been made to advance a rational explanation of the phenomena, which being based on chemical and spectroscopical analysis.

From the research of the morbid anatomy in yellow fever,[1] conducted by Prof. Summers at Memphis, in 1878, it appears that the investigation was directed toward ascertaining the nature of the coloring matter, but the results all proved negative. The main evidence tending to elucidate this occult(?) subject is to be derived from general (but actual) scientific inquiry conducted in the physiological laboratory. There experiments can not be entered upon, and processes conducted on the basis of the *speculative naught*, the "specific, dualistic, infectious X," but palpable or perceivable matter and physical conditions are and must be employed in order to produce any contemplated result; the facts are there produced by which the inquirer is enabled to explain the tint in yellow fever patients, and is, simultaneously, convinced of this occurrence in common with other icteric diseases (choloses). From physiological research the positive evidence is derived in explanation of the nature of the yellow hue in yellow fever patients, namely: That it consists, as we have further above already indicated, partly in the decomposition of hæmoglobin, by an excess of CO_2 in the blood, and partly in an admixture of biliary matter containing biliverdine[2] to the circula-

1. l. c., pp. 29 and 30.

2. Biliverdine stains mucous surfaces and the cutis yellow. Comp. L. Hermann, Grundriss d. Physiol. p. 97.

ting fluids through the blood, and lymph vessels,[1] in consequence of the statical pressure in the liver.

These substances (i. e., CO_2 and sulphuretted hydrogen, the latter arising from the decomposition of the taurine of the biliary matter) with oxygen form a greenish discoloration which turns into yellow as the complimentary colors of the spectrum inversely cover one another and blend in a manner that green and red form a light yellow color, and green and yellow a greenish-yellow.[2]

To prove further the "endogenic" origin of the coloring material in yellow fever, and its original homogeneous nature, attention must be invited to the facts that biliverdine is derivative from bilirubine, and the latter is formed of the hæmatine[3] of decomposed blood corpuscles (the decomposition of blood corpuscles takes place on a grand scale in yellow fever.) Again hæmoglobine also exhibits a marked greenish hue or two lines in green in the spectrum,[4] without being decomposed, simply by great attenuation. In yellow fever this condition is predominant as the blood is greatly expanded, and markedly impoverished. The cutaneous yellow discoloration, it ought now be fully evident, can only be recognized as one of the forced resultants of the physically and chemically altered state of the circulating fluids, constituting the morbid process of yellow fever, of which (meteorological) influences form the "ectogenic," the structural alteration of the glands of secretion and their subsequent interrupted performance of function the "endogenic," and the physico-chemically altered state of the circulating fluids the "amphigenic" causes from which this disease originates. The verification of these axioms is embodied in the records of the most recent observations, where it is stated that the cutis turns yellow secondarily; at first (i. e., in the incipiency of the general venous stasis) it is rather purple, and the yellow tinge is observed consecutively when the blood has sufficiently changed in its physical and chemical character.[5]

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1. Comp. Samuel, l. c., p, 321.

2. Comp. Mueller, Handbuch der Physik, Vol. I. p. 589.

3. Already intimated by Canstatt, l. c., 2d edt. Vol. II, Part I., p. 382, foot note.

4. Comp. L. Hermann, l. c., pp. 29, 44, 98,

5. Comp. Beranger-Feraud, l. c., p. 195, and Summers, l. c., p. 30. In connection with these facts it is highly interesting what Beranger-

BLACK VOMIT.

The ejection of "black vomit" from the stomach is no longer regarded pathognomonie of yellow fever. In Great Britain, according to Anstie,[1] the observation is frequently made that typhus and relapsing fever are attended with the same symptoms, and Summers[2] states that it is met with "under some circumstances" in other diseases. This author observes further, on the evidence of 482 post mortem examinations, that the dark substance of the vomited matter is simply degenerated biliverdine, and the additional ingredients usually being large proportions of broken down blood corpuscles, detritus of liver secretions and liver cells. These facts, in the opinion of Prof. Summers, indicate that the black vomit is of hepatic origin, and not being produced by a hemorrhage from the stomach and other parts, notwithstanding the assertions of other recent writers to the contrary,[3] as great quantities of this substance were found in cases where an evidence of gastric inflammation or congestion could be indicated.

Reviewing these facts, set forth by direct research, and yielding to the interpretation: The dark substance of the black vomit is derived from biliverdine, the inquirer cannot desist from being impressed with another fact, and which is potent in this connection, namely: That biliverdine is a secondary derivate of hæmatine, a substance rich in carbon, and is of a dark color.[4] Thus by positive knowledge, as established by experiment and analysis in the physiological laboratory, although of purely scientific nature, the clue is afforded which aids to explain the nature and origin of the dark substance in the black vomit. It would hence appear immaterial, from the facts here set forth,

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Feraud further observes—p. 197—and owing to the importance and direct bearings of his observation the quotation may be reproduced in the author's on tongue: "C'est un ictère qui ne provient pas de la bile, car on ne trouve pas les éléments de cette bile ici dans les urines, ni dans le sang. Cet ictère coincide avec un ralentissement remarquable dans la circulation capillaire. mais n'est pas concomitant avec un grand relentissement du pouls."

1. L. c., p. 80.
2. L. c., pp. 35 to 38.
3. Comp. Beranger-Feraud, l. c., p. 233.
4. Comp. Hoppe-Seyler, Chem. Analysen, p. 172.

what view may be entertained, whether this dark material is derived from broken down blood corpuscles directly, or from biliverdine. Admitting the hemorrhagic origin to be true, then simply from a decomposition of oxyhæmoglobine and hæmoglobine, by an excess of CO_2 hæmatine would precipitate, and this substance in itself would be sufficient to impart to the vomited matter the dark color. But on the other hand, viewing the coloring matter to be "degenerated biliverdine," the ultimate result or the chemical rationale in the origination of the coloring material of the black vomit, is the same as under the other point of view. The ascertained facts of the physiologico-chemical nature of biliverdine prove, as we have already seen, that it is derivative from hæmatine forming, in the process of morphology, primarily as bilirubine, and secondarily as biliverdine. "Degenerated biliverdine" must of necessity chromatically exhibit the same physical character as hæmatine, for they are but transformed to biliprasine, and which substance, analogous to hæmatine, would tinge vomitted matter dark.[1] Thus the irrefutable fact is again verified that, namely: Physiological morphology is the elementary antecedent of pathological morphology, and that the latter can only be specifically determined by the material involved, which, however, is homogeneous, but reacts morbidly while being chemically differentiated in its synthetical formula. The origin and nature of the coloring material of the black vomit is therefore fully known, and the hypothetical "X" or "imported" (exotic) "extogenic," or "specific poison of infection," generally believed to be the originator and a component part of the black vomit, must be consigned to its proper abode—to supposition and mystification.

A further source of dark discoloration may still be mentioned, which is capable of assuming great magnitude in diseased processes, or processes of dissolution, where colorless protoplasma is largely exuded and transuded, namely: When CO_2 (which is present in yellow fever in excess) is conveyed to protoplasma, it darkens (truebt) it.[2]

The exemplification may be found in the dark (black) expectoration, which generally is observed in chronic spleen affections,

1. Comp. Gorup-Besanez, Organische Chemie, p. 692, et seq. Hoppe-Seyler, Chem. Analsen, p. 172, et seq. Hoppe-Seyler, Physiol. Chemie, pp. 398-99. L. Hermann, Grundriss d. Physiol. pp. 29 and 98.

2. Comp. L. Hermann, Handbuch d. Physiol., p. 463.

when an undue proportion of large white blood cells circulate through the lungs and are from the action of CO_2 on them expectorated as a broken down or a structureless black mass.

The fact of finding, usually, large proportions of blood corpuscles, more or less deranged or broken up, in the vomited matter, would strongly point to the hæmorrhagic origin, and as also liver cells are met with in them, it is to be inferred that, in a great measure, the blood is derived from the liver as one of the consequences of the morbid actions through which the liver is rendered "almost entirely devoid of blood."[1] But the hæmorrhagic increments are not alone of hepatic origin; they may have been imparted by hæmorrhagic effusion from the surfaces of the œsophagus and stomach. Ecchymosis is frequently observed in the epithelial coating of the stomach, having resulted from ruptured vessels, which were lardaceously degenerated.[2]

But, to allude to all the morbid changes that are observed in yellow fever, is not here the intention; only to those that tend to elucidate the histo-chemical processes (patho-chemistry) or their origin. In that respect, first of all the structural changes which must be described, are those of the

LIVER.

This organ deserves first mentioning, as in it the primary steps take place toward developing the yellow fever, owing to the interruption of its function from mere physico-mechanical influences. The kidneys and spleen are of secondary consideration; although their deranged functions perform an important part in the histo-chemistry of yellow fever; the rest of those organs morbidly altered can safely be classified as complications.

Of 482 autopsies held by Summers[3] over those that died of yellow fever at Memphis in 1878, as a summary statement with reference to the morbid alterations of the liver, that author was pleased to say: "I have failed to remark anything very extraordinary concerning the liver in yellow fever beyond the simple cessation of function;" and, therefore, the hepatic lesions appeared to him "of a negative character."

1. Comp. Summers, l. c. p. 21.
2. Comp. Beranger Feraud, l. c. p. 312.
3. L. c. p. 21.

The evidence, however, submitted by Béranger Féraud[1] of 551 post-mortem examinations is quite different. Of this number that author relates the morbid alterations of the liver of 473 cases, which were specially examined: 25 of them presented vascular turgescence, 30 structural enlargement[2] (consistance augmentée), 22 were yellow and gorged with blood, the rest were brittle and bloodless, and presented a great variety of discoloration; whereas, Summers merely mentions the yellow (boxwood) tint.

The microscopical examination, as is narrated by Béranger Féraud, reveals the following facts: The perivascular connective tissue is thickened and slightly hardened. The hepatic globules have a uniform aspect: their cells are hypertrophied (deo m.m 0176 à 0 m.m 0 394); the nucleus when it exists is rather visible, and is quite large, and sometimes there are two of them. The hepatic cells contain, without an exception, fat globules rounded and in varying numbers; sometimes there is but one, and it fills the cell and nucleus, being flattened and atrophied. The inter-cellular spaces are widened and contain no more connective tissue, but a granular protoplasmatic substance properly belonging to the broken down hepatic cells.[3]

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1. L. C. pp. 290, 316–321.

On this occasion it may not be improper to state that for the home records on this subject requisition was made to the Health Department of this city, knowing that nine autopsies on yellow fever cases were held at the quarantine, and the request was kindly granted and the report of autopsies furnished. It is, however, lamentable that the scientific part usually shares in the government of city Health Departments, so that scarcely anything can be made available for scientific research. As a general rule, objects of scientific value are consigned to refuse. This city contains immense facilities for inquiry on all topics of the medical science; but, as it appears, political qualifications elevate to office and scientific attainments are usually disregarded. The sphere of activeness of our Health Department has as yet not exhibited a completion of its scientific task.

2. Of nine post-mortem examinations held at the St. Louis Quarantine five proved enlargement of the liver.

3. With these statements also agrees the report of post-mortem examinations performed by Dr. Marvin.—Amer. Practitioner, Nov., 1878.

The statements found in the proceedings of the Louisiana State Medical Association, April 9, 10, 11, 1879, p. 146, in reference to the morbid alteration of the liver structure in yellow fever, are too indefinite in order to be available, and do not appear to be based on personal observation.

KIDNEYS.

Not always are these organs found morbidly altered, though some writers assert to the contrary (Summers, Crevaux, etc.), but to others (Alvarenge) only thirty per cent are found morbidly altered. According to Beranger Feraud, of the total number of 551 autopsies 82 per cent were discovered structurely altered, and only 18 per cent appeared unaffected.

The principal morbid changes, uniformly observed, are said to be general enlargement[1] and congestion of the cortical portion, especially in cases in which the disease terminated fatally after a short duration; in the other cases a fatty granular degeneration was observed, involving all tissue elements. Sometimes cysts were found, which were apparently produced by the atrophy of the connective tissue of the Malpighian glomerules that were more or less "vividly" discolorated by biliverdine (not bilirubine), but containing no "colloid matter," but rather serous contents, and which being the consequence of a long preceding interstitial nephritis.

SPLEEN.

It appears from the records submitted by Summers that the spleen is always found markedly and characteristically altered, its lesions being of uncommon prominence, and although resembling those that may be found in common with other febrile affections, yet they were sufficiently well defined. This author found the spleen greatly hypertrophied,[2] its parenchyma distended and the Malpighian bodies swollen — many of them ruptured. Albumen was found largely deposited in the splenic substance in the form of stringy coagula, and a doughy consistency of the splenic substance was observed, resembling the condition known under the term amyloid degeneration. The chief characteristical differences were, that, in yellow fever, the spleen is soft and swollen, with a thin and tense capsule which is sometimes even ruptured, while in intermittent fever the organ is indurated and forms what is denominated the *ague cake* (hence rather hard).

1. Of nine domestic post-mortem cases seven were found with enlargement of the kidneys.

2. Of the nine post-mortem cases of St. Louis Quarantine in six the spleen was found enlarged.

However, the records given by Beranger Feraud[1] do not accord with those of Summers, but of which the latter author was, probably, not aware, however, he observes already in the outset that "the pathology of yellow fever, as set forth by different authors, is strangely conflicting" — neither those agree of the "Transaction of the Clinic. Society of London,[2] nor the other submitted by Haenisch.[3] Some of the differences stated by Beranger Feraud are the following: "The spleen does not present any pathognomonic alterations in yellow fever; its volume, density, physiological state of integrity, or its lesions, are in correspondence with those arising from other causes." The facts of observation stated in the Transaction of the Clinic. Society of London fail to corroborate those stated by Summers, as the spleen was found unaltered, excepting that some vessels were surrounded by chronic fibroid thickening. The negative evidence stated by Hænisch is not quite so direct, as this author remarks that the spleen is not greatly altered (hypertrophied), only being slightly softened and looks darker, and the parenchyma is sometimes rather fragile.

Now, those facts are of particular interest, as they tend to indicate that the spleen is only secondarily affected, as the lesions are not constant, which ought to be the case, according to the doctrine of "specific infection." The "miasmatic," "putrescent" and "specific poison," when having access to the human organism, is supposed to affect the spleen, primarily owing to the immediate toxical (fermentative) effects, which are asserted it produces in the blood, and hence cause the spleen to swell primarily and invariably.

However, excluding the idea of hypothetical influences and that of presumptive processes as the source of the origin and development of the morbid alterations in the system in general and in the spleen in particular, and simply admitting physical influences as the causes of yellow fever, of which the variations have reacted morbifically, certainly the blood and lymph—the circulating fluids—are primarily affected, and then only physico-chemically. The interference of the performance of functions of special organs arising therefrom, if that cannot

1. L. c. p. 321.

2. L. c. pp. 192 and 196.

3. Ziemssen, Handbuch, etc. II, p. 488.

be corrected by the systemic physico-chemical reaction, structural alterations ensue, and by which the general morbid condition of the system leading to the development of yellow fever is reciprocally augmented and intensified. The first of the organs to be affected is the liver (not the spleen), as its histological elements do not bear collateral pressure.[1]

HISTO-CHEMISTY.

Ample proof, probably, has already been submitted under the heading "etiology and genius epidemicus," that the process transpiring in the human organism and terminating in yellow fever are caused by physical influences (meteorological variations); here, probably, it is only needed to indicate the manner in which those transformations are accomplished. It is therefore indispensable to study the primary influences and their reaction upon the human organism, or the biological fluctuations produced by physical surroundings.

It has been seen that yellow fever has prevailed with a degree of intensity proportional to the meteorological variation of a given locality, and that in accordance with the special or general shadings of those influences the sanitary state of the inhabitants exhibits noticeable and essential differences—either being exempt from or severely afflicted with the fever.

From the evidence of the law, which further above was already submitted, it is now understood that an atmosphere of high barometric pressure, or of less elevation of temperature contains a higher per centage of oxygen, and that thereby, in a common altitude (that of, or within 1,000 feet over, the sea level) an increase of the frequency of respiration and pulse is produced, augmenting the exhalation of CO_2 from the lungs. By a reduction of atmospheric pressure and by a higher degree of temperature, particularly when accompanied with dryness (which usually is the case) an influence is exercised of quite a reverse nature, but favorable to the development of yellow fever.

It has also been made apparent that at every locality, when an epidemic raged, a period of predisposition was noticed, some times but slightly, and usually in the preceding summer, but if, exceptionally, the preceding summer months failed to exhibit variations, favoring the development of morbid processes, it

1. Niemeyer, Lehrbuch der spec. Pathol. und Therap. 6th edit., vol. i, p. 659.

will be found that they prevailed in the preceding winter and spring seasons (i. e. of the year of the epidemic,) and consist, mainly, of a reduction of barometrical pressure and an undue elevation of temperature.

These facts are illustrated by the meteorological data of Memphis, which show that in 1877 the meteorological fluctuations were such as not to predispose to disease, but the predisposing influence for the summer and fall of 1878 were prevalent in the earlier part of the same year, which we will reproduce here and differentiate them by a comparison of the year 1875. This year was one of the most normal years as to meteorological variations, and, as we have already alluded to, when no disease of any special character prevailed.

Monthly means of extremes of the reduction of atmospheric pressure, and elevation of temperature at Memphis in 1878:

MONTH.	BAR.	THER.
January	— .13	+ 6.2
February	— .19	+ 5.0
March	— .06	+ 6.9
April	— .23	+ 7.0
May	— .01	+ 2.6
June	— .05	— 2.2
July	— .18	+ 1.3
August	— .07	+ 7.4
September	+ .06	+ 2.9
October	— .02	+ 3.3
November	.00	+ 0.6
December	+ .15	—10.7

By the evidence of these data the proof is afforded that during the first five months of the year such physical influences prevailed constituting the predisposing causes, namely a minus of atmospheric pressure and a plus of temperature, and expressing these extremes in figures the following mean of the five months is obtained:

Bar. — .12 Ther. + 5.5

As to the meteorological data of 1877 of Memphis, which apparently indicate a discrepancy with regard to the prevalence of predisposing influences prior to the epidemic, the evidence, however, which is derived from the data of the table last submitted must appear conclusive to all without diversity of opinion. The period of predisposition prevails; in this case it was

only transposed from the previous summer to the winter and spring season of the same year.

Before entering into the minute examination of the histo-chemical process in yellow fever, which ultimately result in those lesions which make up the morbid anatomy, it would appear a prerequisite to analyze some of the physiological effects of those influences on the human organism that result into regressive action. It would thus be proper primarily to advert to the consequences occurring from the reduction of atmospheric pressure, or reciprocally arising from the force of expansion. Bodies expand in volume proportionately to the reduction of atmospheric pressure, according to their physical character, owing to the law that the force of expansion is on an inverse ratio to the diminution of atmospheric pressure [1] the fluids of the human body, *a priori*, must assume more space, and hence constitute one of the primary steps in pathological chemistry.

This proposition is well sustained by the fact that the blood and lymph, also the gases of these fluids, exhibit a material degree of expansion when the depression of the barometric column amounts to several inches, either in a balloon ascension or on the tops of mountains, so that the blood may be pressed through the skin, pulmonary tissue or other organs.

Under slight reduction of atmospheric pressure, dizziness, vertigo, somnolence, languidness, and relaxation of the muscular tissue is experienced; sometimes bilious vomiting or bilious diarrhœa ensues, a result of venous stasis, and which again is produced by the force of expansion in the volume of the blood. Similar inconveniences are experienced by many persons prior to the approach of a tempest, and those who are "weather indicators" prognosticate, by some particular irritation, a particular change of the weather to take place even several days prior to its occurrence; the cause of the irritation is merely the force of expansion in operation. Moreover these physico-pathological impressions are gravely augmented by a sudden and great excess of temperature, which in the summer months frequently leads to insolation [2] (sunstroke.)

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1. For a definition of this law I am obliged to Professor A. Litton, St. Louis Med. Col., who kindly communicated the desired information in a private note.

2. In the month of July, 1878, such was the experience to an alarming extent, in this city, and has already been alluded to.

Although of the exact degree of expansibility of the blood as a body, data are not at my command, but it is well known that from the gases (O., CO_2, and N.) forming component parts of the blood and lymph, carburetted hydrogen with ammonia is readily formed in regressive action; being gases of high expansibility, they swell the volume of the blood many times, produce a high degree of venous turgescence (e. g. narcosis of chloroform), and consequently a large augmented "collateral pressure."

If in this connection the clinical fact, long since recognized[1] and in this treatise also already alluded to, may be called to mind, namely, that the liver cells while in the physiological or healthy state of action—in the elaboration of bile—do not bear undue lateral pressure unless at once suffering morbid alteration. In the morbid state the pressure meets with still less resistance, owing to the tissue elements being in a great measure deprived of the natural degree of elasticity as the fatty degeneration is then in its commencement, the interference of the performance of function and the consequences resulting therefrom may be well understood, particularly when the interrupting influences continue to exist for an entire season.

Every one exposed to those influences becomes afflicted, but all do not suffer alike, as the individual organization exhibits a certain range of the force of resistance, hence while a large proportion of the population will suffer, only a certain small percentage will succumb. In the original essay on yellow fever, published in 1874, we have already pointed out that by the action of the liver cells primitive compounds are elaborated from the portal blood by hydrolytical cleavage, namely mucine and glycogen.

Mucine is the ammoniacal or alkaline substance which, from all probabilities is essential for the formation of bile; glycogen, the other product, forms under the access of arterial blood into the acini,[2] and which is derived from the hepatic artery. This substance is, from all indications, a suboxide, and is carried by the hepatic vein into the vena cava, reaching thus the lungs, where it eagerly attracts oxygen from the atmosphere and thus constitutes the "vital" impetus in the process of respiration.

1. Niemeyer, l. c.

2. A view suggested some years ago by a distinguished colleague, Dr. John Faber of this city.

But efforts have been made by doctrinarians to discredit the influence of the hepatic histo-chemical action, here set forth, over "vital" action, and over the formation of the physiologico-chemical substrata named in forming the essential increments in general physiology, on the ground that no unquestionable proof is as yet found on record demonstrating those processes to take place in the manner indicated, and the products described were not yet found thus elaborated beyond doubt.

These scruples are, however, readily removed by showing the fact that portal blood contains in 1,000 parts 5.75 fat, whereas the blood of the hepatic vein but 0.97;[1] that further, by way of metamorphosis from lardaceous substance mucinous substance is formed, and from mucinous-lardaceous substance[2] (particularly in regressive action). Also by another fact, namely: That if from any cause whatever the blood circulation of the liver is interfered with, which most readily takes place owing to the double capillary system, the cells of this organ will fail in their physiologico-chemical action in cleaving (separating) mucine from glycogen, and that, consequently, these cells then undergo a fatty degeneration. The blood subsequently conveyed to the pulmonary circulation can not be completely oxygenated in the lungs as residual (ammoniacal) material is left in it, and on this account in itself generates an undue proportion of CO_2 by the absorption of oxygen from tissue elements and from other blood corpuscles; thus the blood is stained characteristically dark, and for the increased number of fat globules there may be found the cause of their origin, also for the formation of urea in the blood.[3]

From the plain processes and simple pathological conditions just now indicated, and of which, as we have seen, the original cause is the force of expansion—the physical equivalent following in an inverse ratio upon the reduction of atmospheric pressure—and being intensified in reaction by a simultaneous excess of solar heat (the temperature), the data submitted in the last table gain in significance. They show, and which is worthy of remembrance, that during the first five months a depression (–.12 mean) of atmospheric pressure prevailed, and that such a

1. Comp. Hoppe-Seyler, Physiol. Chem., p. 468. Samuel, l. c., p. 301, states blood in general contains in 1000 parts 2.5 fat.
2. Virchow, Tumors, Vol. II. p. 399.
3. Comp. Beranger-Feraud, l. c., p. 327.

depression corresponds, on the basis of an inverse ratio, with a + 24 of increase of the force of expansion, therefore pressing upon the liver circulation twenty-four times as much as the atmospheric pressure is not below its normal mean and being intensified in reaction by an excess of + 5.5 mean of temperature. With these facts in regard to the fundamental law of nature before us, the thoughtful observer can no longer be indifferent, and for the dogma of "specific infection" not even a shadow of evidence of its existence remains.

From the nature of those meteorological influences the physiological functions of the liver were so severely encroached upon that, as a natural consequence, the hepatic chemistry failed in the hydrolitic action to separate mucine from glycogen, and the lesions of the blood, augmented by the consecutive structural lesions of the liver, find their *forced* origin, from which results the development of yellow fever in summer and autumnal months, at which time the meteorological variations augment the morbid reactions.

It must be borne in mind that but slight pressure upon interacinous capillaries suffices to cause a regurgitation of bile into the blood; and pressure upon the portal vein, as also upon the navel string, causes CO_2 to collect in the blood,[1] leading, as we know to yellow discoloration[2] from the attenuation of the blood, and from the decomposition of the hæmoglobine of the blood corpuscles regressively forming into yellow coloring matter (biliverdine.)

In the following summary there are found five different modes of origin of the yellow discoloration, viz.:

1. Pressure upon the biliary vessels by which bile is forced into the blood and lymphatic vessels.

2. Pressure upon the portal vein, thereby causing a development of an undue quantity of CO_2 in the blood, resulting in a subsequent yellow discoloration of the cutis.

3. Pressure upon the navel string, thereby producing the same effects in the portal circulation as by pressure upon the portal vein of the adult.

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1. Comp. L. Hermann, Grundriss d. Physiol., pp. 97 and 155.

2. Comp. for histological analogy of hepatic and placental circulation, and histo-chemical action on the composition of the blood or the development of yellow discolvration. Flint, Physiol., Vol. Secretion. Hering, Stricker's Handbuch der Gewebelehre. Rosswell Park, Maternal impressions.

4. Attenuation of the blood by water and gases (CO_2, carburetted hydrogen with ammonia, and sulphuretted hydrogen,) producing the chromatical reflex, in the blood, of the yellow color.

5. Direct decomposition of the hæmoglobine of the blood corpuscles in consequence of contusions, forming bilious coloring matter in the extravasated blood[1] when entirely disconnected with the hepatic circulation.

The "hæmatogenic icterus" can not be precluded, its occurrence is too intimately embodied with the pathological chemistry, or that of yellow fever. The evidence is now so fully presented and is in its bearings so entirely conclusive that nothing should restrain us any longer from announcing the fact: There is nothing peculiar or inexplicable in the discoloration of the tissues in yellow fellow. As we have seen, the same discoloration results from various causes, and is present in various conditions and in different affections, yet it has its origin in common, namely: In the composition of hæmoglobine transforming into biliary coloring matter, and in the physical chromatic reflex. In yellow fever the origin of the discoloration can only be recognized as the result of physical influences, manifested firstly, by the pressure upon the biliary vessels; secondly, pressure upon the portal vein; thirdly, attenuation of the blood by gases, and fourthly, decomposition of hæmoglobine, forming regressively biliary coloring matter extraneous to hepatic connection.

The physical influences in operation producing the causal momenta of the development of yellow fever in human beings are, as we once more repeat, reduction of atmospheric pressure to a degree below the mean; elevation of temperature above the mean; and deficiency of rainfall also below the mean, or, collectively expressed, summer extremes.

One more of the morbific influences remains to be indicated which, in the pathological chemistry of yellow fever, it is a powerful reagent; it injures the blood directly. Its reaction is intensified when the nitrogenized component parts of the blood are not previously sufficiently reduced by the action of the urinary secretions, or an excess of ammoniacal matter in relation to the climatical surroundings is eliminated, a large proportion of the blood corpuscles will then be broken up and the degree of mor-

1. Hoppe-Seyler, Physiol. Chem., p. 399.

bidity as well as that of mortality is in a great measure thereby determined. To it, however, we can here only allude. The records of those localities that were infested with yellow fever abundantly prove that, at least two and frequently all three of the essential meteorological influences simultaneously supervened, and if then the law in physics is borne in mind, barometrical depression, thermometrical elevation, hyetal deficiency is followed by a stagnant air charged with a disproportionately high degree of relative humidity, which has arisen from an increased degree of evaporation, the other law presents itself in full potency that, namely, the

CALORIC

(of the the human organism) can not properly be given off—only in a rate of a little more than one-third—and thereby acting most seriously upon the solubility of the albumen in the circulating fluid, and strongly predisposes to its coagulability (to the formations of capillary embolism ?)

From inquiry the facts have been derived that at 0° in dry air 293.040,and at 30° (C.?) in moist air 105.390 of calorie units were given off,[1] thus exhibiting a difference of nearly two-thirds less in warm and moist air.

As long as the temperature of the human body is equalized by evaporation the degree of temperature will not assume a febrile state, but when the surrounding temperature (that of the atmosphere in our point of view) is approaching that of the blood heat and is moist, a fever temperature ensues at once; organs already structurally altered are, under these influences, prone to undergo a fatty degeneration.[2] The fever temperature in yellow fever has been observed to range as high as 111°.1 (F.?). [3]

In view of these details of nature's law of general relativeness, or of the reactions manifested by the human organism in consequence of physical surroundings, exhibiting either healthful or diseased actions, it would not only be of interest to compare the data of specialized meteorological influences with the general hygienic fluctuation of those localities and districts that are liable to be infested with yellow fever, and immediately

1. Comp. Pettenkofer, Populaere Vorlesungen. Samuel, l. c. p. 735. Lombard l. c. Tom. I. p. 273.
2. Samuel. l. c. p. 335.
3. Proceedings Louisiana State Med., Soc., p. 140.

prior or during an epidemic above synoptically submitted, but it is all important to compare them with those of the general tables, found at the close of this volume, for the series of years therein specified, particularly to contrast them with those of the healthy years; they correspond precisely with the hygienic fluctuations.

It is chiefly due to these potent influences over health or disease that immigration from northerly regions proves dangerous—not so from southerly regions—as in the portal circulation of those who come from northerly districts all the elements are contained, owing to the fact their system is adapted to the northern climate and in the sudden transition to a southern climate and its variations finds its elements readily transformed into compounds constituting the chemical ingredients of the process of yellow fever.

SECTION III.

PROPHYLAXIS.

HYGIENE.

The area embracing the localities that were infested by yellow fever epidemics in 1873, 1876, and 1878 is found between the 81st and 92nd meridian, west of Greenwich and the 29th and 39.07th parallel—i. e. from Savannah to Shreveport, and New Orleans (and below) to Cincinnatti—the altitude ranged from 10 feet, New Orleans, to 675 feet (Chattanooga).

The geological formation or nature of the soil, upon which the localities are founded where the fever prevailed, is in the major part alluvium, particularly along the Atlantic coast, and the shore of the Mississippi River and its contributaries. Some of these localities are found upon different geological formations; in the State of Mississippi and in West Tennessee, besides the alluvial soil, the tertiary formation is almost exclusively met with, excepting a small strip of cretatious formation along the eastern boundary line. Along the shores of the Ohio River and upper Mississippi we find the following substrata: At Cairo, tertiary formation; at St. Louis and Gallipolis, carboniferous; Louisville, devonian; Cincinnati and Chattanooga, cambrian and silurian soil. In the valley of the Cumberland River, at Nashville, cretatious soil is found.[1]

As far as the sanitary condition of any of those localities may appear dependent upon the topographical configuration of the surroundings, or may be deteriorated by accidental or local noxious conditions from collection of sedimentary matter and refuse undergoing decomposition (putrescence, and eliminating mephitic gases)—marked differences are found within the compass of the localities compared, establishing the fact that favorably located and well cleansed places suffered equally as severe from yellow fever as those where the topography is unfavorable and sanitation not at all enforced, i. e. in any sense of strictness. Nay even a locality prone to have yellow fever, and while directly in an unfavorable sanitary condition, is found

1. Comp. Walker, Statistical Atlas of the United States, plates XIII and XIV.

exempt, comparatively speaking, while other cities of less predisposing influences of this kind suffered severely. That theory which seeks for the causes of yellow fever in local putrescence, and asserts that the "infecting malaria" arises from it and would set up a decomposing fermentative process, is not sustained.

New Orleans, for instance, (further above already adverted to) having no altitude (only 10 feet,) and not being cleansed entirely of the sediments left of a great inundation which was spread over the valley of the lower Mississippi in the earlier part of the summer of 1873, yet remained exempt from an epidemic, while Shreveport and Memphis suffered intensely.

While the streets at New Orleans are not so broad as they are at Shreveport and Memphis, the population on the contrary, is by far more dense; thus all the conditions which the "specific infection" theory of putrescence calls into requisition were most prominently represented, and yet no epidemic of the fever supervened. For facilitating the survey of local conditions, from which influences arise that are congenial to the development of, or are predisposing to yellow fever, and which may prove suggestive for the purpose of devising prophylactic measures, a table of the principal cities of that yellow fever area, above defined, is here adduced, expressive of the particular character of the locality in its statistical and physico-geographical aspect, or in its cosmic-chorological relativity.

In the next following table are eight more localities named, in allusion to the yellow fever area of 1878 than were indicated in the meteorological tables. It may be said, in the explanation that the geological and topographical data which can be recognized as essential local conditions in the etiology of yellow fever are thus more fully obtained. Were it justifiable also to concede to the view which of late appears to meet with popular favor, namely that local putrescence precedes the occurrence of yellow fever, such concession could not long be permitted. Like the phrase "importation of the poison," either in the *bilge water*, or by textile refuse or raw material; or that of the "dormancy of the poisoning germs," it proves a gratuitous illusion. The enumerations and descriptions of some of the principal localities of the yellow fever area of 1878 afford the proof that the fever did not prevail, as we know, even where hygienic rules were insufficiently carried out, while at other localities where they were strictly enforced and no putrescence was to be found,

TABLE STATING LATITUDE, LONGITUDE, ALTITUDE, GEOLOGICAL FORMATION, POPULATION, PREVALENCE OF "MALARIAL DISEASES," ETC.

LOCALITY.	Latitude.	Longitude W. of Greenwich.	Altitude (feet.)	Geological Formation.	TOPOGRAPHY.	Population.	PREVALENCE OF "MALARIAL DISEASES."	REMARKS.
New Orleans..	29.75	90.00	10	Alluvial.	Sea port, and is located on the left shore of the Mississippi River upon flat and swampy soil.	191.418	From 900 to 1,400 per 10,000 deaths	The surface of the ground on which New Orleans is built is below high water mark. The population at the present, probably exceeds the number here stated, as this is only a copy of that stated by the United States census of 1870.
Shreveport	32.30	93.45	180	Alluvial.	Located on right shore of Red River in a plain which, in the western direction, is swampy, and nearly borders on the Cross Lake in the northern direction.	4,000	From 900 to 1,400 per 10,000 deaths	In the western direction, but in close proximity to the city, there is a rendering establishment, from which a great stench is spread over the place, and the locality is reported to be filthy.
Memphis.....	35.08	88.00	400	Alluvial.	Located on the left shore of the Mississippi River, and on rather elevated argillaceous soil, of which the height is probably on an average 130 feet over the river bed, slanting westwardly to a level of Wolf River and another creek which passes through the city.	40,226	From 530 to 900 per 10,000 deaths	The geological and topographical data were kindly stated in a private note by Commissioner J. B. Killebrew, already referred to, and from general information, it is learned that refuse is directly conveyed into the creek, from which consequently injurious affluvia are arising.
Nashville	36.10	86.40	533	Cambrian and Silurian.	Situated on left bank of Cumberland River upon undulated surface, which, however, in the northwestern direction is flat and soil of the humus variety.	52,865	From 100 to 250 per 10,000 deaths	There is no particular source from which a contamination of the generally good sanitary condition could arise.

TABLE STATING LATITUDE, LONGITUDE, ALTITUDE, GEOLOGICAL FORMATION, POPULATION, PREVALENCE OF "MALARIAL DISEASES," ETC.

LOCALITY.	Latitude.	Longitude W. of Greenwich.	Altitude (feet.)	Geological Formation.	TOPOGRAPHY.	Population.	PREVALENCE OF "MALARIAL DISEASES."	REMARKS.
Savannah	32.05	81.70	45	Alluvial.	A seaport, located on right bank of the Savannah River and about 12 miles west of sea shore, on a sandy plateau of about 45 feet elevation over the river bed, with swamps on the eastern and western side.	28,235	From 550 to 900 per 10,000 deaths	The city has wide streets with numerous shade trees, and is rather sparsely inhabited. The data of the survey, etc., are in the main copied from Dr. Woodhull's report, for which see *American Journal of Medical Science*, July number, 1877.
Charleston	32.45	79.57	30	Alluvial.	A seaport, and is located on low, sandy ground.	48,956	From 900 to 1,400 per 10,000 deaths	The streets of Charleston are spacious and are shaded with trees; they are also kept extremely clean. The dwellings are comfortable, and of elegant construction.
Mobile	30.24	87.59	52	Alluvial.	A seaport, located on Mobile Bay and upon sandy soil.	32,034	From 550 to 900 per 10,000 deaths	.....
St. Louis.....	38.40	90.50	450	Carboniferous. (Surface sandy loam underlined with lime stone.	Located on right bank of Mississippi River on undulated ground with a gentle eastward declivity.	490,000	From 550 to 900 per 10,000 deaths	The number of the population is that which was reported by D. B. Gould in the City Directory, 1875. The sewer system is excellent and secures a thorough drainage. The streets are macadamized with lime stone, and they are hence either miry or dusty, and in some quarters very filthy. The rates of mortality, however, compare very favorably with other cities, as only the minimum is reached in St. Louis.

TABLE STATING LATITUDE, LONGITUDE, ALTITUDE, GEOLOGICAL FORMATION, POPULATION, PREVALENCE OF "MALARIAL DISEASES," ETC.

LOCALITY.	Latitude.	Longitude W. of Greenwich.	Altitude (feet)	Geological Formation.	TOPOGRAPHY.	Population.	PREVALENCE OF "MALARIAL DISEASES."	REMARKS.
Cincinnati	39.07	84.30	550	Cambrian and Silurian.	Situated on the right bank of the Ohio River, is a pleasing and picturesque valley, which is, semi-circularly surrounded by a series of hills, that are all under high culture.	216,237	From 100 to 250 per 10,000 deaths	.....
Gallipolis.....	38.40	82.10	600	Carboniferous.	Located on the right bank of the Ohio River, a little below the mouth of the Kanawha River, and upon fertile ground.	3,700	From 100 to 250 per 10,000 deaths	On the eastern or West Virginia side of the "Kanawha Ridge," extends up to the shore of the Ohio River in a direction from southeast to northwest, and on the western or the Ohio side another small ridge extends further north. Gallipolis is thus found in a narrow valley, to which equatorial winds have ready ingress, and against the polar currents the localiiy is rather shielded. The annual isothermal line nearly corresponds with that of Baltimore.
Louisville.....	38.00	85.25	500(‡)	Devonian.	Is founded upon the left shore of the Ohio River, in an open plain, with a rolling surface, of which the immediate subsurface stratum is limestone.	100,753	From 100 to 250 per 10,000 deaths	.....
Cairo.....	37.00	89.15	42(‡)	Tertiary.	Located in the trigon of the junction of the Ohio River with the Mississippi River. The ground is low and the city surrounded by dikes.	6,300(‡)	From 550 to 900 per 10,000 deaths	Cairo is principally a commercial depot; for the comfort and general cleanliness, in regard to inhabitation, but limited provisions are existing. The surface of the ground is nearly on a level with the medium stage of the water in the Mississippi River; hence the locality is prone to collections of filth.

TABLE STATING LATITUDE, LONGITUDE, ALTITUDE, GEOLOGICAL FORMATION. POPULATION, PREVALENCE OF "MALARIAL DISEASES," ETC.

LOCALITY.	Latitude.	Longitude W. of Greenwich.	Altitude (feet)	Geological Formation.	TOPOGRAPHY.	Population.	PREVALENCE OF "MALARIAL DISEASES."	REMARKS.
Chattanooga...	35.00	85.15	675	Cambrian and Silurian.	Located on the left shore of the Tennessee River, which has in part a rising pebbly surface, and in part a black or loamy fertile humis soil. The surface is in a basin-like valley, which is surrounded by mountain ranges, varying from 800 to 1,800 feet in height over the river bed.	12,500	From 550 to 900 per 10,000 deaths	This city is spaciously built, and the inhabitants are fully cognizant of the necessity of enforcing general sanitary rules. The place, however, has a marked valley climate, owing to the immediate return of the vapors from the river, as the mountain tops are but seldom reached by the ascending current. A vapor cloud, during the warm season, is usually suspended over the locality, which reacts in a degree highly morbific.
Holly Springs.	34.45	90.24	400(‡)	Tertiary.	An inland town, and is located on sandy surface stratum of the soil in an undulated plain.	4,000	From 550 to 900 per 10,000 deaths	This place is said to be higienically well regulated, where cleanliness is one of the most prominent features, and the streets are laid out spacious, the ground having a natural drainage.
Vicksburg.....	32.20	90.49	350	Alluvial.	Located on the left shore of the Mississippi River, and upon a bluff, about 50 to 75 feet higher than the river bed.	12,443	From 550 to 900 per 10,000 deaths	.....
Natchez.....	31.33	91.28	246	Alluvial.	Located on the left bank shore of the Mississippi River on a bluff of about 50 feet elevation over the river bed.	9,057	From 250 to 550 per 10,000 deaths	.....

the fever raged furiously. This fact is well exemplified by the yellow fever history of New Orleans in contradistinction to Shreveport and Memphis in 1873, already intimated, and by that of Holly Springs in 1878. The latter city is reported to be exemplary as to cleanliness, and ranks first in order in the enforcements of hygienic regulations. While at Memphis, it is said, filth and putrescence constantly impart septical effluvia to the air, which arise from the Wolf River and another creek passing through the city by which are received all refuse, yet, proportionately, Holly Springs suffered more intensely than Memphis.

Moreover, the fact is verified by the history of Louisville and Nashville of 1878. In a hygienical point of view both cities are located equally favorable, and have sanitary measures observed with an equal strictness, also to both places alike thousands of Southern refugees came in during the epidemic, and yet Nashville remained entirely unafflicted while at Louisville indigenous cases were brought to observation.

But, the untenableness of the view, that in local "putrescent infection" the cause is found of the occurrence of yellow fever at particular localities, is further made apparent by the evidence derived from a comparison of the origin of the fever at Grenada and Memphis in 1878. Grenada is rather a healthfully located town: in an open and undulating plain, on the left bank of the Yalahusha River (a small tributary to the Tallahatchee), in 32° 50′ latitude and 89° 52′ longitude (about ninety statute miles south of Memphis), and its population is 3,000 (‡). The prevalence of the so-called malarial diseases ranges there only to a medium intensity, from 250 to 550 mortality per 10,000 from all causes; yet the first case of yellow fever was observed on the 25th of July, whereas, at Memphis, on the 13th of August — nearly three weeks later — although the population of Memphis was confined to the area of the city, owing to the enforcement of land and river quarantine restraints, after the 27th of July, and consequently exposed to "putrescent infection," constantly arising from Wolf River and the other creek, passing through the city.

The evidence developed by these comparisons can certainly no longer be disregarded; they indicate that the causes of yellow fever epidemics are not found arbitrarily assumed possibilities, but are found in the variations of those physical influences by

which all vital manifestations are determined, either in plants or animals, and archebiotic,—or necrobiotically. Nevertheless, the reply is frequently heard that those who pretend to disprove the tenableness of the doctrine of the "poison of infection," and who believe that they are exposing the delusion, by which the explanation of the phenomena of nature is based on metaphysical preconceptions, or that it ought to be immaterial whether the people reside in a swamp region or on lofty heights; in comfortable mansions, or in mere huts; whether the surroundings are filthy, or sanitary regulations are properly carried out. Such utterances are gratuitous; they entirely fail in their object. It is a universally recognized fact that the power of resistance against morbific influences is maintained in an inverse ratio to telluric exhalations. Hence, that people should dwell on grounds the exhalations of which do not exceed the minimum is self-evident. Objections against inhabiting localities where the "peculiar" or the "putrescent specific poison of infection" (e. g., "bacillus malariæ") developes are equally as consistent as they are plausible; but surely this is not the case from the fear of the incidental or regular products of the general process of decomposition have any significance in themselves, but from the fact that the nature of the soil, where such processes and developments are taking place, is the cause of physio-chemical influences, which prove highly detrimental to health and life. It is a well established law in physics that, in consequence of the decay of organic substances, ozone is displaced from the atmospheric air, the soil of those localities and districts where decay is incessant admits of being overheated, and that CO_2 is exhaled from it in proportion to the temperature of the soil, leading to a serious contamination of the atmosphere and a morbific interference of the process of respiration.

These facts have been ascertained by direct investigation, when at the same time it has been further learned that on loamy ground the atmosphere contains a normal proportion of ozone, the upper layers of sandy soil (such as is found at Dresden, Saxony,) contain a certain quantity of condensed oxygen, but the highest percentage of CO_2 of the ground coincides with its highest degree of temperature, as the air of the ground then contains from five to six per cent less oxygen than the atmosphere[1]. Thus the view is conceded to that cities located on sandy

1. Comp. Pettenkofer, Cholerafrage, p. 82; also, Muehry, l. c. pp. 105-6.

soil and on subsoil sandstone formations, such as Lyons, France, and Fuerth, in Bavaria, are exempt from cholera, while other places may suffer intensely that are located differently, although being in close proximity to those named.

If similar sanitary advantages should be claimed for Holly Springs in regard to yellow fever, the correctness of the inference derived from the facts of observation is not weakened. This place is located on but slightly elevated ground, of which however the uppermost stratum is sandy. Then, contrasting the tenableness of the inference, that on sandy soil no epidemics of cholera or yellow fever are apt to prevail,[1] as from it no immediate impurities (CO_2 and $CO+HO$) are given off, while yet yellow fever raged at Holly Springs equally as severe as at any other locality which rests on alluvial soil, the apparent discrepancy is explained by the following facts: In the first place, Holly Springs is located in the 34.45 latitude, and under the 60th isothermal line, upon tertiary formation at the boundary line of that of the alluvium, whereas Lyons, in France, is located in the 45.48 latitude and under the 50th isothermal line, or Fuerth, in Bavaria, in the 49.27 latitude and the 49th (‡) isothermal line; the annual temperature consequently is more than ten degrees higher at Holly Springs than at either one of the two named cities; the telluric exhalations of morbific reaction are at Holly Springs proportionately intensified and augmented as the sandy stratum and "bluff loam," which are of small extent, are intermingled with alluvium. Secondly, in the upper regions of the State of Mississippi, or in the "Lagrange group," the first layer is alluvium, the second one "bluff loam," and the third orange sand, which are frequently interlaced and contain layers of clay with dark vegetable matter and beds of lignetes.[2] Such is a porous soil from which morbific exhalations rise extensively, especially when it becomes heated by the summer temperature.[3]

The reasons, therefore, why Holly Springs may not remain

1. Caravans traveling through the deserts of Africa are not known to suffer from cholera or yellow fever.

2. Stated and kindly submitted in a private note by Hon. J. B. Killebrew, Commissioner etc. of the State of Tennessee; also, some of the geological data are remembered from personal observation.

3. Comp. Pettenkofer, Cholerafrage, pp. 82-83, and author's treatise on cholera, 1877, pp. 24-25.

exempt from yellow fever epidemics are self-evident, and explain fully the conditions of the phenomenon.

QUARANTINE.

Arguments urged toward proving the justice of the policy of establishing and maintaining quarantines, as a preventive means against the spreading of epidemic diseases, certainly fail to verify the claimed efficacy of the measure. They only bear testimony to the depressing fact that the immense advancements of science, promoted and achieved by modern investigation, have as yet failed to illuminate that state of mental darkness which, lamentably, has clung to the human race for ages. It is principally nurtured there, where, from the downy couch of indifference, the social incongruities of egotism and dualism are directed perpetually to be fastened upon mankind, in order to obscure the mutual relation of man and nature.

Implicit faith and fear are therefore cultivated; and, in the search of prophylactics against epidemic diseases, not the reasoning faculty of man is consulted which, from the purifying process of scientific investigation, would be the only tribunal for admissible advice, but refuge is taken to custom based entirely on ignorance and superstition. This is sustained only by arbitrary and crude force. Thus quarantine restrictions are exercised under the pretext of prophylactics against disease, but in reality rather for political power and commercial gain.

The "wisdom" which led to the establishment of quarantines dates back to more than four hundred and fifty years. In 1423 quarantine restraints were brought into operation on some islands near Venice, in Italy, against the "importation" of the plague, under the supposition, it being an entity, "endowed" with portability, and on this basis, as at the present day, after the solid foundation of the great doctrine of evolution and transmutation is universally verified and acknowledged — pursuant to which no "specific entity" has an existence on the earth's surface — our cleared up knowledge is ignominiously placed on a level with that state of medical intelligence of the days of Galen (albeit, due reverence to this pre-eminent writer) and to the subsequent era of Paracelsus, when nosology was not a science, but a mere supposition (rather a superstition, as in the individualized Theion of the Greeks was still believed in, in the explanation of the causes of epidemics). Now, in our days, or in

the era of progress and enlightenment, the assertion is stoically ventured that "quarantines are required *from scientific reasons*, and when strictly enforced would *perfectly protect against any epidemic disease*.

It can scarcely be realized that such a wrong could be imposed upon science in general, and upon statistical records in particular, unless dotated interest and bounds of servitude determine the sacrifice of the supremacy of science, human dignity, and independence in the cause of truth. Prior to the introduction of the microscope no definite idea could be formed as to the nature of the supposed "poison," which was (and is yet) *believed* to disseminate disease, and merely a crude inference—that one person "infected" the other—prevailed, which was (and is still) thus interpreted from the continued spreading of epidemic disorders. Since the era of Ehrenberg an apparent persistence has been made available in behalf of that belief, and of the portability of the "infecting poison," as this great naturalist demonstrated the existence of infusoria and their vibrionic action; subsequently similar discoveries were made by examining the circulating fluids and the excretions of persons afflicted with and dying of an epidemic disease, and the credulous mind was thus strengthened in the assumption that the "poison of infection" was an organic entity. In this deception has culminated the error and spurious philosophy of "specific infection;" *the* PRODUCTS *of the process of decomposition are looked upon as having been the* CAUSES *of* the same; individual vibriones are supposed to be self-determining in their action, and not being subject to the omnipotent reaction of the laws of nature or to its physical surroundings.

The great revelations of transmutation in the process of evolution advanced by the doctrine of descent furnished the explanation, that from the "lifeless" substance "living" matter was derived, and from the protoplasmic, specialized cell formations which, in the progressive (constructive) metamorphosis, transform into a higher order of organization. In the regressive (destructive) metamorphosis the course is reversed; the ultimate products of decomposition are the lower and lowest forms, and, finally, the inorganic material. Life actions were hitherto (and in mental obscurity are yet) regarded a mystery, but by modern research they are recognized as the physical and outward manifestations of molecular (atomic) physico-chemical ac-

tion, consequently physical phenomena—either archebiotic, or necrobiotically and are dependent upon or produced by essential conditions of the physical surroundings. In disease, especially in the form of epidemics, this law is irrefutably demonstrated by the data already submitted under the head of genius epidemicus, and by the meteorological, morbid and mortality statistics, found at the end of this treatise. The efforts of infectionsts, therefore, to let the law of *physical* causation of disease appear dubious, by means of rhetorical adroitness and polish, which are employed to lend a probability aspect to the existence of an "infectious poison" with the attributes of specificness, dormancy and portability, fade away in their effects just as the Papal anathemas against science and learning.

Now as to the claimed protection of quarantine measures, and the utility or necessity of establishing and enforcing such restraints, quite naturally we find that the results obtained by an investigation of any profundity correspond precisely with the results that follow the laws of causation.

Yellow fever occurred and continued to prevail, where from the force of the causes, (meterological variations), its origin and duration was one of the necessitated resultants in the realm of phenomena, against which the enforcement of quarantine restriction proved to be mere mockery or as irrelevent as a necromancer's conjuration, as vaccination against variola, or as the wearing of an amulet against accident. Comparing the mode of diffusion of yellow fever with other epidemic diseases, (cholera and plague) which often spread widely and rapidly, the same important fact in learned, namely: this fever spreads from the the equatorial towards the polar regions (at least north of the equator), following, hence, the same law as cholera and the plague, namely: the rotation of the anemon.

Another fundamental fact is corroborated by these diseases in their course, namely: when the currents of air continue to prevail from the polar region (i. e. when actual frost sets in), they disappear, or recede to their minimum.[1]

1. The statements of Canstatt, II. p. 424, second edit., that cholera prevailed at Moscow in the winter from 1831 to 1832 at—35° is certainly incorrect; later writers (Lebert, Ziemssen, II. p. 383, Germ. edit.,) state it but —20°, and if correct inquiry can be made, the results will be still more different. In regard to the plague, the inhabitants of Aleppo know from experience that they will remain free when the disease originates in a northern direction (Smirna). But when occurring in a southern locality, (Damascus), they will have a visitation. Canstatt, l. c., p. 458.

True the plague prevailed at Astrachan from the end of October 1878, to the 11th of February, 1879 (the plague is from all evidence nothing else than a variety of typhus and is therefore more apt to prevail in hibernal seasons), but it may be remembered that Astrachan is located under the 52d isothermal line, on low ground, and at the mouth of the river Volga near the Caspian Sea. Although the district is a low desert, yet it is shielded rather by hilly and mountainous ranges against the ingress of polar currents, but is entirely open to the access of the currents from the equatorial direction, coming over the Caspian Sea; the winter months will be variable, and a mild state of the weather will prevail there to an unusual degree.[1] In general, it is stated, the weather in this region being variable (rather pleasant), the spring season is early, and the summer hot.[2] With the variatians of the weather, disease varies.

In the winter 1878-9, when frost set in, there were few cases of the plague, but during the thawing season, morbidity and mortality increased,[3] notwithstanding the most stringent quarantine measures were put in force (double military cordons, etc.), but upon the approach of equalized or normal climatic conditions (spring season), the plague disappeared.

The Russian government, subsequently, has nevertheless ordered all houses in the "infested district" to be burned, and on the 1st of April General Mellikoff reports to have executed the order faithfully—an indellible testimony of barbarity and absurdity.[4]

In yellow fever the law of spreading is entirely analogous to that of the plague. In the epidemic of 1878 there was a great opportunity for observation on these points, as it spread in rapid succession over the largest territory noted in our records. The first case came to observation In New Orleans on or about the 24th of July, and subsequently the fever spread in a northern and

1. The rainfall is but 15 inches, ann mean. Blodget's climatolgy, chart opposite page 220.

2. Pierer, Lexicon.

3. Anzeiger des Westens, St. Louis, Feb. 2, 1879.

4. To what extent this violence conflicts with science and the laws of nature may be judged, that the German Government duly suppressed—from diplomatic reciprocity—the report of Prof. Hirsh on this subject, as therein these barbaric measures were duly criticized. Comp. "Freidenker," Milwaukee, April 18, 1880.

northeastern direction until the furthest points were reached, St. Louis, Cincinnati and Gallipolis, notwithstanding the physical law herein involved, yet the believers of the doctrine of "specific infection—like those of an orthodox creed—failed to recognize any fact not allied to their creed, and the natural law of the diffusion of the epidemics could therefore not be comprehended. The law of the mode of spreading in yellow fever epidemics, may be more correctly understood after some of the facts are learned which bear testimony against the existence of the "poison of infection," and hence against the propriety of quarantine restraints, before the explanatory details may again be alluded to, which demonstrate the physical causation of the origin and diffusion. The efforts of disproving the arbitrary assertion of "infection" and "portability of the poison," may appear not necessary, but as a great majority of medical men accede to those false doctrines, circulated purposely to justify the enforcement of quarantine restrictions—or rough police violence—it would therefore be justifiable to adduce some of the facts, which prove on the basis of experience the non-transmissibility and portability of the fancied poison.

a. Duchassaing tested the contagiousness or infectiousness of yellow fever by sleeping with a yellow fever patient in the same bed for several nights without discovering subsequently the slighest impression.[1]

b. Contagion failed to manifest any effect upon inoculation with blood and excrementitious matter of yellow fever patients, or upon imbibition of black vomit.

c. The wearing of the garments of yellow fever patients by others, such as the immediate exchange of shirts, remained without any effect whatever. Also the disease was not communicated by the distribution of other things of yellow fever patients.

d. In hospitals, located healthfully, the attendants were never affected by the disease; nurses as well as other persons remained perfectly free.

e. Within infested districts isolation did not not protect, and quarantine restrictions proved an utter failure.[2]

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1. Comp. Henoch, Supplement to *Canstatt Spec. Path.*, p. 141.

2. Comp. Canstatt, l. c., pp. 400–1. Also Armand, Climatologie General du Globe, p. 735, where a report of the British Council General of Health of 1853 is found, which states, as one of the results of its investigation, that "there is no proof of yellow fever ever being imported."

These facts of observation date back to a period of thirty-five or forty years, hence when the belief in the utility of quarantine measures was fairly ebbing. The argument, it is probable, may now be advanced that requisite strictness in the enforcement of quarantine measures was not observed, and hence that period could not be admitted as a criterion. But in answer to the fact that from 1869 to 1877 on the island of Martinique epidemics of yellow fever again prevailed after a period of eleven years "immunity," and as during this period quarantine measures had been strictly enforced; besides there is a standing assertion that yellow fever never originates there.[1] If inquiry is now directed towards the history of the domestic quarantine restraints, in view of ascertaining the basis on which the lawful right of their enforcement rests, instead of finding scientific facts referred to in the reports of official commissions on which are based recent quarantine laws, mere antiquated custom, again based on ignorance and bare assertion, and which sometimes are in direct conflict with the recorded facts, are met with, and form the groundwork of quarantine authority. To illutrate this, some quotations may be adduced which are copied from the resolutions adopted by the American Public Health Association in session at Richmond, Va., from the 19th to the 22d of November, 1878. They read as follows:

"Not in a solitary instance has a case of yellow fever been found which justifiably could be considered of *de novo* origin—many showed direct importation—and the evidence was convincing in character. The poison was conveyed in clothing, cotton bagging and other goods of a similar character."[2]

Further, from the "Conclusion" of the Board of Experts, authorized by Congress to investigate the "Yellow Fever Epidemic of 1878," quotations may also be adduced which bear similar testimony. The eighteenth of those conclusions[3] has the following wording:

"In all the countries outside of the West Indies which have been visited by it, yellow fever is an *exotic*[4] disease; and in all of them its introduction can be traced either directly or indirectly

1. Comp. Beranger-Feraud, l. c., pp. 70 and 482.

2. The quotations are reproduced in condensed form from several of the resolutions.

3. Dated Washington, January 28, 1879.

4. Italics are mine, for special emphasis.

to the West Indies. In some of them it seems to have established itself permanently, and to have become endemic; as for example in the Brazils. In most of them it has failed of naturalization, and successive epidemics can be traced to successive importations."

The asserted facts of observation, claimed in those "Resolutions" and "Conclusions" here cited, are too closely akin to the favorite views of the late Dr. J. W. Woodworth, Surgeon General of the U. S. Marine Hospital Service and President of the "Board of Experts," published in a pamphlet entitled: "The general subject of quarantine, with particular reference to cholera and yellow fever," Philadelphia, 1877—to be regarded as quite free from the dictatorial influence of this officer, one of whose chief aims was to establish a national quarantine law (since complied with by Congress, and approved by the President of the United States toward the end of May, 1879,) in order to secure an oppresive surveillance over the traveling part of the population, after the manner of despotic governments under the captious phrase of sanitary necessity, creating sinecures for those favored, and having the tune of mutual and reciprocal aggrandizement well pitched.

Among the many unwarrantable assertions of said pamphlet, some are characteristic and may here be alluded to for throwing light on the probable origin of those "resolutions" and "conclusions." They are the following:[1]

"Yellow fever is a disease produced by an invisible poison, capable of self-multiplication outside of the human organism"—"The germ is transmissible. It is capable of being transported in the personal effects of passengers and sailors, but the damp, filthy holds and bilge water of ships are its favorite lurking places, where, if confined it multiplies and increases in virulence to such an extent as not only to affect those on board, but even to exert its pernicious influence in the direction of the currents of air to a considerable distance."[2] By these quotations are ex-

1. P. 9.

2. The latter part of the quotation bears full analogy to the puerile fears entertained of the fancied venomous nature of the salamander, described by Plinius, for which see Author's pamphlet on variola 1878, p. 14, the first part of it fairly exhibits the illusive character of bare assertions, no evidence in its behalf is on record; on the contrary the results of direct investigation on these points proved entirely in the negative. Comp. evidence submitted in the official report of Surgeon Woodhull, U. S. A. in

pressed the fundamental views upon which the principal provisions of the national quarantine law are based, and by them is also expressed the spirit in which the law is executed by the National Board of Health.

Depressing and humiliating to the scientific inquirer as it is to tolerate the sway of such fabrications in medical science, yet with a perverted taste they are welcomed by a great majority in the profession in preference to the modest truth of nature's reality, elucidated and established by prolonged and exhaustive investigations; the latter are rather consigned to the wastebasket. Thus pursuant to erroneous precepts and maxims the American Public Health Association have quoted from page 10 of Surgeon General Woodworth's pamphlet that "the period of incubation of the yellow fever 'poison' was from two to six days," and stated further, on the supposition of the "portability of the poison" that the "poison of yellow fever" was imported to New Orleans in the latter part of May (25th?) by the steamship Emily B. Souder, but the first case of yellow fever did not occur earlier at New Orleans than on the 12th of July, according to the official Weekly Reports of the U. S. Marine Hospital Service.

If now the asserted virulent attributes of the imagined "poision," and the pretended efficacy of quarantine restraint against its "importation" are borne in mind, a remarkable discrepancy is brought to notice between its mathematically calculated potency of reaction, and, when compared with the natural mode of occurrence and diffusion, its quarantine prophylactis. Here already the period of incubation is found to extend over a lapse of time of more than six weeks, or, to suit the occasion, were the "germs," "endowed" with "dormancy," thus offering resistance to the physical forces under a temperature of 81° and 84° (monthly mean respectively) and being in "*the bilge water—their favorite lurking place?*" Whereas, even the vigorous upward fermentation, as we know, can not resist a temperature of 64° to 77° under the access of due moisture.[1]

reference to the epidemic of Savannah in 1876.—American Journal of the Med. Science, July 1877, p. 38. Others will also find evidence in said report disproving their being "strongly convinced" that the "yellow fever poison can only be imported by portions of the soil or atmosphere from an infected place"—St. Louis Clin. Record, Sept. 1878, p. 146—as an equally gratuitous illusion.

1. Comp. Claude Bernard, l. c. pp. 76–79.

New Orleans being the first locality where the fever occurred, this city was thus declared the "center of infection,"[1] from which at a subsequent date a river tow boat, John Porter, has been accused of having taken the "poison of infection" and carried it to ports up the river.

The Porter left New Orleans on the 19th of July for her trip up the river and landed at Vicksburg on the 25th of July, where, as we already know, two of the crew were left afflicted with yellow fever, but the first indigenous case was observed there on or about the 11th of August.

On the 29th of July three additional cases were landed by the Porter at Arkansas City, but no indigenous cases originated there at any subsequent period whatever.

On the same day she landed at President's Island, 12 miles South of Memphis to take quarantine, which was then rigidly enforced for Memphis already since the 27th of July, the Porter being there duly inspected and subsequently having obtained permission to steam up the river. Thus the vessel did not touch Memphis at all, yet this locality is registered with those "infected by the Porter." Again to demonstrate the uselessness of quarantine molestations, attention is invited to the fact that since the 27th of July those "protective measures" were put in force at Memphis against river and railroad communication, but the fever set in on the 14th day of August and reacting very destructively. Further: on the 12th of August 95 cases and 10 deaths of yellow fever were reported from Grenada, an inland town and disconnected from all river communication. The evidence adduced may appear adequate to exhibit the discrepancy, already alluded to, in the theory of "infection and spreading" of yellow fever, but as the potency of the "poison" is admitted to be of such a high degree that Memphis was "infected" (by radiation ?) from the steamer Porter, the most direct and convincing evidence can not be omitted from mention, disproving all vain ideas of "infection and importation of the poison."

This evidence is afforded by the history of the city of Nashville. The city of Nashville [1] as has already been repeatedly

1. Telegram, Memphis, Tenn. Nov. 15, 1878. Results of the Yellow Fever Commissioners' Investigation.

2. Also Louisville, by resolution of the Board of Health, Aug. 2d, extended hospitality to Southern refugees similar to Nashville.—St. Louis Clin. Record, April, 1879, p. 2.

stated, extended officially, by resolution of the City Council, Aug. 20, hospitality to every Southern refugee (instead of quarantine restriction), whether already afflicted with yellow fever or not; hence many thousands availed themselves of this munificent opportunity and made Nashville their temporary abode. But what have been the results? instead of dissemination *en masse* of the "poison of infection" by direct importation, not in a single instance has any one of the inhabitants become affected, the fever remained exclusively with those who had brought it with them from their former place of residence.[1]

With regard to that part of those illusions which recognize the existence of "germs" of the "specific yellow fever poison," and of which it is said that "they are carried by the currents of air even to a considerable distance, the history of the fever at Natchez may be adduced for promoting a better understanding; it affords evidence which is of diametrically opposite bearing.

Until the 21st of August twenty cases of yellow fever were reported from Natchez, and since no more. The city authorities of that place certainly ascribed this exemption to the efficiency of their rigid enforcement of quarantine restrictions. However, according to the theory of "air currents carrying the 'germs' to a considerable distance," there could not have been any possibility of remaining exempt, for nearly all around the city, in close proximity, the disease raged most intensely.

But, examining into the natural — the real and actual — causes, it was found that the morbific influences (high temperature, reduction of atmospheric pressure and diminution of rainfall), elsewhere prevalent, were here and in a narrow circuit around Natchez, entirely neutralized by the normal quantity of rain falling. All over the area of the State of Mississippi a marked deficiency of rainfall is recorded for the summer months. The normal quantity of rain falling at Natchez for the

1. Similar facts are reported by Prof. L. P. Yandell from Louisville—see Louisvillle Med. News, Dec. 7, 1878, p. 276—although that about 30,000 refugees had come to that city and been dispersed all over the place—in hotels, boarding houses, and private families—yet the indigenous cases were few and confined to one but healthfully located district. The number of indigenous cases was 42 with 27 deaths, and the grand total of all cases, including refugees was 131 cases with 61 deaths.

It may also be of interest to compare the list, found at the end of this volume, of those localities whither refugees fled and did not "infect by importation" the community.

summer months is 3.63 inches monthly mean,[1] and during these months, in 1878, the rainfall is marked 3.60, monthly mean. The rainfall is, therefore, to be admitted as normal. A slight deficiency occurred in the month of August during the period some yellow fever cases prevailed. In order properly to judge the diminution of rainfall as one of the essential conditions favoring yellow fever, it may be added that over the entire yellow fever area in the State of Mississippi (excepting Port Gibson) a deficiency of rainfall of 1.50 inches per month[2] is recorded for the same period.

Must not now the question suggest itself by what evidence could the enforcement of quarantine restrictions appear justified under the pretext of preventing disease? What force or potency is proved causing "infection" in general, and what material or organic forms have been demonstrated constituting the "germs" of the "poison," disseminating disease in special? What are the logics, therefore, if at one locality but a single approach to the "focus of infection" is regarded sufficient to cause an innumerable multiplication, and at other places the "sources of infection" may be in the very midst by the thousands, yet no "infection" whatsoever takes place! Illusive as all abstractions of metaphysical inference are, so is their kindred hypothesis of "specific infection."

The proof obtained by this even cursory inquiry, as to quarantine protection, is prima facie negative, and naturally it could not be otherwise, as *there is no infection.*

The discussion of the propriety of quarantine restrictions could well be ended here, and the evidence adduced from those although but limited number of localities, proving quarantine restraint superfluous, is conclusive; but to survey the entire

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1. There is a different average given by other authors. In Blodget's Climatology the mean for those months is indicated 4.35 in the tables, and on the hyetal charts 5.00. According to the notations in Walker's Statistical Atlas the mean is only 4.33. In the text here the figures are reproduced from the charts of the Monthly Weather Review, published by the U S. A. Signal Service.

The data given in Blodget's work are copies of the records of different observers, whose instruments have not been equalized, as the quotations of one and the same locality frequently differ widely.

2. In a document submitted to the committee of United States Senators and members of Congress, and the Board of Experts, I had stated, by an arithmetical error, it to have been 2.03, which is here corrected.

yellow fever area (i. e., of 1878) those places should not be omitted to be indicated which form the terminating points, and as thereby the negative value of quarantine provision is further and clearly proved. A line of the natural limitation may thus be drawn, terminating with the 39° north latitude and nearly with 700 feet altitude, beyond which the state of the atmosphere prevented processes similar to yellow fever to occur as indigenous products. The inference is thereby also afforded, that the necessity of quarantine restriction can simply be urged from want of acquaintance with the laws of nature's mode of action.

The terminating points were: St. Louis, Cincinnati, Gallipolis, and Chattanooga. At a glance over the map of physical geography it is perceived that the annual mean temperature varies in some of these localities; but the interesting fact of observation is, that the degree of intensity of the prevalence of yellow fever at these places (Gallipolis somewhat exceeding owing to the local topography) is proportionate to their annual mean temperature.

St. Louis lies under the 55th isothermal line, and having a population of 490,000. Quarantine restrictions were enforced since the 10th of August, with all their stringencies, but the first cases of yellow fever (eight cases and two deaths) are reported for the week from the 24th to the 30th of August, inclusive. The total number for the period of the epidemic was 75 cases and 39 deaths. However, the report on yellow fever in this city of St. Louis Medical Society states figures differently. There, it is stated, that the total number of cases was 80 and deaths 71; that of these numbers 13 cases proved to be of indigenous or spontaneous origin, and that as early as the 16th of July cases had arrived from the South and were attended here with yellow fever, of whom some died, but that none of their relations and attendants, who had been constantly with them, ever exhibited subsequently any symptoms or signs of yellow fever.

Thus domestic evidence affords also the proof that, firstly, there is no "infection" following contact; and, secondly, that a subsequent occurrence of a greater number of cases (epidemic form) cannot be prevented by quarantine restraints.[1]

1. In the history of the steamer John Porter and the ferryboat Edwardsville, the latter was hired by the Health Department of this city on the 23d of August to transport yellow fever patients to the Quarantine, some fifteen miles down the river; and notwithstanding the em-

Cincinnati is located under the 53.7 isothermal line, and has a population of 216,237. Previous to the 15th day of August, one refugee was treated there for yellow fever, who soon recovered and left for New York. On the 15th of August the steamer John Porter was coming up the river, but was prevented from landing at Cincinnati, as at Lawreneeburg, several miles below, two assistant physicians of the Health Department went on board to see the boat directly proceed to the point of destination. There being no other case of yellow fever in Cincinnati at this date, yet the Health authorities resolved to enforce quarantine restrictions most rigidly, and as is stated for the following reasons:

1st. To prevent any person, sick with the disease from entering the city, and taking up their residence in hotels or private houses.

2d. To prevent the introduction of any quantity of baggage belonging to the healthy refugees arriving from infected districts.

3d. To prevent the incoming of certain kinds of objectionable merchandise, such as rags, feathers, hides, etc.

However, since the 28th of July, and during the period of the epidemic, the total number reached 37 cases and 18 deaths. Of those dying one was from New Orleans, 3 from the steamer John Porter, 5 from the steamer Golden Rule, and 2 not stated.[1] But the disease did not spread north of Cincinnati.

At Gallipolis rather similar results are observed. This place is also located under the 53.7 isothermal line, but the population, probably, does not number more than about 3,000.

On the 19th day of August when the steamer John Porter was one mile below Gallipolis, with 10 sick on board, she was

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pirical evidence of the "non-infectiousness" of yellow fever was well known in the city, it is found that rhetorical flourish still prevailed as to "infection by contact," similar to those made by Prof. Ziemssen of small-pox "infection." (See author's pamphlet on variola, 1878, pp. 11 and 12.) The boat Edwardsville was said to have been thoroughly "disinfected," yet she was regarded the source of "infection," as five of her crew had taken yellow fever, from the 9th to the 15th of October, when she was abandoned.

1. The official reports of the U. S. Marine Hospital Service gave a different showing: as the total number is there stated to have been 65 cases and 37 deaths,—28 more cases and 19 more deaths.

compelled to return "below the bend,"[1] (if to Miller's point, a distance of 25 stat. miles, but if to Burlington 50 miles, but the reports state that for the week ending August 23d, eleven cases were there under treatment, all from the steamer John Porter. For the following week (ending August 30th) one case (from the Porter), and three deaths are reported, and for the week ending September 6th one death among those from the Porter. During the entire period of the epidemic (to November 1st), including all those admitted from the Porter, the total number is reported to have reached 45 cases and 26 deaths, leaving for the city and district 33 cases and 22 deaths, of which towards the latter part of the epidemic, cases occurred that could not be traced to the Porter.[2]

Chattanooga is a place of 6,093, (probably now 10,000) inhabitants, and is located under the 59th isothermal line. There occurred 446 cases and 135 deaths of yellow fever. The first case, a refugee, occurred August 21st, and the second, also a refugee, September 6th; of indigenous origin, the first case is recorded, September 18th. At this locality the degree of intensity is demonstrated to be due to the higher rate of annual mean temperature, and although the epidemic was of considerable magnitude, yet owing to the altitude it did not spread further.

Arguments for maintaining the quarantine system now require other pretexts than those: "preventing the importation and dissemination of the poison of epidemic diseases," as they are proved to be without foundation in fact. But by inveterate infectionists the question, whether a disease at a certain locality and period, could possibly have occurred without the "imported poison," would be answered after the manner of the responses in a catechism. The doctrine of "infection," as we have proved is but visionary, the premises taken in its favor are presumptions, and the conclusions therefrom drawn are only error. The alleged importation of the "poison of infection" by the Porter to Gallipolis and other places, and the subsequent "dissemination of the poison," among the inhabitants, also, the lodgment of the "poison" on the Edwardsville, from which five of her

1. Comp. Report of St. Louis Med. Society, p. 81.

2. Comp. Reports U. S. Marine Hosps. Service. These reports also state the total number of cases for Gallipolis and the district to be but 31, and the total number of deaths 17. According, however, to the report of the Cincinnati Health Officer [p. 88], the total number of cases was 35. In the text, the daily telegrams form the basis of information.

crew, it is asserted to have been "infected," further by personal contact asserted from the employees at the St. Louis Quaratine, (among whom the lamented Dr. H. C. Davis—physician in charge—is registered), is now proved to be but soothing fascination, sufficient, however, to confuse immature judgment for justifying other than purely hygienic measures.

By a meteorological table of daily means and extremes for the month of October, we are enabled to demonstrate the natural and immediate causes of the occurrence of those yellow fever cases of the Edwardsville and Quarantine of this place, to which the great extremes of the spring and summer seasons had strongly predisposed.

From the data of the general tables (found at the end of the volume,) it will be learned that the meteorological conditions of the year 1878 were extreme, as the atmospherical pressure was .07 below the annual mean; the temperature 4.8 in excess, the rainfall about normal (.08 inches in excess). The fluctuations were wide, and set in uncommonly early. In the month of April the monthly means were as follows: Barometer—.21; thermometer +9.5; rainfall,+2.88 inches, and in consequence of these potent influences, as we already know vegetation was roused to action nearly an entire month in advance! In the month of July, for the week ending the twentieth, the weekly means are recorded, thus: Barometer, 29.90, thermometer, 88.8, rainfall, 0.004; the extremes were: Bar., 29.83, ther., 100. During this week 135 deaths of sunstroke (insolatio) occurred, but for which, as yet, no "infection" is ventured to be claimed and no efficacy of prevention by quarantine rulings. Now by mere analogy the same law and the same influences are demonstrated to have been in operation during that period of the month of October, when those cases of yellow fever occurred among the employees of the Edwardsville and at the Quarantine; the only observable difference is rather a lesser degree in the range of extremes, but in relativity to the season, they were of nearly equal intensity of reaction.

To present this proposition clearly and in order to find the chain of generical connection of physical influences over necrobiotic action, attention is invited to a fact of daily observation by the practitioner, namely: That diseases similar in character supervene synchronously. Hence pronounced cases of yellow fever were prone to occur under the prevailing influences as the

predominant fevers represented the "bilious congestive" character. In connection with this it should be borne in mind particularly, that all parties afflicted on the Edwardsville and at the Quarantine were completely exhausted in consequence of night and day attendance; moreover that owing to the autumnal morbific influences of the river and the unhealthy location of the grounds of the Quarantine Station (on low and alluvial soil and in a narrow valley) the intensity of reaction of the wide atmospheric fluctuations could for any bio-physiological consideration not be endured as the force of resistance had already ebbed, the process of dissolution naturally resulted in "yellow fever!" The nature of these influences has already been alluded to, but as by them, on the one hand, (in the month of April) constructive action was aroused, and on the other, (in July to October—or during the summer and autumnal season—) destructive action, attention must be directed to the fact that to the great excess of rainfall in the month of April the advanced constructive activity in nature is to be ascribed, as otherwise the extremes of the other variations would have caused destructive action as in the other two seasons.

The variations of the summer months represent the following means: Barometer, —.03; thermometer, + 1.1; rainfall, —.19; of which the height of extremes, as we have already seen, coincided with the greatest number of sunstrokes, and if the comparison will be applied to the occurrence of those cases of yellow fever on the Edwardsville and at the Quarantine, precisely the same law is found to have been in operation. Those cases occurred from the 9th to 15th of October, and if the meteorological data of the same month are examined, the extremes of the variations are also found coincidental with this period, of which the intensity of reaction is hightened by the absence of local rainfall and prevalence of the barometrical minimum, caused, from the 13th to the 16th, in consequence of a most furious storm on the 12th at the coast, telegraphed via Boston, heavy rains in California and snow storms in the Rocky Mountains from the 13th to the 14th, according to a telegram via Chicago October 14th. To estimate the intensity of reaction of those influences correctly, especially as to their coincidence with the occurrence of last mentioned cases of yellow fever, it appears requisite to reproduce the meteorological data of the month of October, and not only in monthly, but in daily means, which are as follows:

DATE.	BAR.	THER.	RAINFALL.	EXTREMES OF TEMP.	
				MAX.	MIN.
1	29.77	72.2	0.23	83.	67.
2	30.06	68.5	——	77.	59.
3	39.05	69.7	——	80.	59.
4	30.12	62.7	0.10	69.	60.
5	30.20	55.0	0.21	59.	51.
6	30.10	56.2	——	65.	43.
7	30.04	63.2	0.06	70.	54.
8	29.89	70.7	——	80.	56.
9	30.00	66.7	0.10	72.	64.
10	29.94(?)	67.7	0.37	75.	61.
11	30.13	60.5	——	67.	57.
12	30.11	60.2	——	60.	49.
13	29.92	65.2	——	74.	50.
14	29.84	74.0	——	85.	62.
15	29.75	73.7	——	86.	65.
16	29.73	69.0	0.81	79.	58.
17	30.06	51.2	——	57.	46.
18	30.20	46.5	——	53.	39.5
19	30.12	51.2	——	60.	38.
20	29.87	58.0	——	70.	46.
21	29.91	53.5	0.23	67.	46.
22	30.09	48.0	——	53.	39.
23	29.93	56.2	——	70.	43.
24	30.00	59.2	——	68.	44.
25	30.21	50.2	0.21	64.	48.
26	30.37	40.2	1.28	49.	38,
27	30.45	36.0	——	38.	29.5
28	30.17	40.7	——	49.	31.
29	29.90	42.0	——	48.	33.
30	30.11	40.0	——	52.	36.
31	30.39	35.0	——	41.	26.

On board of the Edwardsville the use of "disinfectants" was not at all spared, yet from the 9th to the 15th of October, out of eleven persons, the officers and crew of the steamer, five were taken with yellow fever, and who all died. At the Quarantine three indigenous cases occurred from the 7th to the 15th of October, of whom two died, and two more cases occurred from the 20th to the 24th, of whom one died. Of the thirteen indigenous cases of the city proper, eight occurred from the 5th to the 22d of October, all of whom died. The thoughtful observer perceives that all these cases occurred during the period of sudden and great fluctuations in temperature (from 43° to 86°, and 39°.5 to 70° respectively,) and, in accordance with the physical laws during a period of barometrical depressions (even as low as 29.73

a diminution of more than .30 under the mean,) owing to the prevalence of severe storms elsewhere, as above indicated.

In such a state of the weather the air is sultry and its reactions on the human organism are regressively, of which the potency is intensified—at St. Louis at least—when those variations prevail so late in the season, as then the transition state is in progress to adapt the human organism to the influences of the winter season; the hepatic histo-chemical actions are sensitively interrupted by variations approaching those of the summer season, particularly when the structure is already morbidly altered, thus morbid actions are prone to assume those shadings by which the prevailing morbidity is characterized.

Thus to the scientist and scientific sanitarian quarantine molestations prove but nullities and pretentious, but infectionists endeavor to continue their enforcements, probably not from want of better information exclusively, but apparently for the gratification of interested motives.

Whatever failures and shortcomings are recorded in quarantine history, by rhetorical dialectics they have always been described as insurmountable difficulties in the execution of detail measures. But the aggressions against natural laws, individual rights, and humanity, incident to such arbitrary reign, were omitted from such "official" record.

For these reasons the believers in "infection" and admirers of quarantine rule, are too prone to designate an impartial investigation and honest criticism, a defamation and *banalité*, as pretension and deception are averse to open truth.[1]

Truth, however, can not be suppressed, and the facts by which it is sustained do not bear to serve other than realistic and disinterested purposes.

A cursory selection of some of the revolting laws, regulations and deeds that have grown out of quarantine willfulness and rude *cordons militairs*, characterizing the "scientific" basis of historical origin, and "lawful" deportment even at the present day, can not well be omitted in this connection. We have already learned that Venice had quarantine restrictions enforced as early as 1423, and cultivating the belief that exclusion would protect against epidemic diseases (the plague). Superstition was thereby aroused anew and widely spread, and anything occur-

1. See Prof. Hirsch's Report, already quoted, and Comp. Lebert, Cholera, vide Ziemssen's Handbuch, vol. I. p. 377.

ring that could be attributed to mystery, some individuals were charged (precisely as at the present in regard of conveying the "poison of infection") as being the instrumentality of the infernal power doing all the mischief. In conformity with such premises, at Regensburg in the year 1596 and on the ninth day of April, *one hundred and thirty-three* "witches" were burnt under the plea that they had been the causes of severe weather —hail-storms and water spouts.[1]

In 1656 when at Genoa (Italy) the plague was prevalent, eleven persons attempted to escape the disease by embarking in a Felucca with the intention to land in the Provance, but at every place they were repulsed and driven back to Genoa. In the meantime the plague had broken out among them and but one of the eleven reached the shore of Genoa alive again.[2]

In Noja (lower Italy) the plague prevailed in 1815, thus double entrenchments were thrown up all around the city, mounted with guards and cannons, the latter directed to the gates of the city; the trenches well filled with troups and orders were given to fire on any approaching when not halting upon order, thus a patient approaching in delirium was shot dead. Also a soldier and a citizen were tried before court martial, as the citizen had thrown a pack of play cards to the soldier—both were convicted and shot dead.[3]

Similar are the results following the example set by the Russian government in reference to the incineration of the houses and household furniture, in Weslianca, 1879 but, enigmatically, *after the plague was over.*[4]

Owing to the enforcement of measures of this and similar kind, it has become a popular habit among the "Calmucks" not to nurse any of their sick any more, for fear of infection, but to take them to an island (of those about the shore of the Caspian

1. Comp. Kopp, Witterungsangaben, 1879, p. 68,
2. Comp. Westermann's Monatshefte, May 1879, p. 234.
3. Vide Liebermeister, Ziemssen's Handbuch, vol. II. p. 464.
4. The *fourth* recommendation of the committee appointed to make a sanitary survey of Memphis. Washington, D. C., December 13 (vide Mo. Republican Dec. 14., '79,) is evidently modeled after those *Russian* prophylactics, viz: to condemn and burn a number of houses in Memphis. The German Imperial Government also resorted to those prophylactics with soldierly determination, by incinerating the potato fields, in view to annihilate the "American potato-beatle," but, alas, the results proved a decided and painful failure!

Sea ?) where they leave them to their own fate—*either to die or survive.*[1] Instances of a no less appalling character are on record, and occurring among an intelligent and sensitive people makes it still more depressing.

In the city of Baltimore during the month of September, 1876, "a woman was abandoned and died while left entirely alone in a house, on the rumor that she was afflicted with yellow fever."[2] Further, during the epidemic of 1878 at Louisville, in the first half of the month of August, a French lady arrived there from New Orleans who did not speak English, but having met with some accident on the railroad she manifested indications of distress and anxiety. As she had come from New Orleans she was seized by the "authorities" and placed in a hospital, where her gestures of indignation and efforts to obtain her liberty were taken for symptoms of yellow fever. Medicine was administered to her by force, until the French consul interfered, and the "error" was discovered.[3]

Another specimen of Don Quixotian adventure of quarantine tyranny came to pass in the city of St. Louis: In the evening of the 6th of September, 1878, the steamer City of Vicksburg, with some eighty refugees from Greenville was halted at the Quarantine for the passengers to disembark, but as no accommodation could be extended them there, they were taken on board the transport Edwardsville and landed at the wharf of the city (at foot of Carroll street) on the evening of the 8th of September, where again they were packed in six closed omnibuses and at full speed driven through the city to the Central Railroad Depot, to take trains to other and remote places.[4]

Again: From Grenada the telegrams state, Aug. 21, 1878, that the trains on the railroad rush by that place at a speed of

1. See Anzeiger des Westens, St. Louis, Mo., March 6, 1879.

2. Comp. author's treatment on Cholera, p. 14.

3. See Anzeiger des Westens, Aug. 16, 1868.

4. In this connection it may be warrantable to exemplify the intellectual state and legislative wisdom of the framers (or their counsel) of the city charter by producing here section 35, p. 59, of the "modern" basis of quarantine and "sanitary" vexations. It reads as follows: "No person, association or corporation should knowingly *receive for medical treatment of the invalid* or *sick*, any patient sick with small-pox, plague or cholera, *unless authorized by an ordinance therefor*. Every violation of this section shall be punished by a fine not less than one hundred dollars nor more than three hundred dollars. (Italics are mine.—Author.)

fifty miles per hour. (Thus crossing the bridge over the Yalabusha River at such velocity that human life was most frivolously exposed to the danger of the breaking of those usually frail structures. In the first half of 1879 three such "accidents" were reported: One of the bridge at St. Charles, Mo., and two in Illinois, north of Alton.) The quarantine power over epidemic diseases could not depart without crowning its absurdity with the following: In a "special" the *Globe-Democrat* of this city is advised from Washington, D. C., August 17, 1878, of a favorable attention extended at the Postmaster General's office to a proposition received from the Surgeon General (Marine Hosp. Service?), wherein it was contemplated to expose all mail matters from yellow fever districts to a heat of 325° F., by way of baking the mail in an oven. In case this proposition had been carried into effect, the interesting novelty would thereby have been established that rose-colored and perfumed letters, hitherto the bearers of Cupid's arrows only, should now also be a "favorite lurking place of the yellow fever poison;" and *printed mail matter*, frequently containing succulent effusions of eloquence, and munificent designs of political shrewdness, to which, as of old, the epithet "cooked and dried," could only be applied, would, from modern sagacity, also be parched!

The monstrosity that "germs of infection" should be thought to exist in and be conveyed by everything portable, is demonstrated in an appalling manner by the sanitary officiousness at New Orleans, on or about the 12th of August, 1878. In the first instance a cargo of bananas from Jamaica was not permitted to pass quarantine unless after being "disinfected" according to a regulation then in force, but "carbolized" southern fruit is not found palatable, even by the quarantine officials, and hence the cargo had to be removed to the city refuse. But the following occurrence reaches the climax of the ridiculous and brutal: On or about the 10th of August, 1878, a vessel arrived at the New Orleans quarantine from some Central American port, with a large number of live turtles on board, which, according to quarantine regulations had also to be "disinfected," as the quarantine officers considered them extremely dangerous for conveying "poison of infection," thus every one of them was injected with carbolic acid; naturally all were killed by the process and were then thrown overboard.[1]

1. See Anzeiger des Westens, Aug. 18, 1878.

Such enormities could still occur in the year 1878, and in the name of medical and biological science! Further, there is a manner in which quarantine manipulations are made to serve other than sanitary purposes. This may appear from the following facts: In the month of August and early part of September, 1878, Cuban sugar, as is usual, was shipped via New Orleans to Belcher's sugar refinery, of St. Louis, but in the wisdom of the quarantine management of this place, the sugar was suspected to carry "poison of infection," and the cargo was put in quarantine. However, the same sugar by way of New York (on the mere certificate of New York firms) was looked upon as free from the "poison of infection."[1] Many similar vexatory restrictions were practiced by so-called health authorities of other places; also merely for the sake of favoring momentary commercial interest.

Before closing this chapter it may be of interest also to learn to what an extent objects of economy may be involved in quarantine husbandry, so far, as the expense account for the treatment of yellow fever patients at the St. Louis quarantine, has assumed its characteristical feature. The data here adduced giving expression of the financial exhibit are copied from official documents.[2]

The total cost of the attendance of the yellow fever cases in 1878 was $19,840.56. It will be remembered that the total number of cases for the city of St. Louis was 151, but 47 of these did not receive quarantine treatment, leaving therefore the number of quarantine cases 104. The expense of quarantine cases is, therefore, $190.77 per capita.

In general the hospital expense per capita does not exceed $15.00,[3] hence a yellow fever case costs $175.77 more than any other patient. To be sure, as we see, yellow fever epidemics afford a favorable basis in point of financial drift under quarantine pretenses.[4]

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1. Comp. Le Messager Franco-Americain, New York, Sept. 22, 1878, p. 1.

2. Mayor's message, 1879. Ann. Rep. of the Health Com'r.

3. See comparative tables of the city hospital expense. Annual Rep. of Res. Physician, Mayor's message, 1879.

4. There are two additional illustrations [rather on a large scale] by which Schiller's epigram on Science: "To one it is the sublime and heavenly deity, to the other a good milk cow, which supplies him with butter," is too truly verified. The first one is the following:

In the session of 1879 the U. S. Congress appropriated $650,000 for the

In summing up the evidence of this chapter, quarantine restrictions are found despotic and cruel, a total failure in their (so-called) object, and directly antagonistic to the indications of verified science. Also that Sanitary Boards, who base their activity only on the doctrine of "specific infection," do not accomplish any other object than to consume public appropriations and enjoy their ignoble comfort of existence.

The last point remaining for consideration, as the closing paragraph of the entire subject as far as the compass of this treatise was contemplated, is:

"DISINFECTION."

Here we shall be brief. It will probably not be expected that we review the list of disinfectants, and neither the various methods or procedures of disinfection, but the object here can

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first year, to investigate the causes of yellow fever and to prevent it from spreading, and pursuant to these provisions the National Board of Health sent "Commissioners and Experts" to various places where the fever had been prevalent, but until the present [May, 1880,] nothing has come to general knowledge of the activity of these "Commissioners and Experts" than the telegrams that, when one of them left New Orleans for St. Louis, the other left St. Louis for New Orleans, or when one left Washington for Memphis, the other left Memphis for Washington, etc., and they, "in their responsible duties" in conjunction with "local authorities"—*looked on—matters.* However, when the year was up the appropriation was faithfully and completely consumed!

The second is this, which we quote from the "Freidenker," Milwaukee, May 16th, 1880:

The epidemic of the plague of last year cost the Russian government 1,600,000 marks ($400,000.) These expenditures were incurred during the period from January to April, 1879, when Gen. Loris Melikoff was Governor General of the districts of Astrachan, Saratoff and Samara, until the epidemic was over.

Of the items of expenditure the establishment of the Cordon Militair and Quarantine absorbed one-half, namely, 800,000 marks; the guarding of the Wolga at 'suspicious' places 48,000 marks; the pay of the medical staff *and other officers*, 200,000 marks, and medical supplies, 72,000 marks. (!?) Large sums were expended for the transportation of troops and the rest [sic] was divided among the inhabitants of the towns and villages whose houses and other property was burnt by order of Gen. Melikoff.

Now the *rest*—a trifle—was given to those as a compensation whose property was unwarrantably destroyed by fire under the pretext sanitation and by the deceiving guidance of the theory of "specific infection." The other data need no comment.

Prosit seculum undevicesimum, seculum intelligentiæ et humanitatis!

only be to furnish the statistical proof of the utter failure of disinfection in detail and in totality, as naturally the results could not be otherwise. The apparition of infection exists only in the minds of those in whose imagination it comes like Banquo's ghost, and in the pallor of fear the conjuration "trembling I inhibit thee," is hurled against it in form of disinfection. However, the "experienced" and of Mephistophelian sagacity are sensitively mindful of the instructive precepts of his infernal majesty as a resumé of the experience of practical life, where human relations to nature are sunk beneath metaphysical transcendencies, or palpable facts into speculative negations. The doctrine of infection and disinfection is therefore strongly urged, as under the veil of belief the devil's tributes are best secured. Thus:

> "Once in might, hast thou the right;
> The 'what' is asked, and not the 'why.'
> I should lack knowledge of navigation:
> War, *trade*, and piracy—
> A trinity—admitting not of separation."[1]

Disinfection has an object. It cannot be accomplished without disinfectants, which *en masse*, in commercial trade, merit attention. During the epidemic of 1878 hundreds of barrels of carbolic acid were ordered by the Surgeon General, United States Marine Hospital Service, and by a "sanitarian" of Munich, who, as it appears, is interested there in a large laboratory,[2] the proposition was made to the Russian government to "disinfect" the battle-fields of the late Turco-Russian war. If now "disinfection" may be rated, in point of expense, on the basis of the cost of the treatment of yellow fever patients at the St. Louis Quarantine, the momentum (trade interest) of the question of general disinfection must be quite comprehensible.

Owing to the "promising good that should be derived from disinfection," according to the report of the Surgeon General, United States Marine Hospital Service, July 27, 1878, and the "miraculous success crowning the success of the *authorities*[3]

1. Translated from Gœthe's "Faust," 2d part, 5th act.

2. How perplexing would it be to a modern physiologist, in the presence of such startling facts, to write (not only a "Literaturgeschichte" but) a history of medicine, especially as: "Das Niedrige und Gemeine ist dem, der einmal in die Tiefe der Erkenntniss getaucht und mit Anstrengung seines Geistes die Wahrheit gesucht, fremd und abstossend."—Comp. Ueber die Entwickelug der Erkenntniss, Munich, 1879.

3. Italics are mine.—Author.

during the latter years by a liberal use of carbolic acid, thereby overcoming the "poison of infection," (miraculous, indeed, as there were no diseases of an epidemic character prevalent, excepting seventy-six at Savannah, where the yellow fever epidemic took its natural course irrespective of carbolic acid), disinfectants were employed to so full an extent at New Orleans in the beginning of the epidemic of 1878, that the levee was strewn with carbolate of lime so thickly as to make the air suffocating from the evaporation of carbolic acid, and so on elsewhere; but the provoking truth could not be omitted in section 4 of the report of the American Public Health Association, dated Richmond, Va., November 20, 1878, that disinfection proved a complete failure — at least in preventing yellow fever.

Other testimony or direct evidence, typical in character, may be adduced to prove that "disinfection" is as harmless in the prevention of yellow fever as the incineration of the woman in Palcala, India, in 1827, upon the grave of her husband to prevent cholera and to soothe the gods,[1] or the nine days of prayers ordered in all Roman Catholic churches of New Orleans, August 18, 1878, for the cessation of the epidemic.

At Memphis, where a Mrs. Kate Bionda, who kept a boarding house for river men, became afflicted with yellow fever on the 13th of August, 1878, the first case in that place, and the Health officer Dr. Erskin was directed to "disinfect and fumigate" the entire block, but alas, as we now know, the fever raged subsequently as terribly in that square as in any other.

Another is that of the steamer Edwardsville, the quarantine boat in use at St. Louis, from about the 23d of August, 1878, when she was cleaned and fresh water pumped in, and carbolic acid "used liberally," and what are the facts recorded by history?[2]

To indicate how asssiduously "infection" was guarded against, the following quotation from the report of the St. Louis Medical Society, p. 48, may here be reproduced: "When a man was brought down in an ambulance, he was taken up stairs and put to

1. Comp. Lebert; vide Ziemssen, Handbuch, vol. II, p. 349.

2. The evidence in loco is sufficient to pacify the agitated minds of those who framed city ordinance, 10,615, app. Feb. 19th, 1878. As it affords them better information to avoid a refutation of fulminant assertions: by "disinfection" an "infectious and contagious" disease is eradicated (See Sec. 5).

bed, and the bedding on which he was brought down, if any, was taken out of the ambulance, and burned on the wharf. When he reached the quarantine, the sheets, pillow-cases and the coverlets of the bed on which he lay while in transit, were taken off and left at the quarantine to be washed, the patient himself being placed in a ward devoted either to yellow fever or malarial fevers. On the return trip of the boat, the cabin was closed, all utensils cleaned and "disinfected," and chlorine liberated in the ward itself. Towards the 8th of October, the boat began to show that she was 'infected,' by the occurrence of several cases of very malignant yellow fever in her captain and crew."

To the reader it may appear fatiguing to familiarize himself with the various isolated facts here enumerated as evidence proving quarantine restrictions and 'disinfection' of negative value, except to parry a much used retort; the facts required to be stated directly and circumstantially, as the proof thus produced is irrefutable. The natural law of the causation manifested in yellow fever epidemics, demonstrated by the data of the meteorological tables, which are compiled with the greatest care and accuracy. All assertions to the contrary of infectionists and contagionists, and the efficacy of quarantine restrictions and of 'disinfection' exclusively rest, as Oerterlen[1] observes, upon arbitrary or absurd inferences from (general) facts and (special) cases. The conclusions to which this eminent author has come may here, in fine, be reproduced and have our entire approbation. "The fears of infection, publicly entertained would at once disappear if physicians would emancipate themselves from the common custom and cease to *believe* in them. Authorities would discontinue the employment of military cordons, quarantines (sperren) and disinfection, and other measures as worthless as vexatious; and for obvious reasons, every intelligent person, and humanist abhors the continuance of those absurdities and barbarities in the manner that they are carried into effect at the present day."

1 Comp. Seuchen, pp. 560 and 562.

APPENDIX.

APPENDIX.

Statistics of the meteorological conditions, expressed in monthly means, of those localities which are typical in representing the principal places where the fever prevailed, as also those of close proximity and remaining free from the yellow fever in order to demonstrate by contrast the state of the weather upon which the occurrence of yellow fever is dependent. It was anticipated that the essential state of the atmosphere would be expressed by recording its pressure, temperature and rainfall; the other variations can be calculated approximately with satisfactory reliability.

[Observanda: For convenience of comparison, the "approximate normal means" are here once more tabulated.]

LOCALITY.	BAROMETER.		THERMOMETER.		RAINFALL.	
	Annual Mean.	Mean of the Summer Months.	Annual Mean.	Mean of the Summer Months.	Annual Mean.	Mean of the Summer Months.
New Orleans.....	30.06	30.02	68.6	80.8	5.71	5.60
Shreveport.....	30.05	30.00	65.0	80.9	4.40	3.17
Memphis.....	30.07	30.06	60.7	77.7	4.25	3.19
Nashville.....	30.06	30.00	57.9	76.8	4.10	3.64
Savannah.....	30.10	30.06	65.8	79.2	4.48	6.02
Charleston	30.08	30.05	65.4	79.3	5.28	7.48
Mobile	30.09	30.04	66.4	79.8	5.37	6.61
St. Louis..... ..	30.03	29.98	54.2	75.1	3.37	4.10

NOTE.—The summer months embrace July, August and September. The rainfall denotes the total quantity that fell every month. These notations are observed in all the subsequent tables.

NEW ORLEANS—1872.

MONTHS.	BAR.	THER.	RAINFALL.
January	30.19	47.7	5.10
February.....	29.98	56.2	4.77
March....	30.07	59.2	9.18
April.	30.03	70.4	5.01
May.....	30.07	75.8	3,14
June	30.03	80.5	5.34
July.....	30.03	82.1	6.43
August	30.03	82.6	3.75
September.....	30.03	79.3	2.10
October.....	30.07	68.4	3.18
November	30.13	57.4	7.43
December.	30.20	51.4	5.25
Annual Means.....	30.07	67.68	5.08
Means of the Summer Months.....	30.03 (+00.01)	81.3 (+00.5)	4.09 (—1.51)

NEW ORLEANS—1873.	BAR.	THER.	RAINFALL.
January	30.11	49.5	5.06
February	30.08	60.5	1.93
March	30.15	60.4	5.10
Aprll	30.02	66.9	1.74
May	29.92	73.7	18.68
June	30.00	80.1	6.68
July	30.06	82·4	6.27
August	30.03	81.2	8.30
September	30.01	78.7	3.19
October	30.10	68.2	1.85
November	30.10	61.2	5.95
December	30.18	56.6	I.79
Annual Means	30.06	68.2	5.54
Means of the Summer Months	30.03 (+00.01)	80.7 (—00.1)	5.92 (+0.32)

NEW ORLEANS—1874.	BAR.	THER.	RAINFALL.
January	30.18	56.	1.68
February	30.10	59.1	3.68
March	30.05	66.2	7.57
April	30.04	65.6	13.62
May	30.02	75.7	0.22
June	30.01	81.3	9.62
July	30.03	81.4	12.53
August	30.00	83.9	4.82
September	30.00	78.9	4.21
October	30.11	70.4	0.00
November	30.14	63.3	1.12
December	30.18	58.8	3 27
Annual Means	30.07	70.0	5.19
Mean of the Summer Months	30.01 (—00.01)	81.4 (+00.4)	7.18 (+1.58)

NEW ORLEANS—1875.	BAR.	THER.	RAINFALL.
January	30.16	54.2	8.44
February	30.15	55.9	13.85
March	30.05	63.5	10.84
April	30.05	65.3	8.05
May	29.99	76.2	2.53
June	30.08	80.1	4.92
July	30.09	81.8	6.57
August	30.02	79.3	8.61
September	30.01	76.6	7.89
October	30.11	67.3	2.09
November	30.04	65.6	6.79
December	30.06	61.5	5.15
Annual Means	30.06	68.9	7.14
Means of the Summer Months	30.04 (+00.02)	79.2 (—01.7)	7.69 (+2.09)

NEW ORLEANS—1876.	BAR.	THER.	RAINFALL.
January	30.23	60.3	4.43
February	30.17	58.9	8.20
March	30.04	59.9	11.32
April	30.05	69.1	6.41
May	30.04	74.8	7.10
June	30.00	80.6	6.20
July	30.03	83.4	4.73
August	30.02	82.2	4.44
September	30.00	79.1	0.26
October	30.04	67.6	0.24
November	30.07	59.2	4.35
December	30.15	48.1	9.27
Annual Means	30.07	68.6	5.60
Means of the Summer Months	30.01 (—00.01)	81.5 (+00.7)	3.14 (—2.40)

NEW ORLEANS—1877.	BAR.	THER.	RAINFALL.
January	30.20	57.3	5.30
February	30.14	55.9	0.98
March	30.07	60.7	4.94
April	29.92	68.6	4.79
May	29.99	73.5	1.48
June	30.03	81.3	2.75
July	30.00	83.7	6.41
August	29.98	83.1	2.54
September	29.94	78.4	13.21
October	30.01	70.2	9.55
November	30.10	58.3	6.58
December	30.15	55.5	4.96
Annual Means	30.04	68.5	5.25
Means of the Summer Months	29.97 (—00.05)	81.7 (—00.9)	7.38 (+1.78)

NEW ORLEANS—1878.	BAR.	THER.	RAINFALL.
January	30.09	50.5	5.99
February	29.60	53.2	3.50
March	29.61	69.8	4.84
April	29.84	70.3	1.81
May	29.97	79.1	8.11
June	29.99	82.0	7.04
July	29.94	84.8	6.29
August	29.97	83.6	5.30
September	30.02	72.8	2.66
October	30.06	70.9	5.07
November	30.07	60.7	7.91
December	30.15	50.7	8.85
Annual Means	29.94	69.0	5.69
Means of the Summer Months	29.97 (—00.05	80.2 (—00.6)	4.75 (—0.85)

SHREVEPORT, LA.—1872.

MONTHS.	BAR.	THER.	RAINFALL.
January	30.21	40.7	5.55
February	29.96	50.6	5.89
March	30.06	54.4	4.11
April	29.98	66.5	7.18
May	30.01	73.5	9.10
June	30.00	80.4	2.70
July	29.98	84.0	1.62
August	30.01	84.5	0.40
September	30.00	78.6	2.91
October	30.08	65.5	3.41
November	30.13	50.0	1.39
December	30.21	42.0	7.03
Annual Means	30.05	64.2	4.25
Means of the Summer months	29.99 (—00.01)	82.3 (—01.4)	1.64 (—1.53)

SHREVEPORT, LA.—1873.	BAR.	THER.	RAINFALL.
January	30.10	42.2	3.13
February	30.05	52.0	7.47
March	30.11	58.9	2.67
April	29.97	64.8	1.94
May	29.89	72.9	4.58
June	29.96	79.6	7.94
July	30.03	81.6	3.31
August	30.04	81.7	1.59
September	30.04	75.7	2.31
October	30.13	62.6	4.15
November	30.10	56.5	8.35
December	30.19	49.9	4.93
Annual Means	30.06	64.8	4.36
Means of the Summer months	30.03 (+00.03)	79.6 (—01.3)	2.40 (— 1.77)

SHREVEPORT, LA.—1874.	BAR.	THER.	RAINFALL.
January	30.17	50.4	3.51
February	30.10	51.6	7.58
March	30.01	60.5	9.27
April	30.01	61.0	10.64
May	29.99	75.2	1.19
June	29.98	82.7	1.35
July	30.01	82.5	5.59
August	29.96	86.0	0.19
September	29.91	95.4	6.33
October	30.04	65.6	0.10
November	30.04	58.7	2.10
December	30.13	52.9	6.95
Annual Means	30.03	65.2	4.56
Means of the Summer months	29.96 (—00.04)	81.3 (+00.4	4.03 (+0.86)

SHREVEPORT, LA.--1875.	BAR.	THER.	RAINFALL.
January	30.21	41.4	3.93
February	30.13	49.9	2.67
March	30.02	57.2	4.94
April	30.03	63.0	3.46
May	29.96	74.7	0.91
June	30.03	83.1	1.79
July	30.03	86.1	2.16
August	30.01	79.9	6.17
September	30.07	73.4	8.02
October	39.14	62.7	4.40
November	30.05	58.1	2.99
December	30.05	55.4	9.54
Annual Means	30.05	65.3	4.25
Means of the Summer months	30.03 (+00.03)	79.4 (—01.5)	5.45 (+2.28)

SHREVEPORT, LA.--1876.	BAR.	THER.	RAINFALL.
January	30,24	53.6	7.26
February	30.19	55.3	2.68
March	30.05	54.3	11.67
April	39.04	67.5	5.83
May	30.02	72.8	9.47
June	30.00	78.8	2.08
July	30.04	83.6	1.87
August	30.03	83.1	2.22
September	30.05	75.3	0.62
October	30.07	64.4	5.42
November	30.13	53.1	2.99
December	30.26	43.3	2.38
Annual Means	30.08	65.4	4.54
Means of the Summer months	30.04 (+00.04)	80.6 (—00.3)	1.59(—1.58)

SHREVEPORT, LA.--1877.	BAR.	THER.	RAINFALL.
January	30.26	44.1	2.84
February	30.22	52.1	2.48
March	30.08	58.3	3.87
April	29.93	65.0	5.42
May	30.03	73.6	1.24
June	30.04	80.2	2.55
July	29 97	81.8	2.37
August	29.97	82.8	0.20
September	29.97	75.6	9.93
October	30.00	65.4	9.30
November	30.13	51.7	3.76
December	30.18	51.2	3.75
Annual Means	30.06	65.1	3.97
Means of the Summer months	29.97 (—00.03)	80.4 (—00.5)	4.16 (+0.99)

SHREVEPORT, LA.--1878.	BAR.	THER.	RAINFALL.
January	30.[illegible]	45.9	5.29
February	29.96	50.4	2.67
March	29.95	67.4	6.74
April	29.80	69.5	5.97
May	29.95	73.4	6.09
June	29.92	78.6	7.55
July	29.95	85.0	6.11
August	29.92	82.9	2.29
September	30.03	74.5	1.66
October	30.06	65.6	3.35
November	30.06	56.2	3.46
December	30.17	43.0	7.72
Annual Means	29.98	66.0	4.90
Means of the Summer months	29.96 (—00.04)	80.8 (—00.1)	3.35 (+0.18)

MEMPHIS, TENN—1872.

MONTHS.	BAR.	THER.	RAINFALL.
January	30.26	35.0	2.17
February	30.03	43.0	4.24
March	30.12	47.0	5.19
April	30.04	64.0	6.99
May	30.05	71.0	4.16
June	30.05	76.0	4.44
July	30.04	83.0	4.23
August	30.08	81.0	0.54
September	30.07	73.0	3.62
October	30.14	59.0	3.23
November	30.20	44.0	1.67
December	30.27	34.0	3.47
Annual Means	30.11	59.	3.66
Means of the Summer months	30.06 (normal)	79.0 (+01.3)	2.79 (—0.40)

MEMPHIS, TENN.--1873.	BAR.	THER.	RAINFALL.
January	30.15	35.0	5.85
February	30.07	44.0	8.98
March	30.12	50.0	3.41
April	29.96	60.0	4.87
May	29.90	69.0,	4.82
June	29.95	79.0	6.36
July	30.00	78.0	0.82
August	30.03	79.0	4.53
September	30.04	71.0	3.53
October	30.13	43.0	5.95
November	30.32	26.0	3.87
December	30.21	26.8	3.18
Annual Means	30.07	55.0	4.68
Means of the Summer months	30.02 (—00.04)	76.0 (—01.7)	2.96 (—0.23)

MEMPHIS, TENN.--1874.	BAR.	THER.	RAINFALL.
January	30.19	45.0	2.88
February	30.14	45.0	4.10
March	30.08	53.0	6.61
April	30.04	55.0	10.16
May	30.00	72.4	0.63
June	29.99	81.0	2.22
July	30.02	82.8	0.47
August	29.98	82.9	4.60
September	30.04	73.2	4.72
October	30.02	60.3	1.07
November	29.98	52.0	3.67
December	30.04	45.6	2.94
Annual Means	30.04	62.3	3.67
Means of the Summer months	30.01 (—00.05)	79.6 (+01.9)	3.07 (—0-12)

NOTE.—There having been 42 cases of yellow fever during the summer at Memphis.

MEMPHIS, TENN., 1875.	BAR.	THER.	RAINFALL.
January	30.24	34.1	7.45
February	30.16	40.2	3.34
March	30.03	50.6	8.60
April	30.03	57.7	3.48
May	29.98	68.6	4.21
June	29.98	79.1	2.72
July	30.02	82.2	4.34
August	30.01	74.9	2.39
September	30.01	69.8	2.94
October	30.10	57.1	2.38
November	30.06	50.9	9.63
December	30.03	49.7	5.54
Annual Means	30.05	59.5	4.97
Means of the Summer months	30.01 (—00.05)	75.6 (—02.1)	3.22 (+0.03)

MEMPHIS, TENN.--1876.	BAR.	THER.	RAINFALL.
January	30.22	47.9	7.65
February	30.18	48.6	1.33
March	30.04	47.4	11.03
April	30.04	61.2	4.51
May	30.00	70.9	8.49
June	29.96	77.1	2.70
July	30.01	81.3	4.38
August	30.02	79.1	5.37
September	30.02	70.0	3.37
October	30.05	58.5	3.04
November	30.08	48.1	3.95
December	30.20	32.6	0.80
Annual Means	30.07	61.9	4.72
Means of the Summer Months	30.01 (—00.05)	76.8 (—00.9)	4.37 (+1.20)

MEMPHIS, TENN.--1877.	BAR.	THER.	RAINFALL.
January	30.22	39.3	4.31
February	30.19	46.7	1.54
March	30.05	50.0	4.24
April	29.91	59.3	13.90
May	29.99	70.5	1.81
June	29.98	77.8	18.16
July	30.00	80.4	6.22
August	29.99	78.0	6.05
September	30.02	71.0	3.11
October	30.04	62.8	3.75
November	30.11	47.6	5.97
December	30.16	50.5	4.44
Annual Means	30.05	61.1	4.46
Means of the Summer Months	30.00 (—00.06)	76.4 (—01.3)	5.12 (+1.93)

MEMPHIS, TENN—1878.	BAR. Comp. 1875.	THER. Comp. 1875.	RAINFALL.
January	30.11 (—00.13)	40.3 (†6.2)	4.01
February	29.97 (—00.19)	45.2 (†5.0)	5.08
March	29.97 (—00.06)	67.5 (†6.9)	2.80
April	29.80 (—00.23)	64.7 (†7.0)	13.03
May	29.97 (—00.01)	71.2 (†2·6)	3.66
June	29.93 (—00.05)	76.9 (—2.2)	5.47
July	29.84 (—00.18)	83.5 (†1.3)	2.50
August	29.94 (—00.07)	82.3 (†7.4)	1.82
September	30.07 (+00.06)	72.7 (†2.9)	1.70
October	30.08 (—00.02)	60.4 (†3.3)	2.91
November	30.06 (normal)	51.5 (†0.6)	2.45
December	30.18 (+00.15)	39.0 (—10.7)	3.27
Annual Means	29.99	62.1	4.05
Means of the Summer Months	29.95 (—00.11)	79.5 (+01.8)	2.00 (—1.19)

NOTE: The year 1875 exhibits no variation which could be announced as predisposing cause, but in lieu thereof an undue elevation of temperature and proportionate reduction of atmospheric pressure prevailed during nearly all the first half of 1878, as is indicated by the quotation that resulted from the comparison of the figures of 1875, which having been one of the most normal years.

NASHVILLE—1872.

MONTHS.	BAR.	THER.	RAINFALL.
January	30.25	35.0	3.32
February	30.05	43.0	2.11
March	30.13	44.2	3.09
April	30.08	62.1	5.91
May	30.07	71.8	3.09
June	30.06	77.4	5.17
July	30.05	79.6	4.90
August	30.09	80.5	1.65
September	30.09	71.7	4.50
October	30.16	58.5	1.58
November	30.22	42.8	2.25
December	30.30	33.9	2.48
Annual Means	30.12	58.3	3.25
Means of the Summer months	30.07 (+00.07)	77.2 (+00.4)	3.68 (+0.04)

NASHVILLE, 1873.	BAR.	THER.	RAINFALL.
January	30.17	35.4	2.96
February	30.05	43.6	7.14
March	30.11	47.4	4.11
April	29.95	59.4	3.59
May	29.89	70.0	4.11
June	29.96	77.9	4.20
July	30.03	80.0	4.63
August	30.02	80.1	2.36
September	30.05	72.5	1.81
October	30.12	56.8	4.26
November	30.07	47.1	4.36
December	30.19	44.6	5.94
Annual Means	30.06	59.3	4.19
Means of the Summer months	30.03 (+00.03)	77.5 (+00.7)	2.93 (−0.71)

NASHVILLE, 1874.	BAR.	THER.	RAINFALL.
January	30.19	43.3	5.22
February	30.12	44.5	9.23
March	30.06	51.7	5.26
April	30.01	54·7	11.48
May	29.97	72.0	1.49
June	29.97	83.5	2.87
July	29.99	83.4	2.65
August	29.97	81.5	3.52
September	30.05	73.4	3.12
October	30.14	59.8	2.63
November	30.16	49.8	6.12
December	30.22	44.0	4.19
Annual Means	30.07	61.7	4.81
Means of the Summer months	30.30 (normal)	79.4 (+02.6)	3.09 (−0.55)

NASHVILLE.—1875.	BAR.	THER.	RAINFALL.
January	30.22	33.7	6.15
February	30.16	38.2	3.06
March	30.03	49.1	8.14
April	30.01	56.3	4.25
May	29.97	68.3	1.73
June	29.99	77.0	5.63
July	29.98	81·3	8.12
August	29.97	74.0	1.60
September	30.03	69.2	3.79
October	30.06	56.4	1.25
November	30.03	50.4	5.46
December	30.00	49.2	4.30
Annual Means	30.03	58.6	4.37
Means of the Summer Months	29.99 (—00.01)	74.8 (—0.20)	4.50 (+0.86)

NASHVILLE.—1876.	BAR.	THER.	RAINFALL.
January	30.19	47.3	6.41
February	30.13	46.2	2.22
March	30.01	46.6	5.28
April	30.01	60.5	3.62
May	29.99	70.3	3.40
June	29.94	76.5	5.65
July	29.99	80.9	7.15
August	30.00	78.7	5.77
September	29.97	69.2	2.52
October	30.02	56.7	2.68
November	30.03	46.4	1.26
December	30.15	30.8	0.95
Annual Means	30.03	59.1	3.91
Means of the Summer Months	29.98 (—00.02)	76.2 (—00.6)	5.14 (+1.50)

NASHVILLE.—1877.	BAR.	THER.	RAINFALL.
January	30.19	37.0	4.05
February	30.16	45.0	1.06
March	30.05	47.4	4.95
April	29.90	59.2	9.47
May	30.00	67.3	1.25
June	29.98	77.3	6.02
July	29.98	81.1	3.25
August	29.97	77.4	4.16
September	30.01	70.6	5.40
October	30.04	60.9	2.61
November	30.10	47.3	4.93
December	30.16	48.2	2.49
Annual Means	30.05	59.9	4.13
Means of the Summer Months	30.00 (normal)	76.3 (—00.5)	4.27 (+0.63)

NASHVILLE—1878.	BAR.	THER.	RAINFALL.
January	30.10	38.7	3.34
February	29.97	43.0	2.26
March	29.97	59.6	3.45
April	29.80	63.0	6.77
May	29.94	69.0	2.33
June	29.94	73.7	3.25
July	29.95	82.8	9.23
August	29.92	80.4	5.09
September	30.08	70.1	1.23
October	30.10	59.1	2.20
November	30.06	49.2	3.19
December	30.16	34.7	6.06
Annual Means	30.00	60.2	4.03
Means of the Summer Months	29.98 (—00.02)	77.7 (+00.9)	5.15 (+1.51)

SAVANNAH, GA.—1872.

MONTHS.	BAR.	THER.	RAINFALL.
January	30.16	46.0	2.09
February	30.00	50.0	4.05
March	30.07	53.5	10.18
April	30.10	67.0	2.75
May	30.06	76.0	5.22
June	30.04	80.0	9.52
July	30.06	83.0	4.36
August	30.06	84.0	12.31
September	30.06	76.0	3.52
October	30.06	64.0	3.85
November	30.14	54.0	2.43
December	30.22	46.5	2.29
Annual Means	30.13	65.1	5.20
Means of the Summer months	30.06 (normal)	80.3 (+01.1)	6.73 (†0.71)

SAVANNAH, GA.—1873.	BAR.	THER.	RAINFALL.
January	30.13	49.0	3.50
February	30.10	55.0	0.90
March	30.17	55.0	4.37
April	30.03	67.0	4.37
May	29.98	74.0	5.12
June	30.05	78.8	4.64
July	30.15	81.0	5.44
August	30.08	80.0	5.45
September	30.06	76.4	4.03
October	30.11	63.4	1.09
November	30.10	55.3	5.74
December	30.24	51.8	3.78
Annual Means	30.08	65.5	4.04
Means of the Summer months	30.08 (+00.02)	79.1 (—00.1)	4.97 (+0.95)

SAVANNAH, GA.—1874.	BAR.	THER.	RAINFALL.
January..... (†)	29.24	52.4	2.07
February.....	30.16	53.3	9.71
March.....	30.09	62.2	2.85
April.....	30.07	66.	2.69
May.....	30.01	72.2	2.85
June.....	30.05	80.7	4.85
July.....	30.08	79.0	10.14
August.....	30.03	79.0	6.58
September.....	30.05	75.3	8.89
October.....	30.13	66.3	1.43
November.....	30.19	59.6	1.80
December.....	30.24	54.6	1.66
Annual Means.....	30.11	66.7	4.63
Means of the Summer months.....	30.05 (—00.01)	77.7 (—01.5)	8.53 (+2.51)

NOTE: (†), This quotation is here regarded an error, and 30.24 have therefore been taken into calculation.

SAVANNAH, GA.—1875.	BAR.	THER.	RAINFALL.
January.....	30.19	49.7	8.84
February.....	30.18	50.7	3.50
March.....	30.11	59.2	6.88
April.....	30.03	62.5	5.11
May.....	30.01	73.0	3.20
June.....	30.09	79.4	4.20
July.....	30.09	84.7	1.51
August.....	30.04	78.4	6.14
September.....	30.06	74.7	3.95
October.....	30.09	63.5	2.87
November.....	30.10	60.9	1.49
December.....	30.10	56.0	1.41
Annual Means.....	30.09	66.0	4.08
Means of the Summer Months.....	30.06 (normal)	79.2(normal)	3.86 (—2.16)

SAVANNAH, GA.—1876.	BAR.	THER.	RAINFALL.
January.....	30.20	56.8	2.39
February.....	30.18	56.5	2.21
March.....	30.08	58.7	2.71
April.....	30.08	66.7	5.74
May.....	30.08	74.0	2.25
June.....	30.03	80.0	18.79
July.....	30.06	84.5	6.11
August.....	30.06	82.1	68.8
September.....	29.98	78.0	2.63
October.....	30.06	61.6	9.45
November.....	30.03	56.4	0.88
December.....	30.14	44.9	4.81
Annual Means.....	30.07	65.1	5.57
Means of the Summer Months.....	30.03 (—00.03)	81.5 (+02.3)	5.20 (—0.82)

(896 deaths from yellow fever, at 33 per cent. mort. = 2688 cases.)

SAVANNAH, GA.—1877.	BAR.	THER.	RAINFALL.
January	30.21	54.1	2.63
February	30.13	52.5	1.71
March	30.07	58.5	4.25
April	29.96	65.1	8.82
May	30.04	70.6	2.04
June	30.06	81.3	8.53
July	30.03	83.8	5.67
August	30.00	81.6	3.69
September	29.99	76.7	8.92
October	30.06	68.7	5.57
November	30.09	59.4	3.72
December	30.19	55.1	4.06
Annual Means	30.06	67.2	4.95
Means of the Summer Months	30.00 (—00.06)	80.3 (+01.1)	6.09 (+0.07)

SAVANNAH, GA.—1878.	BAR.	THER.	RAINFALL.
January	30.09	50.2	2.96
February	30.00	53.2	2.19
March	30.04	62.4	1.41
April	29.87	69.7	6.50
May	30.00	77.5	1.11
June	29 99	79.5	6.97
July	30.00	82.8	6.36
August	29.96	84.0	7.63
September	30.05	76.3	7.28
October	30.09	67.1	2.54
November	30.08	58.7	3.70
December	30.15	49.4	5.18
Annual Means	30.02	67.5	4.50
Means of the Summer months	30.00 (—00.06)	81.0 (+01.8)	7.09 (+1.07)

CHARLESTON, S. C.—1872.

MONTHS.	BAR.	THER.	RAINFALL.
January	30.13	45.0	3.78
February	29.99	48.5	5.13
March	30.07	51.0	9.70
April	30.11	65.6	2.46
May	30.02	74.9	6.30
June	30.04	79.7	1·87
July	30.05	84.1	2.30
August	30.05	81.8	7.81
September	30.05	77.8	7.88
October	30.05	64.8	4.21
November	30.14	53.8	3.40
December	30.20	45.8	2.46
Annual Means	30.07	64.4	4.78
Means of the Summer months	30.05 normal	81.2 (+0.19)	5.99 (—1.49)

CHARLESTON, S. C.—1873.	BAR.	THER.	RAINFALL.
January	30.11	48.1	4.13
February	30.06	53.4	2.27
March	30.15	53.6	3.05
April	30.00	64.5	1.33
May	29.98	74.9	4.90
June	30.03	78.1	6.29
July	30.09	80.9	6.97
August	30.07	77.7	12.94
September	30.05	76.0	8.18
October	30.10	63.9	2.07
November	30.07	54.8	5.08
December	30.23	51.4	4.94
Annual Means	30.08	64.7	5.18
Means of the Summer months	30.07 (+00.02)	78.2 (—01.1)	9.36 (+1.88)

CHARLESTON, S. C.—1874.	BAR.	THER.	RAINFALL.
January	30.24	52.1	3.51
February	30.16	51.5	10.45
March	30.08	59.9	3.45
April	30.06	67.7	2.95
May	29.98	71.4	5.50
June	30.01	81.0	2.29
July	30.05	79.3	13.74
August	30.03	79.1	7.06
September	30.05	75.8	6.66
October	30.12	66.7	1.85
November	30.18	58.8	2.11
December	30.23	53.1	2.94
Annual Means	30.09	66.3	5.21
Means of the Summer months	30.04 (—00.01)	78.0 (—01.3)	9.15 (+1.67)

CHARLESTON, S.C.—1875.	BAR.	THER.	RAINFALL.
January	30.19	47.3	7.77
February	30.18	49.2	4.27
March	30.11	57.1	6.37
April	30.03	60.8	4.56
May	30.02	71.7	8.51
June	30.10	78.2	3.15
July	30.08	84.6	1.05
August	30.04	79.9	1.99
September	30.06	75.1	3.58
October	30.08	63.3	3.90
November	30.10	59.7	3.38
December	30.09	54.1	1.92
Annual Means	30.09	65.1	4.25
Means of the Summer months	30.06 (+00.01)	79.8 († 00.3)	2.20 (—)5.28

CHARLESTON, S.C.—1876.	BAR.	THER.	RAINFALL.
January	30.27	55.4	0.63
February	30.18	54.6	2.43
March	30.09	56.6	2.54
April	30.08	64.3	4.93
May	30.09	71.4	3.77
June	30.04	79.9	14.98
July	30.06	83.6	11.26
August	30.06	82.4	5.19
September	29.98	77.9	11.26
October	30.05	62.4	14.32
November	30.01	56.3	1.35
December	30.12	44.1	5.85
Annual Means	30.08	65.7	6.54
Means of the Summer months	30.03 (—00.02)	81.3 (+02.0)	9.23 (+1.75)

NOTE.—(Thirty cases of yellow fever). Information kindly given by Dr. H. Ford, of this city, who received the same from an official source of Charleston. Dr. Hutson Ford's Report to St. Lonis Medical Society on Yellow Fever, 1879, Table 2nd, pp. 159, states 30 deaths, at a rate of 23 per cent mortality, would equal 90.6 cases.

MOBILE, ALA—1872.

MONTHS.	BAR.	THER.	RAINFALL.
January	30.21	45.1	3.69
February	30.01	51.7	8.00
March	30.09	51.4	12.76
April	30.06	69.2	4.35
May	30.09	75.7	3.78
June	30.05	80.6	6.33
July	30.06	80.7	13.37
August	30.06	81.2	1.69
September	30.07	77.6	2.15
October	30.12	65.6	2.77
November	30.19	54.0	5.65
December	30.25	47.9	3.70
Annual Means	30.10	65.0	5.68
Means of the Summer months	30.06 [+00.02]	79.8 [normal]	5.73 [—0.88]

MOBILE, ALA.--1873.	BAR.	THER.	RAINFALL.
January	30.16	46.3	4.16
February	30.13	56.1	3.15
March	30.19	57.0	3.86
April	30.07	65.7	0.88
May	29.98	73.9	11.47
June	30.04	79.4	9.87
July	30.10	82.2	8.75
August	30.04	80.2	10.35
September	30.03	76.1	8.07
October	30.12	65.2	1.85
November	30.12	57.7	3.23
December	30.21	54.1	2.97
Annual Means	30.10	66.1	5.71
Means of the Summer months	30.05 (+00.01)	79.5 (—00.3)	9.05 (+2.44)

MOBILE, ALA.—1874.	BAR.	THER.	RAINFALL.
January	30.21	53.3	2.48
February	30.12	56.7	2.72
March	30.07	63.3	10.57
April	30.06	64.3	10.92
May	30.03	73.6	1.23
June	30.03	80.1	5.69
July	30.05	80.8	10.21
August	30.01	83.8	3.79
September	30.02	77.9	2.54
October	30.12	67.4	0.00
November	30.16	60.2	2.04
December	30.21	54.3	4.17
Annual Means	30.09	67.9	4.69
Means of the Summer Months	30.02 (—00.02)	80.8 (+01.0)	5.51 (—1.10)

MOBILE, ALA—1875.	BAR.	THER.	RAINFALL.
January	30.17	49.8	5.79
February	30.17	50.9	7.15
March	30.08	60.2	8.39
April	30.06	63 2	7.57
May	30.00	75.3	1.46
June	30.09	80.8	2.45
July	30.10	83.9	4.00
August	30.03	78.4	7.07
September	30.03	75.1	8.52
October	30.12	62.7	2.32
November	30.07	62.6	5.06
December	30.09	57.6	3.10
Annual Means	30.08	66.8	5.91
Means of the Summer Months	30.05 (+00.01)	79.1 (—00.7)	6.53 (—0.08)

MOBILE, ALA.,--1876.	BAR.	THER.	RAINFALL.
January	30.26	56.6	3.14
February	30.19	55.3	4.32
March	30.07	55.8	8.01
April	30.07	66.2	3.88
May	30.05	74.5	4.32
June	30.01	80.3	3.35
July	30.05	83.3	5.38
August	30.04	80.1	11.53
September	30.00	76.8	1.76
October	30.05	64.4	0.37
November	30.07	55.7	5.36
December	30.16	44.4	7.18
Annual Means	30.08	66.1	4.88
Means of the Summer months	30.03 (—00.01)	80.0 (+00.2)	6.22 (—0.39)

MOBILE, ALA., 1877.	BAR.	THER.	RAINFALL.
January	30.22	50.1	6.30
February	30.15	53.4	1.40
March	30.09	57.5	5.94
April	29.95	65.9	8.40
May	30.01	72.8	1.68
June	30.05	80.8	7.07
July	30.00	84.8	3.74
August	29.99	82.0	4.69
September	29.96	77.6	12.68
October	30.03	68.1	6.15
November	30.12	56.1	4.70
December	30.18	54.3	5.99
Annual Means	30.06	66.9	5.72
Means of the Summer Months	29.98 (—00.06)	81.4 (+02.4)	7.03 (+0.42)

MOBILE, ALA.—1878.	BAR.	THER.	RAINFALL.
January	30.11	47.9	3.95
February	29.99	51.8	3.40
March	30.00	64.9	4.32
April	29.86	69.4	5.04
May	30.01	75.9	4.86
June	29.96	81.2	6.06
July	29.96	84.0	5.99
August	29.97	82.4	8.67
September	30.04	77.2	4.16
October	30.09	67.8	3.35
November	30.08	37.4	6.32
December	30.17	46.8	7.57
Annual Means	30.08	67.2	5.35
Means of the Summer months	29.99 (—00.05)	81.2 (+01.4)	6.27 —0.34)

ST. LOUIS, MO.—1872.

MONTHS.	BAR.	THER.	RAINFALL.
January	30.16	28.3	0.64
February	30.01	32.4	1.15
March	30.05	39.1	2.43
April	29.94	57.5	3.17
May	29.96	67.4	5.97
June	29.94	76.9	4.28
July	29.94	79.0	4.41
August	30.00	74.9	0.93
September	29.96	69.8	3.45
October	30.07	57.0	0.55
November	30.10	38.1	2.01
December	30.23	25.7	1.70
Annual Means	30.03	51.8	2.55
Means of the Summer months	29.96 (—00.02)	74.5 (—00.6)	2.93 (—1.17)

ST. LOUIS.—1873.	BAR.	THER.	RAINFALL.
January	30.06	26.0	3.53
February	30.05	33.6	1.52
March	30.05	42.6	2.10
April	29.88	51.2	6.86
May	29.83	65.1	5.27
June	29.90	77.1	6.68
July	29.98	77.5	5.96
August	30.02	78.5	0.07
September	30.04	66.6	3.02
October	30.10	52.3	3.27
November	30.05	41.8	1.64
December	30.16	37.2	5.10
Annual Means	30.01	54.1	3.74
Means of the Summer Months	30.01 (+00.03)	74.2 (—00.9)	3.01 (—1.09)

ST. LOUIS.—1874.	BAR.	THER.	RAINFALL.
January	30.14	35.5	3.04
February	30.12	36.6	3.66
March	30.07	43.1	4.36
April	30.04	47.6	3.43
May	29.95	69.5	3.70
June	29.95	79.2	2.00
July	29.98	81.5	5.71
August	29.96	78.3	4.70
September	30.02	70.2	2.32
October	30.12	58.1	1.09
November	30.14	44.3	2.32
December	30.20	37.8	1.46
Annual Means	30.05	56.8	2.90
Means of the Summer Months	29.98 (normal)	76.6 (†01.5)	4.24 (†0.14)

ST. LOUIS.--1875.	BAR.	THER.	RAINFALL.
January	30.28	24.1	0.54
February	30.17	26.2	2.59
March	30.02	40.0	4.08
April	30.00	52.0	2.52
May	29.95	64.9	5.48
June	29.96	73.2	10.84
July	29.96	78.2	9.49
August	29.98	73.1	2.66
September	30.06	67.2	0.24
October	30.04	54.7	1.23
November	30.07	41.7	0.89
December	29.96	43.7	2.42
Annual Means	30.03	53.2	3.58
Means of the Summer Months	30.00 (†00.02)	72.8 (—02.3)	4.13 (†0.03)

ST. LOUIS, 1876.	BAR.	THER.	RAINFALL.
January	30.13	41.4	4.75
February	30.10	40.9	2.86
March	30.01	39.9	6.90
April	29.98	57.3	2.25
May	29.97	67.2	3.13
June	29.89	72.9	6.43
July	29·97	79.2	5.90
August	29.99	77.8	5.03
September	29.99	66.8	7.63
October	30.00	55.7	1.66
November	30.05	40.6	1.74
December	30.18	25.1	0.18
Annual Means	30.02	55.4	4.03
Means of the Summer Months	29.98 (normal)	77.9 (+02.8)	6.18 (+2.08)

ST. LOUIS.—1877.	BAR.	THER.	RAINFALL.
January	30.19	31.5	1.24
February	30.20	41.7	0.88
March	30.04	38.6	3.41
April	29.89	54.6	2.86
May	29.97	63.7	3.11
June	29.91	74.6	8.69
July	29.95	78.4	2.88
August	29.96	76.0	2.61
September	30.00	69.8	3.56
October	30.00	59.6	4.92
November	30.08	42.3	3.76
December	30.11	35.8	3.34
Annual Means	30.02	55.5	3.43
Means of the Summer months	29.97 (—00.01)	74.4 (—00.7)	3.01 (—1.09)

ST. LOUIS. —1878.	BAR. Comp. 1875.	THER. Comp. 1875.	RAINFALL.
January	30.05 (—00.23)	36.2 (+12.1)	2.76
February	29.94 (—00.23)	41.2 (+15.0)	1.64
March	29.91 (—00.09)	53.9 (+13.9)	2.79
April	29.75 (—00.25)	61.2 (+11.2)	6.39 (+3.87)
May	29.91 (—00.04)	63.4 (— 1.5)	4.60
June	29.90 (—00.06)	73.0 (— 0.2)	2.39
July	29.89 (—00.07)	80.7 (+ 2.5)	4.08
August	29.90 (—00.08)	79.1 (+ 6.0)	4.75
September	30.06 (—00.00)	68.8 (+ 1.6)	2.92
October	30.04 (—00.00)	60.3 (+ 5.6)	3.64
November	30.04 (—00.03)	43.7 (+ 2.0)	1.38
December	30.17 (+00.21)	27.2 (—16.5)	4.08
Annual Means	29.96 (—00.07)	59.0 (+04.8)	3.45 (+0.08)
Means of the Summer months	29.95 (—00.03)	76.2 (+01.1)	3.91 (—0.19)

NOTE.—Vegetation ordinarily observed in May was in this year nearly a full month's time in advance, responding to the omnipotent laws of nature, which is exemplified by the following data:

Normal means for the month of April, 1872 to 18877 inclusive—Barometer, 29.96; Thermometer, 51.7; Rainfall, 3.51.

Means for the same month in the year 1878—Barometer, 29.75 [—00.21]; Thermometer, 61.2 [+ 09.5]; Rainfall, 6.39 [+ 2.88].

Statistics of the number of cases, and deaths by yellow fever of the great epidemic of the Valley of the Mississippi in 1878, as they are recorded by daily reports of telegraphic dispatches, and by the weekly reports from the Surgeon Generals office of U. S. Marine Hospital Service. These statistics embrace the total number of cases and deaths as far as they could be ascertained with any reliability, and from every locality where the disease prevailed.

For facilitating the examination of the lists, they are arranged by States; and of these by cities, towns and parishes, giving the weekly number.

The scientific point of interest is thus at once perceived, namely that the fever originated in the summer extremes, and subsided upon the approach of hybernal refrigiration. Also only to have prevailed there where the veriations declined materially from the normal means:

LOUISIANA.[1]

NEW ORLEANS.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
July 12–27	80	33	80	33
" 28 to August 2	153	27	233	60
August 3–9	253	66	466	126
" 10–16	509	140	975	266
" 17–23	891	310	1866	576
" 24–30	1245	339	3111	915
" 31 to September 6.	1730	559	4841	1135
September 7–13	1601	512	6442	1647
" 14–20	1092	386	7534	2033
Total to date as reported from Surg. Gen. office, U. S. M. Hosp. Service.	.....	.....	7538	2368
September 21–27	926	332	8464	2700
" 28 to October 4.	1754	360	10218	3060
October 5–11	988	340	11206	3400
" 12–18	976	235	12182	3635
" 19–25	699	229	12881	3864
" 26 to November 1	371	117	13252	3973
November 2–8	154	37	13406	4010
" 9–15	.....	11	.....	.....
Telegram from November 13 states total	.....	.....	16802	.....
And deaths for the week ending November 15	.....	20	.....	4030
November 16-22	.....	20	.....	4050
" 23–29	.....	8	.....	4058
" 30 to December 6	.....	4	.....	4062
Total	.....	.....	16802	4062

PLAQUEMINE.

August 1 to September 6.	175	35	175	35
September 7–13	258	27	433	62
" 14 to October 18	726	63	1159	125
Total	.....	.....	1159	125

1. The general summary by States with the per cent of mortality and entire grand total will be found in the last table of these statictics.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
BATON ROUGE.				
August 31 to September 6	163	13	163	13
September 7–13	268	19	431	32
" 14–20	241	7	672	39
" 21–27	221	7	893	46
" 28 to October 4	524	32	1417	78
October 5–11	452	35	1869	113
" 12–18	301	16	2170	129
" 19–25	170	15	2340	144
" 26 to November 1	75	16	2415	160
Total	.....	.....	2415	160
MORGAN CITY.				
August 31 to September 6	22	6	22	6
September 7-13	14	2	36	8
" 14-20	30	10	66	18
" 21-27	79	12	145	30
" 28 to October 4	155	18	300	48
October 5-11	128	23	428	71
" 12-18	4	16	432	87
" 19-25	78	7	510	94
" 26 to November 1	53	8	563	102
November 2-8	8	3	571	105
" 9-15	12	1	583	106
" 16-19	.....	1	583	107
Total	.....	.....	583	107
POINT PLEASANT.				
October 10	20	6	20	6
Total	.....	.....	20	6
GREATNA.				
October 12–18	532	53	532	56
Total	.....	.....	532	56
DELTA.				
August 15	1	.....	1	.....
October 2	21	3	22	3
" 25	3	2	25	5
" 31 to November 1	6	.....	36	5
November 16	.....	1	36	6
" 22	.....	3	36	9
Total	.....	.....	36	9

TENSAS PARISH.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
October 4	10	.....	10	...
" 10	50	.....	60	...
Total	.....	.....	60	...

DELPHI.

To September 6	26	6	26	6
To November 15	74	44	100	50
Total	.....	.....	100	50

LAFOURCHE CROSSING.

September 26	2	.....	2	...
Total	.....	.....	2	...

MOUND PLACE.

September 24	6	1	6	1
Total	.....	.....	6	1

BRAUSARD.

September 24	3	1	3	1
Total	.....	.....	3	1

CORIO PLACE.

September 24	19	.....	19	...
Total	.....	.....	19	...

LABADIEVILLE.

September 24	30	.....	30	...
Total	.....	.....	30	...

PORT HUDSON.

To October 20	75	18	75	18
Total	.....	.....	75	18

DONALDSONVILLE AND PARISH.

To September 19	.....	2	...	2
October 12-18	70	11	70	13
" 19-25	1044	139	1114	15
Total	.....	.....	1114	152

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
PORT EADS.				
August 3-9	17	1	17	1
" 10-16	20	6	37	7
" 17-23	16	1	53	8
" 24-30	3	1	56	9
October 5-11	.....	1	56	10
Total	.....	.....	56	10
PILOT TOWN.				
September 10	7	5	7	5
Total	.....	.....	7	5
BAYOU DES ALMO.				
August 24-30	7	.....	7	....
Total	.....	.....	7	...
CLINTON.				
To November 15	96	15	96	15
Total	.....	.....	96	15
COVINGTON.				
August 31	2	1	2	1
Total	.....	.....	2	1
SMITHLAND PLANTATION.				
September 27	...	1	...	1
Total	...	...	...	1
PECAN PLANTATION.				
September 24	2	2	2	2
Total	...	...	2	2
RAILROAD CAMP.				
September 24	1	1	1	1
Total	...	...	1	1
RICCAHO PLANTATION.				
October 12–18	42	15	42	15
Total	...	...	42	15

THOMPSON'S PLANTATION.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	DEATHS.
October 12	47	...	47	...
Total	...	...	47	...

BERWICK CITY.

October 5–11	7	3	7	3
" 19–25	4	...	11	3
Total	...	...	11	3

BEECH GROVE.

October 12	20	15	20	15
Total	...	...	20	15

PAINCAURTVILLE.

October 12–18	150	13	150	13
Total	.....	...	150	13

SOUTHWEST PASS.

August 21–27	42	2	42	2
September 14–20	3	2	45	4
" 28 to Oct. 4	...	5	45	9
Total	...	...	45	9

PATTERSONVILLE AND VICINITY.

September 14–20	28	12	28	12
" 21–27	50	...	78	12
" 28 to Oct. 4	24	...	102	12
October 5–11	37	9	139	21
" 12–18	12	14	151	33
" 19–25	13	...	164	33
" 26 to Nov. 1	5	2	169	35
Total	...	...	169	35

THIBODEAUX.

September 21–27	...	8	...	8
" 28 to Oct. 4	62	13	62	21
October 5–11	304	9	366	30
" 12–18	155	4	521	34
Total	.....	.....	521	34

MISSISSIPPI.

VICKSBURG.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
July 26–27	3	2	3	2
" 28 to August 9	1	.....	4	2
August 10–16	6	1	10	3
" 17–23	165	64	175	67
" 24–30	732	116	907	183
" 31 to September 6	488	126	1395	309
September 7–13	.....	222[2]	4031	531
" 14–20	195	124	4226	655[3]
" 21–27	.....	58	4226	779
" 28 to October 4	.....	70	4226	849
October 5–11	.....	129[1]	4226	978
" 12–18	.....	96[1]	4226	1074
" 19–25	1	35[1]	4227	1109
" 26 to November 1	8	13	4235	1122
November 2–8	.....	17	4235	1139
" 9–15	12[1]	5[1]	4247	1144
" 16–22	.....	5	4247	1149
Total	.....	.....	4247	1149

GREENVILLE.

August 31 to September 6	144	41	144	41
September 7–20	.....	.....	250	151
" 21–27	...	....	....	227
" 28 to October 4	.....	.....	769	260
October 5–11	....	.....	....	301
November 30	.....	.....	....	302
Total	.....	.....	769	302

PEARLINGTON.

October 12–18	8	9	8	9
" 19–25	1	1	9	10
Total	...	...	9	10

ROCKY SPRINGS.

October 17	..	...	23	6
Total	...	...	23	6

1. Including vicinity.
2. Estimated.
3. U. S. Marine Hospital Reports, 721.

BYRAM.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
October 12–18	4	...	4	...
" 19–25	1	...	5	...
Total	...	...	5	...

GRENADA.

July 25-27	1	.....	1	.....
August 10 16	149	45	150	45
" 17-23	502	115	652	160
" 24-30	No rpt	32[2]	.....	192
" 31 to September 6	38	27	690	219
September 7-13	71	30	761	249
" 14-20	23	22	784	271
" 21-27	10	3	794	274
" 28 to Oct. 4	18	...	812	274
October 5-11	6	2	818	323[3]
" 12-18	45[1]	4[1]	863	327
Total	.....	.....	863	327

HOLLY SPRINGS.

August 24-30	9	2	9	2
" 31 to Sept. 6	131	20	149	22
September 7-13	44	46	184	68
" 14-20	65	26	249	94
" 21-27	150	42	399	136
" 28 to Oct. 4	65	33	464	169
October 5-11	Total to 8th		1064	241
" 12-18	53	44	1117	285
" 19-25	47	21	1164	306
" 26 to Nov. 1	18	3	1182	309
Total	.....	.....	1182	309

CANTON.

August 24-30	9	3	9	3
" 31 to Sept. 6	158	28	167	31
September 7-13	197	49	274	80
" 14 20	181	35	455	115
" 21 to Oct. 4	.....	...	720	115
October 5-11	90	26	810	141
" 12 to Nov. 1	.....	...	916	176
Total	.....	.....	916	176

1. Including vicinity. 2. Report incomplete. 3. Corrected total to date.

WEEK.	SUMMIT. CASES.	SUMMIT. DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
August 21			5	2
Total	..	..	5	2
	WATER VALLEY.			
August 24-30	1	1	1	1
September 14-20	17	4	18	5
" 21-27	3	2	21	7
" 28 to Oct. 4	18	10	39	17
October 5-25	107	43	146	60
Total	.....	.....	146	60
	HERNANDO.			
August 31 to Oct. 11	83	33	83	33
October 12-18	50	23	133	56
" 19-25	32	7	165	63
" 26 to Nov. 1	10	6	175	69
Total	.....	.....	175	69
	PORT GIBSON.			
August 17-23	90	5	90	5
" 24-30	130	25	220	30
" 31 to Sept. 6	180	30	400	60
September 7-13	100	39	500	99
" 14 27	120	16	620	115
" 28 to Oct. 11	.....	80	620	195
October 12-25	.....	30	620	225
" 26 to Nov. 1	.....	10	620	235
November 30 to Dec. 6	1	1	621	236
December 14-27	.....	2[1]	621	238
Total	.....	.....	621	238
	BAY ST. LOUIS.			
To September 13	10	5	10	5
September 14–20	15	...	25	5
" 21–27	53	15	78	20
" 28 to October 4	208	36	286	56
October 5–18	52	12	338	68
" 19 to November 1	197	20	535	78
Total	.....	...	535	78

1. Refugees.

OCEAN SPINGS.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
August 17-23	9	4	9	4
" 31 to Sept. 6	23	5	32	9
September 7-13	15	.....	47	9
" 14-20	14	3	61	12
" 21-27	9	5	70	17
" 28 to Oct. 4	18	5	88	22
October 5-11	25	6	113	28
" 11-18	25	1	138	29
" 19-25	17	1	155	30
November 2-8	5	.....	160	30
Total	.....	.....	160	30

MISSISSIPPI CITY AND VICINITY.

September 21–27	8	1	8	1
" 28 to October 4	12	2	20	3
October 19–25	33	3	53	6
Total	...	..	53	6

YAZOO CITY.

October 12–18	15	5	15	5
" 15	31	2	46	7
Total	..	..	46	7

PASS CHRISTIANA.

To September 20	21	1	21	1
September 21–27	12	2	33	3
" 28 to October 4	24	3	59	6
October 5 11	35	3	94	9
" 12–18	32	4	126	13
" 19–25	45	7	170	20
" 26 to November 1	19	..	189	20
November 2–8	7	1	196	21
" 9–15	3	..	199	21
Total	...	..	199	21

BILOXI.

September 14–20	20	7	20	7
" 21–27	5	1	25	8
" 28 to October 11	250	13	275	28
October 12–18	20	12	295	40
Total	.....	...	295	40

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
BOLTON.				
August 12 to October 18.	117	31	117	31
November 11.....	.....	3	117	34
Total.....	.....	...	117	34
SPRING HILL.				
September 28 to Oct. 11..	15	6	15	6
Total.....	...	..	15	6
MERIDIAN.				
To November 1.....	400	80	400	80
December 6.....	1	...	401	80
Total.....	.....	...	401	80
CARROLTON.				
October 2.....	...	.....	200	5[1]
Total.....	.....	.....	200	5[1]
TALLULAH.				
To October 17.....	....	.....	25	5
Total.....	.....	.....	25	5
TUNCA.				
October 12.....	..	5	...	5
Total.....	.....	.....	...	5
TERRY.				
September 14-20.....	20	.....	20	...
Total.....	.....	.....	20	..
ATYKA.				
July 31 to November 16	227	30	227	30
Total.....	.....	...	227	30
CRYSTAL SPRINGS.				
To October 11.....	81	36	81	36
" 12–18.....	31	8	112	44
Total.....	.....	.....	112	44

1. In last 24 hours.

WEEK.	M'COMB. CASES.	M'COMB. DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
September 28 to Oct. 21	141	14	141	14
October 22–27	4	5	145	19
Total	.....	.....	145	19
	LAKE.			
To September 20	3	2	3	2
to November 1	297	84	300	86
Total	.....	.....	300	86
	MOSCOW.			
August 31 to November 3	71	35	71	35
Total	.....	.....	71	35
	BOVINA.			
September 27	20	.....	20	...
Total	.....	.....	20	...
	SCRANTON.			
To October 11	5	3	5	3
Total	.....	.....	5	3
	WENLERVILLE.			
October 26	20	3	20	3
Total	...	...	20	3
	GARNER'S STATION.			
October 18	7	...	7	..
Total	...	...	7	...
	DUCK HILL AND VICINITY.			
October 17	....	11	....	11
Total	.....	...	.....	11
	SENATOBIA.			
August 17–23	5	...	5	...
September 7–13	25	...	30	...
October 18	12	..	42	..
Total	...	...	42	...

DRY GROVE, LEBANON CHURCH AND VICINITY.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
November 1	112	44	112	44
" 2–8	13	8	125	52
Total	.....	.....	125	52

GOODWICH LANDING.

August 31 to September 6	30	4	30	4
To October 17	..	...	110	42
Total	...	...	110	42

HORNLAKE.

October 18	1	...	1	...
Total	...	...	1	...

FRIARS POINT.

To October 11	13	4	13	4
" 12–18	8	2	21	6
Total	...	..	21	6

JACKSON.

August 31	...	1 refu.	...	1
September 28 to Oct. 4	257	36	257	37
October 19–25	99	20	356	57
" 26 to Nov. 1	60	9	416	66
November 2–15	21	12	437	78
Total	.....	.....	437	78

PASCAGULA.

August 31 to September 6	3[1]	...	3	..
September 28 to Oct. 4	..	1	..	1
October 5–11	5	2	8	3
Total	...	...	8	3

NATCHEZ.

August 21	20	...	20	...

1. River hands.

TENNESSEE.

MEMPHIS.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
August 10–16	62	14	62	14
" 17–23	174	57	236	71
" 24–30	653	278	889	349
" 30 to Sept. 6	2360	590	3249	939
September 7–13	1767	727	5016	1666
" 14–20	1521	598	6537	2264
" 21–27	.....	297	.....	2428
" 28 to Oct. 4	.....	199	.....	2627
October 5–11	.....	157	.....	2784
" 12–18	.....	108	.....	2892
" 19–25	.....	50	.....	2942
" 26 to Nov. 1	.....	22	.....	2964
November 2–8	.....	33	.....	2997
" 9–22	.....	33	.....	3030
" 23–29	.....	2	.....	3032
" 30 to Dec. 6	.....	1	.....	3033
December 7–13	.....	2	.....	3035
Total			12140	3035

NOTE.—The total number of cases is obtained by calculation on the basis of 25 per cent. of mortality. The correctness of this basis is corroborated by the statements of Prof. Summers, quoted in the text, who could make them from personal observation and special information.

TANGIPAHOA.

September 28 to Oct. 4	6	2	6	2
October 5–11	12	...	18	2
" 12–18	89	40	127	42
" 19–25	2	1	129	43
Total			129	43

BROWNSVILLE.

August 31 to Sept. 6	17	13	17	13
September 7–13	13	16	30	29
" 14–20	100	15	130	44
" 21–27	67	22	197	66
" 28 to Oct. 4	77	20	274	86
October 5-11	139	35	413	121
" 12–25	147	31	560	152
Total			560	152

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
GRAND JUNCTION.				
August 12 to Sept. 15.....	42	...	42	...
September 16 to Oct. 4.....	78	52	120	52
October 5–26	54	22	174	74
Total			174	74
MILAN DEPOT.				
August 20 to Sept 1.....	20	4	20	4
October 5-11.....	1	..	21	4
" 12-18.....	2	2	23	6
" 26 to Nov. 1.....	12	6	35	12
Total.....			35	12
MASON.				
September 1.....	...	1 refu	...	1
To November 1.....	60	23	60	24
Total			60	24
WHITE.				
September 1.....	1	...	1	...
Total.....			1	...
PARIS.				
August 24 to Oct. 11.....	52	22	52	22
Total.....			52	22
MARTIN.				
September 28.....	28	...	28	...
Total.....			28	...
GERMANTOWN.				
August 20 to Oct. 16.....	65	36	65	36
Total.....			65	36
LAGRANGE.				
To October 4.....	30	15	30	15
October 5–11.....	20	6	50	21
" 12–18	2	1	52	22
" 19–25	1	...	53	22
Total			53	22

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
LYNNVILLE.				
September 25	2	...	2	...
Total			2	...
COLLIERSVILLE.				
October 7	8	...	8	...
Total			8	...
GALLOWAY.				
October 7	5	...	5	...
Total			5	...
CHATTANOOGA.				
August 21	1 refu.	...	1	..
September 6	1 refu.	...	2	...
" 14–27	39	26	41	26
" 28 to October 4	43	18	84	44
October 5–18	101	30	185	74
" 19–25	80	23	265	97
" 26 to November 1	168	30	433	127
November 2–8	11	6	444	133
" 9–15	2	2	446	135
Total	.....	.....	446	135
NASHVILLE.				
September 14 to Oct. 28	13	6	13	6
Total (all refugees)			13	6
FLORIDA.				
KEY WEST.				
August 31 to September 6	2	1	2	1
September 14-20	6	5	8	6
" 21 to October 4	27	10	35	16
October 5–11	2	...	37	16
" 12–18	...	1	37	17
Total	.....	.....	37	17
FERNANDINA.				
July 27	3	2	3	2
Total	...	...	3	2

ALABAMA.

MOBILE.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
August 17–23	1	1	1	1
" 24–30	1	1	2	2
September 14–20	4	2	6	4
" 21–27	11	7	17	11
" 28 to October 4	13	6	30	17
October 5-11	7	3	37	20
" 12-18	56	12	93	32
" 19-25	71	17	164	49
" 26 to November 1	60	10	224	50
November 2-8	35	9	259	68
" 9-15	21	8	280	76
" 16-22	8	4	288	80
" 23-29	3	1	291	81
" 30 to Dec. 10	3	1	294	82
Total	.....	.....	294	82

TUSCUMBIA.

August 24–30	2	...	2	...
October 22	5	1	7	1
Total	.....	.....	7	1

DECATURE.

October 11	82	15	82	15
" 12–18	73	12	155	27
" 19–25	23	13	178	40
" 26 to November 1	10	2	188	42
November 2–8	8	1	196	43
" 9–22	4	2	200	45
Total	.....	.....	200	45

LEIGHTON.

August 24–30	...	1	...	1
Total	.....	.....	...	1

ARKANSAS.

HELENA.

October 11	59	...	59	–
" 12–18	17	9	76	9
Total	...	...	76	9

HOPEFIELD.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	DEATHS.
To September 25	6	.....	6	...
October 5–11	24	.....	30	...
" 12–18	6	.....	36	...
	.....	.....	—	
Total	.....	.....	36	...

KENTUCKY.

LOUISVILLE.

August 24–30	7	4	7	4
" 31 to September 6	25	7	32	11
September 7–13	27	7	59	18
" 14–20	18	8	77	26
" 21–27	18	10	95	36
" 28 to October 4	7	5	102	41
October 5–11	10	8	112	49
" 12–18	15	5	127	54
" 19–25	4	7	131	61
Total			—	—
			131	61

NOTE: The first indigenous case occurred on the 12th of September. The total number of the refugees were: Cases 89, and deaths 34. Deducting these numbers from the grand total. there are left 42 cases and 27 deaths of "indiginous cases."

HICKMAN.

August 16 to September 6	60	24	60	24
September 7–13	79	25	139	49
" 14–20	66	25	205	74
			—	—
Total			205	74

MISSOURI.

ST. LOUIS.

August 24–30	8 refu	2 refu	8	2
" 31 to September 6	64	13	72	15
September 7–13	2	1	74	16
" 14–20	.....	6	74	22
" 21–27	....	4	74	26
" 28 to October 4	.....	2	74	28[1]
October 5–11	1	3	75	44
" 12–18	.....	4	...	48
" 19–25	...	4	...	52
			—	—
Total	.....	.....	75	52

NOTE: Of the total (cases and deaths) there were about 30 of indigenous origin.

1. U. S. M. Hosp. Ser. Rep. 41.

ILLINOIS.

CAIRO.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	GRAND TOTAL. DEATHS.
August 17–23	2	4	2	4
" 24–30	5	3	7	7
September 7–13	1	2	8	9
" 14–20	5	3	13	12
" 21–27	2	...	15	12
" 28 to October 4	3	1	18	13
October 5–11	18	12	36	25
" 12–18	.....	1	36	26
" 19–25	50	16	86	42
November 2–8	8	3	94	45
" 9–15	....	2	94	47
Total	.....	.....	94	47

NOTE.—The first two cases were landed by the steamer Golden Gate, and the first four deaths were persons landed by John Porter; the other three deaths occurring in the week from August 24th to 30th were also river hands. According to the U. S. M. H. Rep., the total of cases were only 83, and the total of deaths 44.

OHIO.

CINCINNATI.

July 28 to August 1	2	1 refu	2	1
August 3–9	2	...	4	1
" 10–16	3	1	7	2
" 17–23	5	3[1]	12	5
" 24–30	5	2	17	7
" 31 to September 6	6	5[2]	23	12
September 7–13	7	2[3]	30	14
" 14–20	5	1 refu	35	15
" 21 to Oct. 4	2 1 a refu	1	37	16
October 19–25	..	1	37	17
" 26 to Nov. 1	..	1	37	18
Total			37	18

NOTE.—According to the U. S. M. H. Rep. the grand total is: Cases 65, deaths 37.

NEW RICHMOND.

September 7–13	7	5	7	5
Total			7	5

1. Of the Porter.
2. Of the Golden Rule.
3. 1 a refugee.

ABERDEEN.

WEEK.	CASES.	DEATHS.	GRAND TOTAL. CASES.	DEATHS.
September 27	..	5	..	5
			..	—
Total				5

GALLIPOLIS.

August 17–23	11[1]	...	11	..
" 24–30	1[1]	3	12	3
" 31 to September 6	..	1[1]	12	4
September 7–13	24	11	36	15
" 14–20	5	4	41	19
" 21–27	3	5	44	24
October 26 to Nov. 1	1	2	45	26
			—	—
Total	...		45	26

NOTE.—According to the U. S. M. H. Peport, the grand total would be: Cases, 31: and deaths, 17. According to the report of Dr. Minor, Health Officer of Cincinnati, the total number of cases was 35.

POMEROY.

To October 15	4[1]	...	4	...
			—	
Total	..	...	4	...

NOTE.—Two of these cases, the 1st and 2d engineer of the Porter, subsequently died, but have been accounted for in the table of Gallipolis.

List of those localities where scattered cases of yellow fever were quartered (refugees from the South,) and not being followed by cases of indigenous origin:

CITY.	STATE.
New York	New York.
Lockport	New York.
Philadelphia	Pennsylvania.
Pittsburgh	Pennsylvania.
Alleghany	Pennsylvania.
Gloster	New Jersey.
Richmond	Virginia.
Wheeling	West Virginia.
Dayton	Ohio.
Columbus	Ohio.
Indianapolis	Indiana.
Madison	Indiana.
Chicago	Illinois.
Foulton	Kentucy.
Little Rock	Arkansas.

1. Of the Porter.

Totals of the number of cases and deaths by States and the percentage of mortality:

STATES.	CASES.	DEATHS.	Per cent. mort.
Louisiana	24068	4903	20.37
Mississippi	12703	3277	25.7
Tennessee	13719	3539	25.7
Alabama	501	129	25.7
Florida	40	19	47.5
Arkansas	112	9	8.0
Kentucky	336	135	40.1
Missouri	75	52	69.3
Illinois	94	47	50.0
Ohio	89	54	60.6
Grand Total	51737	12164	23.5

The data given in the conclusions of the Board of experts,[1] dated Washington, January 29, 1879, as to the total number of yellow fever cases and deaths are greatly exaggerated; there 120,000 cases and from 18,000 to 20,000 deaths are indicated!

The percentage of mortality of this epidemic corresponds fairly with the average. At Martinique the mean of the rate of mortality of yellow fever may be admitted as 23.1, as the period of which recorded data are submitted extends over 51 years (from 1818 to 1869) and enumerates the results of 26 epidemics. The grand total of the cases of those epidemics numbered 16,347, and the deaths 3,794, which equals a percentage of mortality of 23.2, however the records were taken at two stations: at Fort-de-France with 23.2 per cent., and Saint Pierre with 23.0, the mean would thus be 23.1.

Frequently the mortality of yellow fever is liable to great fluctuations. At Martinique in 1838 the percentage was 57.5; in 1869, 44.4; in 1842 only 13.0, and in 1875–76 at Rio de Janeiro, 40.7.[2] An average mortality of yellow fever at New Orleans, Dr. Barton obtained from 15 epidemics (1817 to 1854) to be 17.6 per cent. pro 1.000 of the population, [3] but on this basis of comparison the epidemic of 1878 exhibits an excess of 2.7 per cent. (estimating the population of New Orleans in 1878 to have been 200.000.)

If now a retrospective view may be cast upon the law, and upon the adduced sustaining and corroborating facts, copied

1. See page 15.
2. Comp. Beranger Fereau l. c. pp. 172–75.
3. Comp. Blodgets Climatology, 1857, p. 461.

from the official meteorological records and from the statistics of morbidness and mortality, as they (law and facts) have been presented, in this treatise, in other and previous publications and written essays, clearly and comprehensibly, as we trust, the supposition may be entertained that the great truths, expounded from nature's laws as to the substantiated causes of yellow fever would not be liable to be disregarded in general legislation, and that the "well informed" would be prone to recognize and acknowledge nature's reality. But, alas, by experience quite the reverse is revealed! prejudice and customary routine supersedes science; implicit faith reigns over demonstrable truths; and scientific advice is subordinate to—interested motives?

With the etiological law, that the causes of epidemic diseases rest in the relativeness of the variations of meteorological influences, many of the members of the "Commission and Board of Experts" were fully familiarized, as my former publications and a special communication were sent to the American Public Health Association, when in session at Richmond, Va. Retrograde influences have, thus, not been spared to prevent others becoming members of said Commission or Board, who would not co-operate with that element, whose task it appears to have been, to prevent the adoption there of anything except laid schemes, of which the doctrine of "the portability of the poison of specific infection" was to constitute the basis. For obtaining a glimpse into the exclusiveness of the organization of this Commission and Board, where, from all indication, the purpose was to force the National Quarantine Law, and with it the National Board of Health, upon the people, and to estimate the efficacy of this subsequently created board and the competency in the sphere of activeness of this peculiarly organized body, of which it was asserted that, in conjunction with a rigid enforcement of the National Quarantine system, it would prevent the "importation" and "spreading" of yellow fever.

The following quotation from the Chicago *Medical Gazette*, January 5th, 1880, may first of all here be submitted:

[From the Chicago Medical Gazette, January 5, 1880.]

The National Board of Health is made up mostly of general practitioners, residing at such long distances from one another, that mutual acquaintance is impossible, and frequent meetings are impracticable. The duties of a board so organized must necessarily be delegated, in a large degree, to one or more per-

sons mutually acquainted and located at some central point. The National Board of Health, therefore, has practically resolved itself into one or two officers at Washington. The board, therefore, as a whole, is a practical nonentity, and the fancy legislation which called it into being and authorized it to spend a half million of dollars from the U. S. treasury, has simply created another health department, having jurisdiction in certain matters previously looked after by the U. S. Marine Hospital Service, and has practically placed the power of this new department in the hands of a small minority of the legally constituted board. Had the U. S. Marine Hospital Service been inefficient, which does not appear, it should have been improved. No good reason has been shown for the transfer of any of its power. The South, with unwonted relish for national supremacy, called for a national appropriation of a half million dollars, to be used ostensibly for putting Southern cities in sanitary order. Then an act was passed creating this board, and to give it a coloring of liberality the board was made up of prominent medical men scattered from one end of the Union to the other, so scattered as to render most of them mere figure-heads. The nucleolus of the whole matter thus appears; a medical officer of the army, and possibly one or two others are being magnified at public expense. Can the originators of the law explain why certain powers were taken from the Marine Hospital Service and delegated to this board, or why it has been so organized that a majority of its members are figure-heads, or what necessity existed for its creation? Now that the hurrah under which it was ushered into existence is subsiding, people are beginning to inquire what we want of a National Board of Health. The problems of local sanitarian and urban cleanliness are the only really important ones, but they do not depend for solution on the National Board. This board has thus far failed to enunciate a new truth, to lay down a new practical rule. It has appointed scores of "inspectors" to work over ground already thoroughly covered by local boards. The commerce of the country has been damaged millions of dollars by injudicious and premature fright, brought about by the desire of the board to convince the country of its usefulness. The method by which local boards are persuaded to endorse their so-called rules is unworthy of a scientific body. The method is simple: an "inspector" calls at a country town, calls upon the mayor, asks the mayor if he wants any money for putting the town in order. The mayor always wants the money. He is simply required to adopt the rules, which having been done, the remittance is forwarded, and the endorsement of the rules is duly heralded in the Bulletin, by which the general public is supposed to be informed that the particular local boards are fully endorsing everything. Poverty of the Southern cities, rather than a widespread faith in the board, leads to the endorsement of these rules. Several cities, notably Vicksburgh and Key West, have refused

to endorse the dogmas contained in the several circulars, and declined to place themselves under the guardianship of the National Board. These cities receive no money, but have instead the satisfaction of sturdy independence. In one of the first numbers of the Bulletin it was announced with a great flourish that the board expected to show the results of its "investigations on other animals than man." A commission duly selected with regard to its soundness on the germ theory and faith in quarantine, was sent to Havana to experiment. This commission placed on board the yellow fever infected brig John Walsh, of Philadelphia, monkeys, dogs, cats and parrots. The individual who acted for the commission did not remain on board the vessel to watch the monkeys, and the cabin boy kindly assumed that duty, and now reports that he gave each monkey a "chew of tobacco." The monkeys being sick when the inspector returned, the fact was cabled to the National Board at Washington, and announced in the Bulletin as a commencement of the tidal wave of information that was to deluge the medical world. "The monkey was discovered to be susceptible to the contagious influence." Capt. Armstrong's story may not be correct, but the thinking public will always be harrassed with doubt. The following is from the Nautical Gazette, July 9, 1879.

According to laundry rules for ships, adopted by the National Board of Health, "Each seaman shall have two suits of underclothing, the clothing and bedding shall be aired every clear day, the men shall be required to change their underclothing every evening, after work, while in port, and each working suit shall be washed, dried and aired after a day's work." That "each seaman shall have two suits of underclothing" is quite proper; but who is to enforce this—the captain, the shipping commissioner, or the National Board of Health? Who will superintend the washing, and where is the drying air to be found at night, in tropical climates, where the dew falls like rain? And then the average sailor has but one working suit, so that if he must wait until it is "dried and aired," he either must work, the next day, clad in nothing, or in one of those "two suits of underclothing." Evidently the learned men of the National Board of Health have never been at sea, yet they seem to be all "at sea" as to carrying out their rules on ship-board. "These regulations as to clothing, airing of bedding, and ventilation, shall, as far as possible, be observed at sea as well as in port." According to this rule, the crew would be kept busy washing, drying and airing the "two suits of underclothing" and the "working suit," and in the spare time, amuse themselves in "airing the bedding." To carry out this plan, half of the cargo would be washing-water, and soap, while the men could tell the captain that by law they must wash their undershirt before furling the top gallant sails, or putting a reef in the topsails. The National Board of Health would turn poor Jack into a washerwoman. If this learned

board do not know any more about ships and what is necessary to keep their sanitary condition up to a proper standard than is shown in rule 18, their powers should at once be curtailed, so far as relates to vessels. It seems to us that the National Board of Health will prove to be a very expensive and needless adjunct to Federal affairs, and, as we have said before, it has an odor of jobbery about it that is very suspicious.

And now to intimate the interior cabala in operation against the efforts to secure a deliberate consideration of the propriety of the National Quarantine Law, some of the correspondence and recommendations of Hon. Anthony Ittner, then member of Congress and representing this district, may here be adduced, which also indicate the aim to secure my appointment as member of that Commission, or procuring me the opportunity of an exposition of the natural laws that cause yellow fever; or with the view of having this side of the question represented, to secure the reading of my "Testimony," and to let it share, as other communications, a due consideration, but the records bear the sad testimony that all these efforts were in vain and have officially been, to say the least, entirely disregarded.

HOUSE OF REPRESENTATIVES,
WASHINGTON, D. C., February 6th, 1879.

CHAS. SPINZIG, M. D., ST. LOUIS, MO.:

My dear Sir—Your kind favor of 4th inst., came just to hand and was read with much pleasure. I thank you for your expressions of friendship and good will.

I have serious apprehensions that the final outcome of the yellow fever investigation will in the main prove a failure, on account of *pet schemes* entertained by prominent parties connected therewith.

I have seen Secretary Schurz, who informed me that he spoke to the President in favor of your appointment as one of the yellow fever Commissioners. In haste, I remain,

Yours very truly,

ANTHONY ITTNER.

HOUSE OF REPRESENTATIVES,
WASHINGTON, D. C., Jan. 19th, 1879.

CHAS. SPINZIG, M. D., ST. LOUIS, MO.:

Dear Sir—Your two letters of the 15th inst., came to hand in due time; also inclosed letter of J. B. Killebrew, of Nashville, Tenn., all of which I read with much pleasure.

I have not yet had the opportunity to see Mr. House, but shall make it a point to do so in the morning. I have seen Senator Harris, who says he will see that your testimony receives proper attention. He says, however, that it must take the course of all other testimony and written communications, which requires it first to be passed upon by the Commission of "Experts." I asked the Senator if the Commission of Experts had the power to reject any of the testimony and consign it to the waste basket, and he promptly replied that they had not, and said it was their place to pass upon it and submit it together with their report thereon, to the Committee of the Senate and House, who will thereupon dispose of the entire subject, as to them seems right and proper. He further said that it was the purpose of the Commission to have all the testimony before the Committee printed in some shape; if so, I shall take pleasure in furnishing you with a copy.

I visited Capt. Howgate to-day at his home, and found that he was absent in New York, and would not return before Wednesday. I will see him when he returns. I have had one copy made and if it is necessary, can have another copy made. I was thinking, however, I might give the Captain the copy which I have, and send you a copy of the printed report, which will contain it. Should the testimony be printed, it will be ready for distribution within thirty days. Will this be in time enough for you?

Dear Doctor, I have read your testimony over twice, very carefully, and have every reason to believe that your theory as to the cause of yellow fever epidemics is the true one, yet I do not see that you have given or suggested a remedy, by which the future recurrence of this fatal scourge might be prevented, or if not prevented entirely, be at least in a great measure checked. Or, may it perhaps be since its existence is dependent upon meteorological influences, that there is no human help that can prevent its recurrence or check its spread during its existence. In case we proposed to combat the quarantine regulation theory, which the experts are likely to recommend, we should have something, which to us at least, seems better to substitute in its place.

I herewith inclose a circular memorandum of the American Public Health Association, for your perusal.

Hoping to hear from you again soon,

I remain, yours truly,

ANTHONY ITTNER.

HOUSE OF REPRESENTATIVES,
WASHINGTON, D. C., Dec. 19th, 1878.

HON. CASEY YOUNG, Chairman House Committee on Yellow Fever Epidemics:

My Dear Sir—I herewith present for your favorable consideration, the name of Chas. Spinzig, of St. Louis, as an eminently proper person to be chosen as one of the experts to aid your Committee in its labors and to make the investigation more complete.

Dr. Spinzig has given much valuable time and labor to the investigation of this subject, having for some years past made epidemic diseases and their cause a special study, having heretofore written and had published several pamphlets treating of this important question.

It seems to me, therefore, that Dr. Spinzig is peculiarly fitted to act as an expert for your Committee, and I have no hesitancy in predicting, should you see it consistent with your duty to select him, that he will prove one of the most efficient, if not the most efficient, experts your Committee will have.

Dr. Spinzig is in the prime of life, a practitioner of the old school of medicine, and stands high among the profession.

I hope and trust that whatever may be said in behalf of others whose names may be presented, that that of Dr. Spinzig will not be overlooked, and furthermore, I hope that the Committee will not allow itself to be governed or controlled by a penurious spirit of economy in treating of this vital and important subject.

I have the honor to be, yours very respectfully,

ANTHONY ITTNER.

Finally, the valid evidence, then available, of the actual causes of yellow fever, was synoptically embodied in my "Testimony" to the Committee of United States Senators, Members of Congress and Experts, and which was submitted, in the month of December, 1878, through the kind efforts of Hon. Anthony Ittner, but haughty pretensions and incorrigible ignorance (or speculation?) consigned it to the waste basket.

A copy of the original, for the possession of which I am also under obligations to Hon. Ittner, as the original was hastily drafted and even without revision mailed, is here submitted to the lenity of the kind reader.

A TESTIMONY

IN REFERENCE TO THE SCIENTIFIC EVIDENCE OF THE CAUSES AND MODE OF SPREADING OF

YELLOW FEVER,

AND OF THE UTTER FUTILITY OF QUARANTINE RESTRICTIONS IN THE SENSE OF PROPHYLACTICS..

BY

DR. C. SPINZIG,

OF ST. LOUIS, MO.

To the Honorable Committee of United States Senators amd Members of Congress, investigating the Origin and Spreading of the Yellow Fever Epidemic, Washington, D. C.:

GENTLEMEN :—Pursuant to the recommendations of the Commission organized under directions of the Surgeon General U. S. Marine Hospital Service, to investigate the causes or the origin and the spreading of yellow fever, the American Public Health Association, in a session held at Richmond, Va. from the 19th to the 22d of Nov., 1878, adopted a resolution to ask of the United States Legislative Authorities, the passage of an act for establishing a National Quarantine, and in accordance to these recommendations the President of the United States in the message submitted to the United States Senate and Congress, Dec. 2nd, 1878, also, advised to pass a law accomplishing this object. The adoption of lawful measures having in view to promote health and prosperity, is certainly welcomed by every one, with the most hearty endorsement, the salubrious effects and beneficial influence would soon grow prominent if the basis rests on scientific data, and conforms to the laws of nature. But as the recommendations of the Commission as also those of the Association upon which the argument rests for establishing the law providing for the erection of a National Quarantine, include the admission that the "invisible poison," capable of self-multiplication, "*and was in every instance imported*," infected the localities that are suffering from yellow fever, the basis for this law therefore, from scientific considerations can be but designated an hypothesis, and the arguments in its favor mere presumptions. The "specific infectious poison or contagion" is nothing but

an imaginary entity; of its nature no definitions can be given and its abode is implicit faith; science can not but preclude its existence.

So far as the history of medicine records the facts all "*cordons sanitaire*" have proved a failure, and the evidence of the last epidemic has given rise to the acknowledgment that land quarantine does not prove efficient against "infection;" therefore, nautical transports are now asserted to be the means of conveyance of the "poison," as the bilge water is regarded "*its favorite lurking place.*" Again the "poison germs" require but two to six days[1] incubation. (Here an interrogation would forcibly demand an explanatory answer, viz.: can "germs" remain dormant in water, and can a dissemination still take place after "growth" has set in?) But adherent to the "doctrine" of infection the Commission reported: the fever was imported to New Orleans in the month of May, by the Steamship Emily B. Souder (May 25th), but the subsequent reports of the yellow fever epidemic in the offical report of the sanitary authority of New Orleans to the Surgeon General of the United States Marine Hospital Service, it could not be otherwise stated than that the first case of yellow fever at New Orleans occured on the 12th of July, hence *about two months later* than the arrival of the Steamship Emily Souder."[2]

The inhabitants of New Orleans entertained a great deal of doubt that the Steamship Souder should have brought the poison into port, as yellow fever cases were reported from various parts of the city, but in the mind of the "Commission" there were none, except imported, and New Orleans was thus unhesitatingly pronounced the original centre of infection, from which by way of transportation, subsequently the "poison" was carried to all localities infected, and that "the disease does not seem to be prevented from prevailing epidemically by distance from the sea level as under favorable circumstances it might prevail in any part of the United States."

In conformity with the report of the Commission, the American Public Health Association in session from the 19th to 22d of Nov., 1878, adopted, therefore, among the various resolutions also, those that here follow:

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1. Dr. Woodworth on Quarantine, P 10.

2. See Dr. Bemis, American Health Board, Nov. 20.

1. We have not in a solitary instance found a case of yellow fever which we could justifiably consider as of *de novo* orgin or as indigenous to its locality.

2. In respect to most of the various towns which we visited and which were points of epidemic prevalence, the testimony showed the importation was direct and convincing in its character.

3. The "poison" was conveyed in clothing, cotton bagging and other goods of the same description.

4. Disinfection proved inefficient!

This with the supposition of a *de facto* existence of the "yellow fever poison," which only requires implicit faith to accede to, being the great unknown—X—, however, it must be further *believed* that in it are vested, all the attributes requisite to excite a deadly influence. The "scientific" inquiry was hence extremely simplified, for with the recognition of the "specific poison," all relative scientific problems are thereby solved, and the actual prevention is endeavored to be demonstrated by quarantine restrictions, as it is further believed the "poison" can be confined to its original "center of infection."

On the other hand, however, it would have been indispensable to discover the "specific poison," and the "disease germs," and to demonstrate their nature; to ascertain what peculiar meteorological influences prevailed in those districts in which the various infested localities are found; what civil state and habitation of persons predisposed to the occurrence of the disease; what post-mortem evidence was revealed and corroborated by repeated autopsies including microscopic and spectroscopical as also chemical analyses; to learn the geological and geognostical peculiarities of each of the localities suffering from yellow fever, etc., for without a careful study of the etiological moments arising from such conditions a correct understanding of the nature, and cause of the disease could scarcely be anticipated and the propriety of enforcing compulsory legislative rules, supported by the doctrine of "infection" can not be scientifically sustained. If nevertheles they are enacted, the ultimate effects must prove as derogatory as the compulsory vaccination acts, of other nations. These acts are also passed under the impression of the correctness of the doctrine of "infection," and that this measure is preventive against variola, but the evidence now at hand has directly proved the opposite.

Before entering upon the demonstration of the physical influences, the actual causes of epidemic diseases in their specialized reactions productive of yellow fever, and in their general character, as regards other phenomena in nature, attention is directed to one more of those intimations, as they are held out as demonstrative evidence for the verification of the dissemination of the poison from the original "centre of infection," also, as the possibility by means of vessels to convey the "poison" to remote places from the seashore, and produce a subsequent infection. The river steamer Porter, a towboat is thus accused of having carried the poison to various places along the river, but particularly to Gallipolis, O.

True a large number of the crew died of yellow fever on her way up the river when comiug from New Orleans, and of whom three were already buried at Vicksburg and three more at Arkansas City, when landing off Memphis, July 29th, where on the 27th of July, on "Presidents Island," twelve miles below, a quarantine station had been established, and the most rigid quarantine measures set in operation. Now, at Vicksburg the yellow fever was manifested on or about the 11th of August, and from Arkansas City *no cases of the fever have been reported*, and from Memphis the first report of a case of yellow fever occurring there is dated August 14th. The Steamer Porter had passed quarantine there, and was only permitted to steam up the river, hence not touching the city at all. Even if infection was possible, the infection then from this source at Memphis certainly would require a heightened phantasy in order to be thus interpreted. At Louisville, Covington and Cincinnati, cases of yellow fever had sprung up previous to the arrival of the Porter. After this vessel landed at Gallipolis, Aug 20th, one of her crew died there, Aug 22d, who in consequence of an exalted fortitude of the mate, was thrown in the river, but in the latter part of September, cases were reported *that could not be traced to the Porter*.

Perhaps no more direct exemplification could here be adduced to illustrate the contradiction attending the *belief* of "infection."

On the 20th of August, the authorities of the City of Nashville, Tenn. extended in a resolution unimcumbered hospitality to all those fleeing from the South before the yellow fever, and with a magnanimity of a noble people have received and welcomed every one during the epidemic who thus made Nashville their

abode, but *no infection has taken place, and the fever did not prevail there.*

Now with special reference to the first resolution adopted by the American Public Health Association in its last session at Richmond, Va., "that not in a solitary instance a case of yellow fever was found, which justifiably could be considered as of *de novo* origin." A case in point needs therefore here to be related, of which the history bears testimony of contradictory evidence, and tends to sustain the inference that many more of similar nature could have been discovered also in the Southern States.

On the 21st of August, I was called to attend a fully expressed case of yellow fever; the patient was a resident of this place and a young man whose vocation was that of a common laborer in a varnish factory, who never had been away from St. Louis and never in contact with any person returning from the South during the epidemic.

Now in consequence of most minute and unwearied research the facts have been found so frequently corroborated that they are admitted as an established law in nature, and of which the bearings or absolute consequences are again found corroborated in the history of the yellow fever epidemic of this summer. The law is this: in proportion to the excess of extremes of summer temperature, reduction of barometrical pressure, and deficiency of rainfall, of atmospheric ozone; also on an inverse ratio ozone is below the mean regressive action is in the ascendancy and fevers assume an epidemic character; [1] whereas, frequent and copious rainfalls are accompanied with an elevation of barometrical pressure, diminution of extreme or high temperature, an increase of the per cent. of atmospheric ozone, and in proportion the salubrious effects on the general health are increased, the rate of mortality diminishes and thus the extremes are counter balanced. The same effects are observed in moderate latitude and altitude.[2]

Further, in reference to the basin of the Mississippi valley, the climate is rather extreme but normally the rainfalls cor-

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1. Ebermayer, Zeitschrift der Meteorologie, 1873. Nov. 22, 23, and 24, and Lombard, Climatologie medicale, 1877, Vol. 1 pp. 170, 171, 406 and 482.

2. Ibid.

respond in degree with those of the valleys of the Alleghany Mountains.[1]

The potential force of the operations of the physical laws in determining organic developments, either progressive or regressive, may become fully apparent by remembering that the spring season at St. Louis with all its fragrance and verdure this year set in fully one month in advance, as in the month of April (the 5th and 6th) leafing and blooming of apple trees was already accomplished,[2] and toward the end of the month (i. e., at about the 20th) ripe strawberries were in the market. The variations of the meteorological conditions upon which these phenomena are dependent were as follows:[3]

The monthly mean of barometrical pressure was a reduction of 0.20 inches below the mean for April, of the six preceding years, and the temperature was in excess of 14.°7, also an excess of 2.89 inches of rainfall, owing to material reduction of temperature at night, yet at this season moderate extremes of elevation of temperature in the day time are recorded. This being the law of progressive metamorphosis. For the regressive metamorphosis an equally forcible exemplification may be adduced, illustrating with equal precision the potential influences of meteorological or physical surroundings upon which animal life (that of man) is dependent, and in those individuals in whom the force of resistance is at the minimum, life becomes highly endangered, nay is even extinguished by the intensity of these reactions in the form of a disease representing a special character owing to the specialized nature of those influences. This law is illustrated by the following facts:

The rate of mortality at this place for the week ending July 20, 1878, was 386, of which 135 deaths were caused by sunstroke (insolation). The meteorological extremes were the following and are expressed in the forms of the weekly means:

BAR.	THER.	WEATHER.	RAINFALL.
29.89	88.8	clear	0.004

For the week ending July 27th, the following data are re-

1. Ratzel, Physikalische Geographie und Naturcharacter d. Ver. St. Nord Amer. Vol. 1, p. 307. On the east side of the Mississippi river the rainfall is 45 inches, annual mean, and on the west side 35 inchs.—Muehry, pp. 494 and 495.

2. Monthly Review and Synopsis of the weather, Washington, D. C., for the month of April, 1878.

3. Also comp. Lumbard, l. c. Vol. 1. p. 231.

corded: mortality 158, of which but 9 deaths were caused by sunstroke (insolation). The meteorological conditions are expressed by the following weekly means:

BAR.	THER.	WEATHER.	RAINFALL.
29.90	77.3	clear.	.006

Contrasting with these data those of the week ending Dec. 7, when still the autumnal season supervened and no extremes of the weather prevailed, the mortality numbered but 98 and the weekly means of the weather read thus:

BAR.	THER.	WEATHER.	RAINFALL.
30.05	39.7	fair	0.19

From the indications of the general law the facts have been learned that in moderate degrees of latitude and altitude salubrious influences to health are noticed which are complementary to those meteorological influences of the regions with extremes, when from seasonal influences the extremes have been equalized, unless an exception may be found resting on special terrestrial configurations. All the localities where yellow fever prevailed epidemically are found at a limited degree of altitude and chiefly south of the 36th degree of latitude, where the summer climate is extreme.

The soil is either palludal or sedimentary, and in proportion the soil differed from these peculiarities the geographical station receding from the 36th degree of latitude and elevated over the minimum of altitude, the fever declined to ultimate extinction. The geographical position of the principal localities here of interest may therefore be tabulated. (See table on next page.)

The first classified region extends under the equator from the level of the sea to 7000 feet altitude, and from there to the 36th degree of latitude at the surface of the sea.

The second region ranges under the equator from the height of 7000 to a little over 8000 feet altitude, and thence to the surface of the sea from the 36th degree to the 63d of latitude.

The third region embodies the space under the equator from 8000 to 1400 feet altitude and from thence to the level of the sea from 60 to 70 degrees of latitude. By mere glancing over the list of the principal localities that have suffered from yellow fever this summer, the fact must appear quite perceptible that those suffering most are found in the "dysenteric region" and those suffering but slightly, in the "enteromesenteric region," Moreover, that the degree of intensity of the fever there pre-

vailing is on an inverse ratio as the locality recedes from the boundary line of the "enteromesenteric region" into the "dysenteric region."

PLACE.	Latitude.	Longitude.	Altitude (feet).	REMARKS.
New Orleans, La.....	30°	90°	....	.....
Baton Rouge, La.....	30.05	91.3	34.5	.....
Vicksburg, Miss.....	32.6	91	57.5	The height of Natchez; the ground is elevated; river bluff.
Memphis, Tenn.....	35	90	219.8	Ground partly bluff.
Cairo, Ill.....	37	89	321.5	Palludal ground.
Cincinnati, O.....	39	84	546.7	Northen half surrounded by high hills.
Louisville, Ky.....	38	83.7	....	Altitude probably that of Cincinnati.
Gallipolis, O.....	38.7	82.3	....	Altitude probably that of Cincinnati.
Chattanooga, Tenn.....	35	85	675.8	On sedimentary, pebbly ground, and surrounded by mountains.
St. Louis, Mo.....	38.7	90.3	426.5	On limestone rock and loam.
Nashville, Tenn.....	36.2	86.8	434.7	Mainly on calcareous pebbly ground.

NOTE.—Nashville is mentioned in this list for the sake of contrast. The data of this list grow more important; and the inference derived therefrom becomes more intelligent by the fact that, in geographical medicine, three grand regional divisions (zones) are recognized for the purpose, partially, of classifying, but mainly of locating disease in its distribution over the earth's surface. These regions or zones are designated:

1. The Dysenteric Region, to which pertain all the fevers and in which are indigenous, all complaints that chiefly arise from affections of the organs of digestion (to which yellow fever appertains).

2. The Enteromesenteric Region, comprising those complaints that arise from affections of the organs of secretion and involving the circulatory system (to which cholera belongs).

3. The Catarrhalic Region, comprising all other affections that are not specifically peculiar or indigenous to the foregoing regions.

In connection with these general facts it must also be borne in mind that in the great valley of the Mississippi, on the east side the elimatical peculiarities differ from those on the west side, as the winters there are milder (warmer) and the summers cooler[1]. This implies that normally frequent and sufficient rainfalls occur there in the summer, and that in consequence thereof the temperature is reduced and the atmosphere purified from accumulated vapors, which are exhaled by the soil in proportion to the intensity of reaction of the summer heat displacing the

1. Woiakoff, Zeitschrift fuer, Meteorologie, 1878, Nos. 2–3.

essential per cent. of atmospheric positive electricity or ozone. The presence of these vapors favors regressive action, the initiatory steps, as has already been indicated, to epidemic diseases of which the typical character is developed by the subtleness of the differentiations of such influences.

Again adverting to the regional distribution of those localities infested with yellow fever and comparing, simultaneously, their meteorological peculiarities for the period of the origin and prevalence of the fever with the normal conditions for the same seasonal period of a series of years, the law again is found fully corroborated that a YELLOW FEVER EPIDEMIC ORIGINATES AND IS PROPAGATED BY METEOROLOGICAL INFLUENCES ABNORMAL TO THE LOCALITY WHERE IT PREVAILS, its destructive character and period of duration is proportionate to the degree of those irregularities or variation.

Consulting now the weather maps, published under the direction of the War Dept. U. S. Army, the evidence is obvious that the temperature of the summer of this year (1878) in the yellow fever district was in *excess* of the mean of many years, for the same period, and that the rainfall was *below* the mean.

These data warant the inference that the barometrical pressure was also low and thus the force of expansion in the human organism exceeded its biological mean (in physics the force of expansion is on an inverse ratio to the degree of barometrical pressure) hence gravely interfering with the portal circulation and dangerously interrupting the function of the liver, a condition highly conducive to the development of yellow fever.

The tables exhibiting the irregularities of the temperature are the following: (See tables on next page.)

From the records it appears that at Natchez, Miss., but a limited number of yellow fever cases were met with (20 cases are reported August 21) and with reference to the quantity of rainfall for that place, the average approximates the normal mean, but the minimum fell in August, whereas, in September, the quantity again approaches the normal mean, and no more cases were reported. Thus, the history of this locality bears corroborative testimony of the intimate relationship of deficient rainfall and the occurrence of the fever.

The quantity of rainfall for Natchez, Miss., for the summer

months of this year, is expressed by the following data, thus:

July	4–6 inches	5.00 mean.
August		2.50 "
September		3.30 "
Mean		3.60

Thereby it is seen that the deficiency is insignificant, as 3.63 is the normal mean.

TEMPERATURE.

REGION.	MONTHS.	Mean for Many Years.	For 1878.	Excess.
Eastern and Western Gulf States.	July	82.6	83.8	1.2
	August	61.6	....	....
	September	77.1	....	....
Ohio Valley and Tennessee	July	78.8	81.4	2.6
	August	76.2	77.4	2.2
	September	68.1	69.1	1.0
	Mean	74.3	76.3	1.9
Upper Mississippi Valley	July	75.8	77.8	2.0
	August	73.4	75.2	1.8
	September	62.6	65.1	2.5
	Mean	70.6	72.7	2.1

RAINFALL IN 1878. IN INCHES.

REGION.	July.	August.	September	Mean.	Deficiency.
Of the Gulf States—					
New Orleans, La	6-8	4-6	2-4	5.	0.68
Baton Rouge, La	4-6	4-6	2-4	4.3	0.56
Plaquemine, La	4-6	4-6	2-4	4.3	0.56
Of the Upper Mississippi Valley — 1					
Port Gibson, Miss	4-6	2-4	2-4	3.1	0.53
Vicksburg, Miss	2-4	2-4	0-1	2.16	1.50
Greenville	2-4	2-4	0-1	2.16	1.50
Grenada	2-4	2-4	0-1	2.16	1.50
Memphis, Tenn	2-4	2-4	0-1	2.16	1.50
Brownsville, Tenn	2-4	2-4	0-1	2.16	1.50
Hickmann, Ky	2-4	2-4	2-4	2.4	1.23
Cairo, Ill	2-4	2-4	2-4	2.4	1.23
Of the Ohio Valley and Tennessee—					
Louisville, Ky	4-6	4-6	2-4	3.8	normal
Cincinnati, O	4-6	4-6	2-4	3.8	normal
Gallipolis, O	4-6	2-4	4-6	3.8	normal
Chattanooga, Tenn	4-6	-6	0-1	3.1	0.50

NOTE. For New Orleans, La., the mean of 5 years (1872–1876 inclusive) for these three months is 5.93.

For Gallipolis, O., the minimum of rainfall is recorded as is seen for August, and in this month (20–22) the fever occurred there first.

For Chattanooga, Tenn., the minimum of rainfall is also synchronous with the occurrence of the fever.]

1. The means and deficiencies are here corrected, as by an error in computation in the original they were stated incorrectly.

The same law is further corroborated by previous epidemics at other localities, first at Savannah, Ga., in 1876. There the mean of rainfall for the months of July, August and September, is 6.02, whereas in 1876, when this locality suffered from yellow fever severely, but 5.20 fell, leaving a deficiency of 0.82. To render this fact more prominent, the means of Charleston, S. C., and Mobile, Ala., may be adduced—places that were spared, while Savannah was gravely infested.

For Charleston, S. C., the mean was 9.20 and for Mobile, Ala., 6.22.

Sporadic cases may occur even at rather remote places from the "center points" of the epidemic and of *de novo* origin. This has further above already been proved in reference to the city of St. Louis, Mo. At this place from the beginning of the month of August to the end of the month of October, 69 deaths of yellow fever are reported,[1] but of which several occurred among "residents;" the others were parties coming from the South, and were admitted into the Quarantine Hospital. However, the death of the Quarantine physician, Dr. Davis, who died from the effects of yellow fever, on the 15th of October, is looked upon as a direct demonstration of infection, but upon the "scientific" inquiry the causes from which the fever was contracted resulting, lamentably, in death, grow very plain when the effects of meteorological extremes are borne in mind.

For the summer months, July, August and September, the state of the weather was extreme, which may be learned from the data here following, expressed in monthly means.

	BAROMETER.	THERMOMETER.	RAINFALL.
July	29.96	81.9	0.68
August	29.90	78.6	4.60
September	30.05	72.2	2.94
Mean	29.97(—0.1)	77.5+3.0	2.75(—1.31)

The mean of five years, (1872 to 1876 inclusive), being 29.98, 74.5 and 4.06.

The fore part of the month of October was extreme, culminating in that degree of intensity characterizing the period in which the death of the Quarantine physician, Dr. Davis, occurred.

1. Report of Health Commissioner Nov. 21, state but 50, all traceable to infection.

Now, the inference is, from the law above indicated, that thus a minimum degree of the biological force of resistance, the *locus minoris resistentiæ*, can but yield to the force of regressive action in operation.

With the view of submitting the evidence in its full scope, the meteorological data are here reproduced *in extenso:*

DATE.	HR'S OF OBS.	BAR.	THER.	RAINFALL
October 12	6 A. M.		48	0
" "	7 "	30.227	51	0
" "	2 P. M.	30.118	68	0
" "	9 "	30.055	61	0
Mean		30.133	57	0
Extremes of temperature—Max. 70, Min. 40.				
October 13	7 A. M.	29.985	63	0
" "	2 P. M.	29.899	72	0
" "	9 "	29.901	68	0
Mean		29.928	67.6	0
Extremes of temperature—Max. 77, Min. 60.				
October 14	7 A. M.	29.915	65	0
" "	2 P. M.	29.771	85	0
" "	9 "	29.856	73	0
Mean		29.847	74.3	0
Extremes of temperature—Max 86, Min. 61.				
October 15	7 A. M.	29.876	67	0
" "	2 P. M.	29.735	80	0
" "	9 "	29.752	74	0
Mean		29.794	73.6	0
Extremes of temperature—Max. 86, Min. 65.				
October 16	7 A. M.	29.676	74	0
" "	2 P. M.	29.623	78	0
" "	9 "	29.822	62	0.81
Mean		29 773	71.3	0.81
Extremes of temperature—Max. 32, Min. 55.				
October 17	7 A. M.	30.002	49	0
" "	2 P. M.	30.031	56	0
" "	9 "	30.103	50	0
Mean		30.045	51.6	0

The diminution of barometrical pressure is thus seen to be extensive, and the sudden elevation of temperature of great extremes from 48 to 86 in about 55 hours with no rainfall. Thus, the contraction of the sickness, resulting in the death of Dr. Davis, when being exhausted from over-work in the faithful performance of prescribed duties, is plainly seen to have arisen from physical causes.

In conclusion, the regional distribution of the number of cases and deaths of yellow fever may yet be indicated, making apparent the degree of intensity by districts, or States where the epidemic prevailed.

There the fact is fully perceptible that those districts found within the "dysenteric region," where meteorological inequali-

ties exhibit the greatest intensity, had the largest number of cases and the greatest death rate.

From the records, as far as they are now in my possession, the following data are here reproduced:

DISTRICTS OR STATES.	No. of Cases.	No. of Deaths.	Percentage of Mortality is 1 death to No. of Cases.
Alabama	125	41	3
Louisiana	14,810	4,123	3.5
Mississippi	7,966	5,493	1.45
Arkansas	75	25	3
Kentucky	327	127	2.57
Tennessee (by calculation)	10,812	3,089	3.5
Florida	37	16	2.3
Illinois (by calculation)	87	25	3.5
Grand total	34,239	12,939	2.64

Comparing this table with that indicating the rainfall, the fact grows remarkably prominent that the highest rate of mortality coincides with the greatest deficiency of rainfall.

The reports further state that Port Gibson, Vicksburg and Memphis, suffered far more than New Orleans in proportion to their population. Now comparing these facts again with the data of the rainfall, the evidence is also again corroborated that the intensity of the fever is in an inverse ratio to the amount of rainfall. Therefore, the indisputable law of nature can no longer be misconstrued that THE CAUSES OF THE ORIGIN AND THE MODE OF SPREADING OF YELLOW FEVER ARE DEPENDENT UPON METEOROLOGICAL INFLUENCES.

YELLOW FEVER AT MEMPHIS IN THE YEAR 1879.

It will not be expected to enter into the etiology of yellow fever again in this place, for it has fully been analyzed in the preceding pages. Here as already stated it is only intended to submit the meteorological, morbid and mortality statistics as additional verifications of the physical law of the causation of the fever, which in this epidemic also proves with mathematical precision to be the same as in those of 1873, 1876 and 1878, and as it was of spontaneous inland origin, the sophistical gossip of "importation," to the grievance of infectionists, is here most radically excluded.

The law is concise. The summer extremes exhibited a slight barometrical depression, and a deficiency of rainfall; the period

of predisposition a two-fold form, of which the reaction of morbific influences were potent; the extremes of the preceding summer, which were uncommonly intense, and the marked variations of the fore part of the year of the epidemic that are highly congenial to cholosis and its consequences (e. g. yellow fever).

In the presence of these fundamental facts, and in absence of any pretext for claiming an "importation of the poison of infection" at this occasion, infectionists were at a loss to save their obsolete dogma until the "authorities" came to their rescue in proclaiming, that some of the "germs" remained from the previous year, and thus "infection" and "dissemination" should have taken their usual course. However, the peculiarity attending this epidemic was, that it remained exclusively confined to Memphis. Quarantine reign will be prone to claim this as one of the results of its efficiency, but to disprove such assertion is no longer required, and would not be proper in this place.

On the other hand the evidence is thereby afforded, sustaining the fact advanced in the text of this treatise, viz., that yellow fever does not spread southwardly from its point of origin, and northwardly it could not spread in 1879, as the summer extremes or variations north of Memphis were not favorable to its diffusion.[1]

Some cases occurred at New Orleans in 1879, of which the first originated on the 22d of July, and until the 6th of September there are reported 25 cases, and 9 deaths.

The monthly means for the three summer months, July, Aug., Sept., and their means and variations were at St. Louis the following:

Months	Bar.	Ther.	Rainfall.
July	29.92	81.4	1.42
August	29.95	75.0	2.22
September	30.09	65·0	1.29
Mean	29.99	73.8	1.61
Variations	+.01	—1.3	—2.49

Although there is a marked and dangerous deficiency of rainfall, but owing to the normal height of barometrical pressure

1. During the month of August, and until the 17th of September, 24 cases of yellow fever arrived from the South at St. Louis, of which some were treated at their homes, but no case of the fever is reported to have occurred at St. Louis in 1879.

and a reduced degree of temperature, the influence of summer dryness could not prove injurious.

The first case occurred on the 5th of July, from which period the fever gradually increased until a maximum was reached, and this was at the end of the first third of the month of August. During the latter two thirds of August the maximum rather continued to supervene, but with the beginning of September the fever gradually diminished until the 31st of October, when it was extinct.

Examining the meteorolgical conditions of Memphis[1] for the year 1879, the first prominent feature observed is, that the first six months exhibited a barometrical depression, and a marked degree of thermometrical excess; the remaining six months exhibit, besides a continued excess of temperature, a decided deficiency of rainfall (5.13 inches). These facts may readily be ascertained by glancing over the data of the following table:[2]

METEOROLOGICAL VARIATIONS AT MEMPHIS, 1879.

MONTHS.	BAR.	THER.	RAINFALL.
January	—.01	+4.6	+0.26
February	—.01	+1.8	+0.09
March	—.10	+5.5	—5.62
April	—.03	+3.8	+2.06
May	+.02	+4.1	+1.22
June	+.02	—2.1	+0.45
July	—.04	+1.4	—1.33
August	—.03	+0.5	+1.18
September	+.11	—0.1	—2.32
October	+.05	+8.5	—1.99
November	+.11	+3.5	—3.64
December	+.09	—3.5	+2.97

The data of the month of August in this table appear to indicate a discrepancy in regard to the facts dwelled on in the text of this treatise, namely, that for the origin and for the prevalence of yellow fever a deficiency of rainfall is essential, and

1. Upon personal request a special copy of the records had been ordered, and was furnished me from the Chief Signal Office U. S. A, for which I herewith acknowledge my profound obligation.

2. The variations indicated by this table are obtained by a comparison of the monthly means with those of the year 1875, which was, as has elsewhere already been stated, quite a normal year in regard to meteorological conditions, and consequently, to the state of health. No diseases of an epidemic character of the class "cholosis" prevailed.

being observed to exist on an inverse ratio to the intensity of the fever. But by glancing over the data of the tables of the daily means, (which thus require here to be submitted—though only of the months of July, August, September and October—in order to produce the full evidence of this epidemic in detail, which verifies, also, the law of causation as it has been set forth in the text), this primary impression is at once corrected, as during the first two-thirds of the month a deficiency of rainfall prevailed; on the 23rd day of the month the precipitation measured for that one day 2.29 inches.

The climax of the epidemic was attained on the 14th of August, when so far the summer extremes represented a high rate.

It will further be observed that in August, although but slight, the other two extremes: barometrical depression and excess of temperature supervened, of which the influences combined could not be neutralized by the one, although excessive, precipitation. The tables of daily means of these four months are therefore here reproduced before that of the monthly means of the year, with the annual means, the means of the summer months, and the variations is submitted:

DAILY MEANS AT MEMPHIS FOR THE MONTH OF JULY, 1879.

DATE.	Barometer.	Thermometer.	Rainfall.	REMARKS.
1	30.04	80.7	.12	
2	30.11	82.5	....	
3	30.08	83.5	....	
4	30.13	85.0	....	Highest bar. on 4th, 30.17.
5	30.10	86.2	....	
6	30.02	85.7	....	
7	30.00	87.5	....	
8	30.08	87.7	....	
9	30.03	89.7	....	Lowest bar. on 12th, 29.80.
10	29.96	91.0	....	
11	29.87	91.0	....	
12	29.86	89.5	....	
13	29.87	87.7	....	
14	29.95	81.5	....	Monthly range, .37.
15	28.98	81.7	....	
16	29.05	87.5	....	
17	29.92	84.7	.18	
18	29.1	78.0	.19	
19	29.94	80.5	.01	Highest temperature on 10th 99.
20	30.02	82.5	....	
21	30.05	83.2	....	
22	29.96	84.5	.02	
23	29.87	83.7	.27	
24	29.85	81.5	.13	Lowest temperature on 1st 67.
25	29.87	81.0	.07	
26	29.91	80.2	.06	
27	29.99	82.2	....	
28	29.97	75.2	1.29	
29	29.98	77.7	.03	Monthly range. 32.
30	30.02	80.7	....	
31	30.05	78.7	.04	

MEMPHIS, AUGUST, 1879.

DATE.	Bar.	Ther.	Rainfall.	REMARKS.
1	30.06	81.5	....	
2	30.08	81.5	.73	
3	30.05	82.0	....	
4	29.96	83.7	.02	Highest bar. on 10th, 30.16.
5	29.95	81.7	....	
6	29.91	85.2	....	
7	29.94	77.0	.47	
8	30.04	71.0	.15	
9	30.13	69.0	.03	
10	30.10	71.3	....	Lowest bar. on 24th, 29.45.
11	30.08	72,7	....	
12	30.04	76.7	....	
13	30.03	76.5	....	
14	29 92	78.2	....	
15	29.86	69.5	.10	Monthly range, .70.
16	29.97	65.7	....	
17	29.99	68.7	....	
18	30.02	72.7	....	
19	30.04	76.0	....	
20	30.01	77.5	....	
21	29.95	80.7	....	Highest temperature on 5th 96 .
22	29.87	75.2	.13	
23	29.60	73.7	2.29	
24	26.67	73.7	.57	
25	29.99	71.7	....	Lowest temperature on 17th, 60.
26	30.02	72.2	....	
27	29.99	73.5	....	
28	30.04	74.2	....	
29	30.12	75.2	....	
30	30.07	76.2	....	Monthly range, 36.
81	29.96	74.5	.08	

MEMPHIS. SEPTEMBER 1879.

DATE.	Bar.	Ther.	Rainfall.	REMARKS.
1	29.79	73.2	.10	
2	29.78	70.5	.22	
3	29.99	73.5	....	
4	30.09	74 5	....	Highest bar. on 25th, 30.32.
5	30 14	71.0	....	
6	30.13	74.0	....	
7	30.07	77.5	....	
8	30.15	67.7	....	
9	30.20	61.5	.02	Lowest bar. on 2d, 29 67.
10	30.18	70.2	....	
11	30.16	76.2	....	
12	30.10	71.0	.25	
13	30.15	68 2	.03	
14	30.17	62.7	....	Monthly range, .65.
15	30.07	65.5	....	
16	30.07	68.2	....	
17	30.13	72.2	....	
18	30.12	74.5	....	
19	30.19	68.5	....	Highest temperature on 11th, 78.
20	30 19	61.7	....	
21	30.10	65.2	....	
22	30.08	71.5	....	
23	30.11	73.0	....	
24	30 26	64.2	....	Lowest temperature on 15th, .51.
25	30.24	61.7	....	
26	30.18	66 5	....	
27	30.17	69 0	....	
28	30 14	70.0	....	
29	30.16	72.5	....	Monthly range, 27.
30	30 22	75.5	....	

MEMPHIS, OCTOBER, 1879.

DATE.	Barometer.	Thermometer.	Rainfall.	REMARKS.
1	30.19	80.0	....	
2	30.16	79.0	....	
3	30.14	79.5	....	
4	30.05	77.7	....	
5	30 01	77.0	.03	Highest Bar. on 24th, 30.59.
6	30.01	70.2	.17	
7	29.91	70.2	.10	
8	30.07	74.5	....	
9	20 08	76 5	01	
10	30.10	78.7	..	Lowest Bar. on 16th, 29.69.
11	30.08	76.0	.15	
12	30.12	71 2	.57	
13	30.12	71.7	.01	
14	30 11	74.7	....	
15	30.03	75.0	....	Monthly range, .90.
16	29 83	68 2	.27	
17	30.05	64.0	.02	
18	30.21	57.5	....	
19	30.25	54.5	....	
20	30.13	55.7	....	Highest temperature on 2d, 92.
21	30.06	60.7	.03	
22	30.15	61.0	....	
23	30.47	50.7	....	
24	30 52	46.7	....	Lowest temperature on 25th, 37.
25	30.48	50.5	....	
2	30.43	55.2	....	
27	30.20	57.7	....	
28	30.05	57.0	....	
29	29.91	62.5	....	Monthly range, 54.
30	30.17	53.2	....	
31	30.42	47.2	.	

By the last four tables, probably, the unabridged proof is made available for comparing it with the list (which follows at the end) of the daily number of cases and deaths, with the view of finding the general law corroborated, that namely, the origin, prevalence and subsidence of yellow fever is on a parallel with the increase, prevalence and subsidence of summer extremes. By the table of the monthly variations for the entire year, sufficient evidence may be obtained to what an extent those irregularities decline from the local and chronological mean, in order to prove congenial to, or causative of, the development of yellow fever.

But to obviate arguments aimed to excite doubt respecting the sufficiency of the sustainining evidence of the meteorological facts, so far introduced in relation to this epidemic, the table of the monthly means for the entire year, containing also the annual means and variations, and the means of the summer months and variations, is therefore additionally here submitted, as by it the facts are verified, in all conceivable forms, that the

same nature of meteorological influences prevail there, where yellow fever, in consequence thereof, originates and supervenes, until from the physical changes, which are of an antagonistic reaction, its extinction is caused.

Monthly and annual means, and the annual variations; also the means of the summer months and variations, of Memphis in 1879:

MONTHS.	BAR.	THER.	RAINF.
January	30.23	38.7	7.71
February	30.17	42.0	3.25
March	30.13	56.1	2.98
April	30.00	61.5	5.54
May	30.00	72.7	5.53
June	30.00	77.0	3.17
July	29.98	83.6	3.01
August	29.98	75.4	4.57
September	30.12	69.7	0.62
October	30.15	65.6	1.39
November	30.17	54.4	6.01
December	30.12	46.2	8.51
Annual means	30.08	61.9	4.35
Variations	+ .01	+ 1.2	+ .10
Means of the summer months	30.02	76.2	2.73
Variations	— .04	— 1.5	— .47

I find the list of the cases and deaths registered from yellow fever at Memphis in 1879, is here now tabulated:

Date.	Month.	Cases.	Deaths.
5th to 27th	July	152	53
28th	July	10	2
29th	July	8	4
30th	July	12	0
31st	July	9	4
July total		191	63

Date.	Month.	Cases.	Deaths.
1	August	13	4
2	"	14	7
3	"	12	2
4	"	15	2
5	"	18	5
6	"	17	3
7	"	19	2
8	"	22	8
9	" Total to date as reported	330	97
10	"	29	5
11	"	34	4
Total to date as reported		415	107
12	"	22	6
13	"	23	12
14	"	40	10
15	"	14	7
16	"	21	7
17	"	25	4
18	"	13	7
19	"	31	4
20	"	27	4
21	"	26	6
22	"	9	11
23	"	17	8
24	"	19	8
25	"	34	8
26	"	29	7
27	"	22	10
28	"	4	10
29	"	22	10
30	"	38	10
31	"	20	5
Total for August		680	208
Grand total to date		871	271

Date.	Month.	Cases.	Deaths.
1	Sept	16	8
2	"	28	4
3	"	26	8
4	"	28	10
5	"	19	10
6	"	17	7
7	"	11	8
8	"	25	11
9	"	20	10
10	"	16	9
11	"	15	8
42	"	21	11
13	"	23	4
14	"	1	4
15	"	19	8
16	"	13	9
17	"	9	10
18	"	10	6
19	"	11	6
20	"	12	2
21	"	8	1
22	"	18	6
23	"	13	5
24	"	10	8
25	"	6	7
26	"	6	6
27	"	11	8
28	"	13	6
29	"	9	2
30	"	17	4
Total for September		451	173
General total to date		1322	444

Date.	Month.	Cases.	Deaths.
1	Oct	2	5
2	"	11	3
3	"	11	1
4	"	10	6
5	"	6	4
6	"	16	6
7	"	2	4
8	"	10	6
9	"	10	6
10	"	16	3
11	"	15	10
12	"	7	7
13	"	12	8
14	"	9	14
15	"	10	9
16	"	7	1
17	"	4	3
18	"	9	5
19	"	2	1
20	"	9	2
21	"	10	9
22	"	5	2
23	"	1	1
24	"	2	3
25	"	1	2
26	"	1	3
27	"	—	—
28	"	—	1
29	"	3	1
30	"	2	—
31	"	—	1
Total for October		203	126
Grand total to date		1525	570
Per centage of mortality			37.3

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