

plough has wearing guards of hardened steel wherever it can touch the edge of the conduit slot; and the shoes are made of soft metal, which takes up all the wear and prevents any injury to the conductors. Two ploughs are used on each car for the sake of absolute reliability.

For suburban lines, or for small cities where the traffic does not justify the employment of the more expensive conduit system, the company furnishes its elevated conductor system. The elevated conductors can be either bracketed off from poles, or hung from wires crossing the street at any desired height above the roadway. Electrical connection between the motor on the car and the elevated conductors is maintained by means of a trolley or contact-brush and a flexible conductor.

The motor and mechanism of a car operate noiselessly, and are entirely concealed from view beneath the bottom of the car. Cars may be stopped as quickly as desired, may reverse at will, and, if derailed, can propel themselves back on the track.

The motor is controlled from either end of the car; and the driver may proceed at any speed, from a slow creep to that of twenty miles an hour.

SCIENTIFIC NEWS IN WASHINGTON.

The Archæology of the District of Columbia. — Our Future Empire. — Science and Psychos.

The Archæology of the District of Columbia.

THE Anthropological Society of Washington consists of four sections, each in charge of a vice-president, but none thus far definitely organized: viz., Section A, somatology; Section B, sociology; Section C, philology, physiology, and psychology; Section D, technology. It has of late become apparent to members interested in archæology (which is included in the last section) that this subject has received inadequate attention during the past year or two, and especially that too little attention has been given to the archæology of the District of Columbia and contiguous territory. In order to strengthen this branch of anthropology, and at the same time to stimulate local investigators, a temporary organization of Section D has been effected. At a meeting of the members of the society interested in local work, called by the vice-president of the section, Dr. O. T. Mason, last week, it was decided to combine efforts and results, with the immediate object of elucidating the history of the aboriginal inhabitants of the Potomac River as recorded in relics and early writings, and with the ultimate object of preparing and publishing a monograph on the antiquities of the District of Columbia. A committee was appointed to prepare *résumés* of existing knowledge on various phases of the subject for presentation at one of the meetings of the society in April next. This committee, which has power to add to its numbers, is as follows: geology in its relations to early man, W. J. McGee of the United States Geological Survey; paleolithic man and his remains, Thomas Wilson, curator of antiquities of the Smithsonian Institution; relics of the later aborigines, S. V. Proudfit of the Interior Department; prehistoric settlements and workshops, Dr. Elmer R. Reynolds of the Pension Office; aboriginal tribes recorded by early explorers, James Mooney of the Bureau of Ethnology.

Our Future Empire.

The event of the sixteenth regular meeting of the National Geographic Society on the 11th inst. was the presentation of an elaborate paper on "The Great Plains of Canada," by Mr. C. A. Kenaston. During several seasons of constant exploration, undertaken with the object of ascertaining the agricultural, pastoral, and other capabilities of the country, Mr. Kenaston became thoroughly acquainted with the vast expanse of plain country stretching from Hudson Bay to the foot-hills of the Rockies, and from the international boundary to the Arctic Circle. The entire tract is one uninterrupted, monotonous, grassy plain, sloping gently to the eastward and northward, diversified only by shallow lakes and broad water-ways in the east, and by shallow but steep-sided cañons of the rivers beginning in the mountains in its central and western portions. The general hydrography, the more detailed topographic features, the flora, the fauna, and the *voyageurs* of the Hudson Bay Company, — the link connecting the aborigines with the white in-

vaders who now possess the land, — were all described at length; and it was pointed out that this region, long the home of the buffalo, the wolf, the badger, and uncounted myriads of wild fowl, is the American wheat-field of the future. In the south-eastern portion of the tract the soil is a dark prairie loam, like that of Minnesota and Iowa; west and north-west of it lie millions of acres of "gumbo" soil, refractory under the first efforts of the agriculturist, but made fruitful by two or three seasons of tillage; while the soil of the northern plains is a fertile yellow loam or boulder drift; and over twenty millions of acres the conditions of soil and climate are alike so favorable to wheat-growing, that only peopling by farmers and the opening of transportation routes are needed to make any part of it successfully rival the famous wheat-fields of Minnesota and Dakota. Already the tract is intersected by the Canadian Pacific and many other railways, the navigable rivers are being supplied with steam-craft, and the lands along railways and waterways are generally sectionized and open to occupation; and the present prospects are that this northern expansion of the Great Plains of America will be overrun by settlement nearly as rapidly as was the part drained by the Mississippi and its tributaries.

Science and Psychos.

On Friday evening last, some thirty or forty scientific men assembled at the residence of Mr. W. A. Croffut, to "assist" at some experiments in hypnotism by that gentleman. Among those present were Professor N. S. Shaler, G. K. Gilbert, Dr. T. N. Gills, A. H. Thompson, W. C. Winrock, Col. Garrick Mallery, Gen. Adam Badeau, Major Powell, and Mr. F. M. Thorn, chief of the Coast Survey, besides several members of Congress. While one of the hypnotized sensitives was personating an aged colored preacher, he was violently seized by Major Powell, denounced as an impostor, and thrust out of the room. He seemed unconscious of the strange interruption, and the stream of his exhortation flowed on unbroken to the end, until Mr. Croffut appeared and recalled him from the trance. Major Powell then made some remarks on hypnotism and the relation of its hallucinations to other states, especially to mental abstraction and heterophemy, and the desirableness of subjecting its phenomena to scientific conditions and observation.

CENSUS OF THE DEFECTIVE CLASSES.

At the suggestion of Senator Eugene Hale, chairman of the census committee of the United States Senate, Professor A. Graham Bell addressed a letter to the committee, in which he refers to some of the results of the census of 1880, especially with reference to the relative increase of the deaf, the blind, the idiotic, and the insane within recent years, as compared with the population in the United States, and to deafness as caused by the marriage of the deaf with the deaf, and makes some suggestions as to the taking of the next census. As this communication is of considerable importance at the present time, when preparations are being made for the next census, we reproduce it here *in extenso*.

According to the census returns, the defective classes have increased 400 per cent in thirty years, while the general population of the country has simply doubled. The following table shows the relative figures at each census since 1850:—

Years.	Total Population of the United States.	Total Blind Population.	Total Deaf-and-Dumb Population.	Total Idiotic Population.	Total Insane Population.
1850.....	23,191,876	9,794	9,803	15,787	15,610
1860.....	31,443,321	12,658	12,821	18,930	24,042
1870.....	38,558,371	20,320	16,205	24,527	37,432
1880.....	50,155,783	48,928	33,878	76,895	91,997

I have examined with care the statistics of the Tenth Census relating to the deaf-and-dumb, and find internal evidence to show that in their case there has been a real increase greater than the increase of the general population, and not simply an apparent

increase due to greater accuracy of enumeration: for, when the whole population of the United States are classified according to their age in 1880, the proportion of deaf-mutes among the younger persons is seen to be greater than among the older; indeed, it is proportionally greater as the age is younger, until quite young children are reached.

The following are the number of the deaf-and-dumb returned in the Tenth Census:—

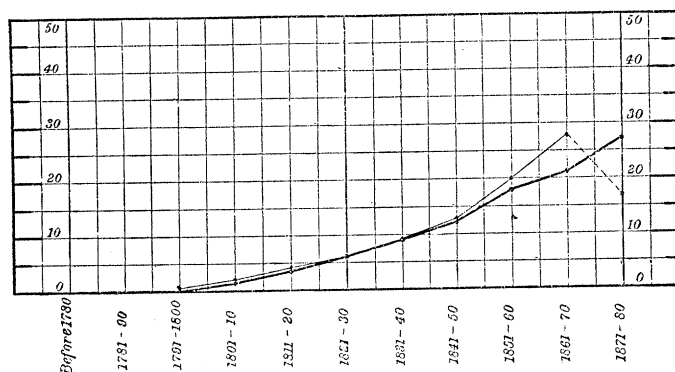
Period when Deafness occurred.	Number of Deaf-Mutes.
At or before birth	12,155
After birth	10,318
Not stated.....	11,405
Total.....	33,878

Classification of these cases according to their age in 1880 shows that there has been an enormous increase of recent years in the numbers of the non-congenitally deaf; but this need hardly be considered as a permanent condition, for it appears to be due to an epidemic of cerebro-spinal meningitis, which will probably die away, as former epidemics have done.

The following table shows the percentage of the whole population of the United States born at each decade, and also the percentage of the congenitally deaf population:—

Period of Birth.	Total Population Living in 1880.	Congenital Deaf-Mutes Living in 1880.	Percentage of the whole Population Living in 1880.	Percentage of Congenitally Deaf Population Living in 1880.
Before 1780.....	4,016	—	0.0080	—
1781-90	20,863	9	0.0416	0.074
1791-1800	196,197	63	0.3912	0.518
1801-10	776,507	241	1.5482	1.983
1811-20	1,830,095	472	3.6488	3.883
1821-30	3,111,317	751	6.2033	6.179
1831-40	4,558,256	1,078	9.0882	8.870
1841-50	6,369,362	1,614	12.6992	13.280
1851-60	9,168,393	2,460	18.2798	20.240
1861-70	10,726,601	3,398	21.3866	27.958
1871-80	13,394,176	2,068	26.7051	17.015
Total.....	50,155,783	12,154	100.0000	100.000

These results are shown in graphical form in the following diagram. The continuous line indicates the percentage of the general population, and the broken line that of the congenitally deaf population, born at each decade.



The indications are that the congenital deaf-mutes of the country are increasing at a greater rate than the general population.

The great and sudden decrease in the numbers of deaf children born in the last decade (1871-80) is probably due to imperfect returns of deaf-mutes under ten years of age: for, though 54 per cent of all the deaf-and-dumb were deaf from birth, only 30 deaf infants were reported in the census of 1880, and only 49 between the ages of one and two, out of a total deaf-mute population of 33,878.

Statistics in my possession show that in the year 1819 deaf-mutes began to marry partners who were themselves deaf-and-dumb.

The percentage of intermarriages has continuously increased, until now not less than 90 per cent of all deaf-mutes who marry, marry partners who are themselves deaf-and-dumb.

The latest statistics collected by me include 1,443 cases of marriage. Of these 1,443 deaf-mutes, I find that 71 (or 5 per cent) had married hearing persons, and 1,372 (or 95 per cent) had intermarried among themselves.

In 1828 a deaf-mute child was born of a deaf-mute father and mother, and now such cases can be numbered by the hundred. My statistics are based upon a list of 528 deaf-mutes, mostly young, who have one or both parents deaf.

Some of these children have already married deaf husbands or wives, and deaf offspring have appeared in the third generation.

I can cite families in which the deafness has been handed down through four generations, and can give in minute detail particulars relating to a family in Maine in which congenital deaf-mutes have appeared for five successive generations in increasing numbers, and in which the younger deaf-mutes are marrying deaf-mutes.

My list of deaf children of deaf parents (all, excepting one, born before 1880) comprises 528 cases (mostly young), 91.6 of whom were deaf from birth.

Upon the assumption that 528 such cases were living when the Tenth Census was taken, we obtain the following results: 1. One person in every 1,480 of the general population was deaf-and-dumb, and one person in every 64 of the deaf-mute population was a child of deaf-mute parents; 2. One person in every 2,736 of the general population was deaf from birth, and one person in every 38 of the congenitally deaf population was a child of deaf-mute parents.

The laws of heredity indicate, that, if these deaf children should marry congenitally deaf husbands or wives, an increased proportion of deaf offspring will appear in the next generation; and that the continuous intermarriage of congenital deaf-mutes from generation to generation may ultimately result in the formation of a deaf variety of the human race in America, in which all or most of the children will be born deaf.

In these conclusions I am supported by the following American men of science, all members of the National Academy of Sciences, and most of these experts on the subject of heredity. These gentlemen are Professor Edward D. Cope, editor of the *American Naturalist*; Professor Alpheus Hyatt of Harvard University; Professor William H. Brewer of Yale University; Dr. Bowditch of Harvard University; Professor Simon Newcomb of Washington, D.C.; and Professor W. K. Brooks of Johns Hopkins University.

I would therefore urge upon the United States the importance of examining in the next census the marital relations of defective persons, and the extent to which their defects have been inherited by their offspring.

The enumeration of the defective classes is always found to be itself defective.

However perfect the classification may be, the returns of these classes will always be incomplete, on account of a natural objection to expose the defects of relatives, especially when these are very young.

Accuracy of enumeration will be promoted by eliminating from the census schedules (as far as may be possible) every question that could wound the feelings of parents or friends of afflicted persons. For example: if the enumerator approached the subject of defects by asking whether the persons enumerated were perfect in sight, hearing, mind, and body, he would be more likely to secure the information desired than if he asked a fond mother whether her child was "blind, deaf-and-dumb, idiotic, insane, maimed, crippled, bedridden, or otherwise disabled."

There are degrees in every defect, and the lesser forms are more

capable of amelioration than the graver. Classification under the graver forms tends to the exclusion of the lesser from the returns; but classification under the lesser forms would include the graver, and be less objectionable to friends, so that evasions would be fewer, and the returns more accurate and complete. For example: the blind, deaf-and-dumb, idiotic, insane, maimed, crippled, bed-ridden, and otherwise disabled, would all be returned under the head of defects in sight, hearing, mind, or body; but the converse would not necessarily be true.

The returns should include all persons laboring under disabilities of sight, hearing, mind, or body, of sufficient magnitude to prevent education in ordinary schools, lessen wealth-producing power, and incapacitate for military service.

The deaf and the blind should be grouped into a sub-class by themselves, and separated as much as possible from the other defective classes, because they are enumerated chiefly for educational purposes, whereas the others need eleemosynary care or restraint.

Public establishments for purely educational purposes should be classified as "schools," and not as "asylums." They should be included in statistics relating to the general education of the people, and excluded from those relating to charitable institutions.

Many children who cannot profitably attend ordinary public schools on account of disabilities are allowed to grow up without instruction, because parents object to send them to asylums, or institutions governed by State boards of charity.

The statistics of the Tenth Census show the following figures relating to defective children of school age (six years and under twenty-one):—

	Total in the United States.	Total in Special Schools.
Blind.....	7,768	1,534
Deaf-and-dumb.....	15,059	4,893
Idiotic.....	29,373	1,942
Insane.....	3,184	—

The term "deaf-and-dumb" is not only objectionable in itself, but is incorrect, because it classifies those who belong to this class as laboring under a double disability instead of a single one.

Deaf-mutes are simply persons who are deaf from childhood; and dumbness or muteness is the result of the natural defect, and not a defect in itself. The vocal organs are not defective.

Many of the so-called deaf-and-dumb can speak. Some had acquired the art before hearing was lost, and others acquired it by instruction in school.

In the census of 1880 all persons who lost hearing before they reached the age of sixteen years are classified as "deaf-and-dumb," whether they can speak or not.

This incorrect and very objectionable classification leads to evasion and inaccurate returns.

Dumbness by itself is not a defect calling for enumeration in the census (unless, indeed, for statistical purposes and the determination of causes), for defective speech alone is not a disability that prevents instruction in ordinary schools. It does not materially lessen wealth-producing power, nor does it incapacitate the person for military service.

Persons who have not studied the subject generally fail to realize that deaf-mutes should be classified among the deaf, and not among the dumb; and enumerators, therefore, can hardly be expected to follow the classification.

For the sake of accuracy in the returns, therefore, it would be well to make defective speech a subject of inquiry in the primary schedule relating to population. The dumb who are deaf, and the dumb who are idiotic, will appear on supplementary schedules relating to the deaf or the feeble-minded; and the dumb who are neither deficient in mind nor hearing need have no special schedule of inquiry.

Special schedules relating to all the defective classes (except the dumb) should be prepared with the assistance of experts of two kinds; viz., specialists who have studied the causes of the defects,

and teachers who are familiar with the special methods of instruction necessary.

The gravity of the disabilities resulting from deafness can be ascertained from two elements: (1) the age or period of life at which the defect occurred; and (2) the amount of deafness (whether total or partial). The former element is the more important of the two, for a slight defect of hearing in an infant results in graver disabilities than total deafness occurring in adult life. For example: in the case of the deaf infant, the defect interferes with the acquisition of language through the ear, and the child remains dumb. His thoughts are carried on without words, so that a mental condition exists which is abnormal. His ignorance is so great as to be appalling; for his mind is deprived of every thing that other people have ever heard of or read about that is not derived directly from their own observation. Without special instruction, such children grow to adult life with all the passions of men and women, but without the restraining influences that spring from a cultivated understanding.

Persons who become deaf in adult life have no greater disability than the defect itself; but, where deafness occurs in childhood, incidental disabilities arise which are greater than the natural defect; but because they are incidental, and not natural, they are capable of amelioration, and even complete removal, by suitable instruction in special schools. Hence the very great importance of a correct enumeration of the young deaf children.

In the primary schedule relating to population the defective classes should be grouped together under the head of "physical and mental condition," instead of under "health," as was done in 1880. The following form is suggested for incorporation in the primary schedule relating to population:—

PHYSICAL AND MENTAL CONDITION.							
Is the person [on the day of the enumerator's visit] sick or temporarily disabled, so as to be unable to attend to ordinary business or duties? If so, what is the sickness or disability?	CONDITION OF —						
	The Senses.		(of persons 5 or more years of age.)	The Mind.		The Body.	
	Sight.	Hearing.		Mental Development.	Mental Health.	Bodily Condition.	Bodily Health.

The enumerator should be instructed to ask whether the person has perfectly normal sight, hearing, and speech; whether the mind is normally developed and in a healthy condition; and whether the bodily condition is normal and the general health good. If the answer is "yes," the enumerator should indicate the reply by a horizontal mark (—) placed in the proper column; if "no," by a mark sloping from right to left (/); and, if the question is not answered in a satisfactory and reliable manner, the column should be left blank. If the physical or mental condition is reported as "not perfectly normal" (/), the enumerator should then inquire whether the disability is sufficiently great to prevent instruction in an ordinary school, to interfere with the acquisition of a suitable means of livelihood, and to incapacitate for military service. If the answer is "yes," he should change the negative mark (/) into a cross (x), and proceed to put the interrogatories contained in the supplementary schedule relating to the special class of defect noted.

As the supplementary schedules should be prepared with the assistance of specialists, it may perhaps not be advisable for me at the present time to refer to the details, excepting so far as to say that inquiries should be instituted relating to the causes of defects and their inheritance by offspring. The marital relations of defective persons should be noted and the results tabulated. The total number of children born to them should be recorded, and the number who died young. The record should also note the number of defective and normal offspring.

In examining the ancestry of deaf-mutes, I have had occasion to consult the original population schedules of former censuses, which are preserved in the Department of the Interior; and I have found little difficulty in tracing the families backward from census to census in the male line of ascent. If the name of the father had been given in former censuses, it might now be possible for genealogical experts to trace from these records the American ancestry of every person now living in the United States in every branch, for the name of the father would give the maiden name of females. I therefore suggest that in the census of 1890 the father's name should be noted in that part of the schedule that relates to the nativity of the parents, so that the people of the United States may leave to their descendants genealogical records from which their full ancestry may at any future time be ascertained.

MENTAL SCIENCE.

Negative Suggestions.

THE meaning of this term as applied to certain hypnotic phenomena has become quite familiar. It refers to the ignoring by the subject of a portion of his sensory experience. If told that upon awakening a certain person will be absent from the room, such a person may stand directly before him, and he will be entirely ignorant of his presence. Dr. Bernheim, in studying the details of this phenomenon (*Revue de l'hypnotisme*, December, 1888), regards the condition as of purely psychic character. The defect is not physiological. The eye sees, for the subject will not run against the "invisible" person, but the brain ignores the impressions made upon it. It refuses them a hearing. This point, that in this condition the perceptions are really present but are not allowed admittance into consciousness, Dr. Bernheim proposes to demonstrate. He tells an apt subject in the hypnotic state that on her awakening he will be gone. She is awakened, searches about, but gives no sign of recognizing Dr. Bernheim. The latter speaks to her, shouts into her ear, sticks a pin into her skin, even touches her eye with it, but all with no response. She is oblivious to all impressions coming from him. If some one else touches her with a pin, she withdraws her hand at once. To do this, she must distinguish Dr. Bernheim from the other spectators; and this involves sight.

It should be noted that this experiment will not always have the same result. If told that they will not see Dr. Bernheim, some subjects will not see him, but will hear him and feel his touch, — a condition causing them a good deal of surprise, and often leading them to infer that another person must be speaking to them, and so on. By suggesting in detail that the doctor will neither be seen, heard, nor felt, a complete anæsthesia can be established.

Returning to the former subject, Dr. Bernheim, while invisible, spoke abusive words to her; but her face betrayed no emotion. Thereupon she was hypnotized by an assistant, and given the suggestion that upon her re-awakening the doctor would again be present. Dr. Bernheim then asked what he had said to her. She denied his having been present; but he insisted, impressing upon her that she would remember all. She declares it must have been a dream, but at last with great hesitation repeats Dr. Bernheim's words, his sticking her with a pin, and so on. The latent impression can thus be revived, showing that it was physiologically recorded. It is not remembered, but by a new suggestion or great effort can be revived.

A similar experience often happens in the normal state. We are absorbed in work while conversation goes on about us. We hear nothing at the time, and we have no idea of what has been said. Later, a chance association, or what not, shows that we had really been taking in what was said, though absorbed by our own work. The proof of this power of revivification is important as an aid to the explanation of hypnotic states, and is equally valuable in the medico-legal complications that might arise from them.

FATIGUE OF SIGHT.—Experiments have recently been made showing in what order a fatigued eye recovers the power of perceiving different colors. The important factor is what color has been used to induce fatigue. If the eye has been fatigued by long exposure to red, the sensitiveness for green is the first to re-appear, then for blue, then yellow, and finally red. After a "blue-fatigue,"

the order is yellow, red, green, blue; after a "green-fatigue," the order of recovery is red, blue, yellow, green; after "yellow-fatigue," it is red, blue, green, yellow. The eye recovers last the perception of the color by which the fatigue has been induced, and first recovers the sensitiveness for the complementary color. The fatigue is in the retina, for it is an independent phenomenon in the two eyes. The point of finest vision, the fovea, requires a longer time to recover from color-fatigue than the less sensitive lateral portions of the retina. The physiological process is considered to be related to the visual purple of the rods and cones.

SENSE OF TASTE.—In the case of a patient whose entire tongue, including the large circumvallate taste-papillæ at the root of the tongue, had been removed, it was found that some power of taste remained. The sensations of sweet, bitter, and sour could be obtained by applying appropriate substances to the back of the pharynx or the stump of the tongue, though if applied to the tongue the taste was apparent only during swallowing. The taste of salt was not perceived. Though these results are not fully in harmony with previous experiments, they are helpful in localizing the tasting-powers of various portions of the mouth cavity.

ACROPHOBIA.—Among the many curious psychical experiences that are now attracting attention, the one to which the term "acrophobia" has been applied has many points of interest. It refers to an exaggerated condition of the fear when in high places. Dr. Verga has recently described the phenomena in his own case. Though by nature not at all timid, all his courage leaves him when above ground. He has palpitations in mounting a step-ladder; finds it extremely unpleasant to ride on top of a coach, or even to look out of a first-story window. His idiosyncrasy forbids him to use an elevator, and the mere thought of those who have cast themselves down from high places causes tingling all over his person. The thought of the earth spinning through space is enough to cause discomfort. He finds this fear growing upon him as sight and hearing become less acute, and what walking in high places was formerly possible for him is getting more and more difficult. A greater or less degree of this fear is undoubtedly quite common. A very intense form of it seems perfectly consistent with normal mental functions.

COLOR-BLINDNESS.—Examinations in English schools tend to bear out the opinion that color-blindness is often declared to be present, when really no organic defect, but only a poor training in the naming and distinction of colors, is apparent. Some pupils, who at first seemed unable to tell colors, could be taught to do so in a few hours. One boy always called black white, and white black, and regarded colors in general as of little importance. Of one hundred boys examined, not one could be declared color-blind; of two hundred boys who were set to arranging and matching shades, none found any difficulty after a few hours' practice; and all could distinguish ordinary colors.

NOTES AND NEWS.

PROFESSOR SHALER of Harvard has just published in the "Memoirs of the Museum of Comparative Zoölogy," by permission of the director of the Geological Survey, a report on the Cambrian district of Bristol County, Mass., including a discussion of twenty-three species of fossils in the lower Cambrian section, from localities previously unknown to science. The total section of Cambrian beds exposed has a thickness of about seven thousand feet, and below that section there is a pre-Cambrian series of unknown depth, but probably approaching ten thousand feet. The report includes a geological map of the district, and two plates of fossils.

—**Frederick Schwatka**, the noted Arctic traveller, who made the longest sledge-journey on record in search of Sir John Franklin's remains, is about to head an expedition through the hitherto unknown northern mountains of Mexico.

—**Surgeon-Gen. Hamilton** has gone to Chicago on official business, and will be absent from Washington for a month. He reports progress in his efforts to reduce Florida cities to a safe sanitary condition.