

only when, as a result of this disease, one or more joints are swollen or otherwise disabled, that the surgeon can be aware of its existence. The absence of any of these evidences will occasionally enable a man to enlist who has been previously discharged from the service on account of alleged chronic rheumatism, in which event the medical examiner would be blameless of the charge of carelessness, as in all probability the discharge was procured through fraud and malingering. Chronic rheumatism of sufficient severity to warrant a discharge from service should be followed by tangible evidence, in the shape of swollen or distorted limbs, deposits in the joints, or enlargements in the surrounding tissues, and these are not likely to disappear; close inspection must be made of all joints to discover any swelling or other evidence of sprain; lameness of an inferior extremity, or stiffness of a superior one, should be an indication for careful questioning as to the receipt of injury.

It is not always wise to place too much confidence in the statements of men as to their freedom from pain or ability to move joints which have been injured. It is well known that the remote effects of sprains and other joint injuries, particularly of the ankle and wrist, are liable to manifest themselves, even at a late period, in swellings or pain after severe exertion; and however honest one may be in the belief of his perfect cure from such an injury, and ability to perform all duty required of him, there may be an actual defect of which he is ignorant. The medical examiner, therefore, must exercise his own judgment from the appearance of the parts, their sensitiveness, etc., as to whether this is the case or not, and he should reject in all instances which give room for doubt. Fractures which have been properly treated, and have united without deformity, are not of themselves causes for rejection, but when they are followed by neuralgic pains, or if there has been much displacement of fragments, so that the symmetry of the limb is destroyed, or if from excessive bony deposits there is impairment of motion, they are causes for rejection. Fractures of the bones of the forearm are very likely to give trouble by interference with the motions of pronation and supination, both of which are necessary in handling the rifle during the exercises in the manual of arms. Malformations of the limbs, as excessive curvature—bow-legs—are objections rather because of the awkward gait they induce than from any interference with the ability of the man to march; when the curvature is caused by a constitutional taint, as rickets, etc., there can be no question as to the propriety of a rejection. Abnormal cartilaginous or bony formations in the muscles, or loose cartilages in the knee-joint, are objections when they impair the use of the joint.

In time of war especial care is necessary, particularly in those affections which present but little external evidence of injury, to detect deception; chronic rheumatism, sprains, alleged dislocations and fractures, must not be made causes for exemption unless the evidences of impaired strength and motion of the parts in which they are located are indisputable. Allegations of pain, loss of motion, involuntary contractions, etc., will constantly be made, and if the surgeon has no other means of completing his diagnosis in a case of suspicion, he should resort to the use of anæsthetics, under which simulation ceases, and the true state of an alleged disability will be made apparent. One must, however, bear in mind the fact that in central lesions of the brain contractions disappear during chloroform narcosis. It should be stated that authority for the use of anæsthetics is limited "to cases of professed rheumatic contraction of joints when unattended with perceptible alteration of form or structure,"²⁸ although it is recommended in a wider range of cases by Tripler and Bartholow, both authorities recognized by the War Department. An ingenious test for simulated contractions of limbs—flexures—has been suggested by a Russian military surgeon, and is published by Zuber.²⁹ It consists in applying tightly to the affected limb an Esmarch bandage, as if for amputation; when the bandage is removed, the rubber cord remaining, the limb straightens itself involuntarily. The test has been tried

in but few cases, and may not invariably succeed, but it is worthy of further trial.

All officers of experience in the examination of malingering soldiers agree upon the fact that their most vulnerable point is in an exaggeration of the symptoms which they endeavor to simulate. When a man comes limping before a surgeon with every expression of pain upon his countenance, or assumes the most unnatural and constrained positions of body or limb, he may, in nine instances out of ten, be set down as a malingerer, if he presents no external physical signs of disease; there is something about a real sufferer or cripple which is very hard to describe, but which every surgeon will recognize; and in a large number of instances the problem will be, not so much in recognizing the deception, as in compelling the subject to admit it.

The Superior Extremities.—Fracture of the clavicle; fracture of the radius and ulna; webbed fingers; permanent flexion or extension of one or more fingers, as well as irremediable loss of motion of these parts; total loss of either thumb; mutilation of right thumb; total loss of the index finger of the right hand; loss of the first and second phalanges of all the fingers of either hand; total loss of any two fingers of the same hand, disqualify.

Fractures of the clavicle, which are almost invariably followed by more or less deformity, are causes for rejection in consequence of the painful pressure made at the seat of injury by the rifle, during certain movements in the manual of arms, and by the "sling straps" when carrying the knapsack or haversack. The mere fact that the clavicle has been fractured is not of itself cause for rejection, and even the presence of a slight deformity should not be objectionable, provided there is neither pain on pressure nor interference with the free motion of the arm. The improved means of transporting the baggage of the soldier have in a great measure done away with the necessity for his knapsack; the few articles of clothing which he requires in the field are rolled in his blanket, which is slung over the shoulder and across the chest, and thus carried without inconvenience or pain to any part of the clavicle which may have sustained an injury. The haversack strap may, however, on long marches, or when the sack is well filled, produce painful pressure, or even excoriate the skin, and the gun is very liable to injure a prominent deformity on this bone. Therefore a tumor at the seat of fracture, from whatever cause, if considerable, would be a valid objection to enlistment. Any fracture of the radius and ulna, particularly Colles', is liable to be followed by impairment of the motions of pronation and supination of the forearm—movements indispensably necessary in the drill of the manual of arms, the "set up" drill, and other military exercises. Should this be the case, rejection is demanded; otherwise, union and motion being perfect, the injury is not a cause for rejection. The degree of mutilation of the hand which should disqualify can be determined only by the facility with which a man so injured can handle a rifle. In loading the Springfield (army) rifle, the breech block is thrown open and the cartridge thrust home by pressure of the right thumb, the rifle is also cocked by the same member; hence it is very important that it should be intact; and any injury which materially interferes with its flexion or strength is a cause for rejection. The common distortion of the extremity due to contusion or felon need not disqualify; the loss of the entire member would, of course, reject; loss or mutilation of the last phalanx of the left thumb need not disqualify. The first and second phalanges of the right index finger may be lost or mutilated without necessarily disqualifying an otherwise very desirable recruit, or a soldier who desired to re-enlist; it is ordinarily the finger used in pulling the trigger, but this can be done with facility by a stump, or by the middle finger, as is the case with many marksmen whose fingers are perfect; it should, however, be the rule for recruits to have a perfect right forefinger, departures from which rule should be made only in rare instances and for very good reasons. Permanent flexion or extension, or loss of motion of any fingers, so materially interferes

with a military use of the hand as to demand rejection. The congenital malformation of the little finger of one or both hands, which is so common, is not considered a disqualification.

In time of war, the loss of the right thumb; loss of any two fingers of the same hand; loss of the first and second phalanges of the fingers on the right hand; permanent flexion or extension of two fingers of the right hand, or all the fingers united (webbed), are causes for exemption.

The Lower Extremities.—Varicose veins; knock-knees; club-feet; splay or flat feet; webbed toes; the toes double or branching; the great toe crossing the other toes; bunions; corns; overriding or superposition of any of the toes to an extreme degree; loss of a great toe; loss of any two toes of the same foot; permanent retraction of the last phalanx of any of the toes, or flexion at a right angle of the first phalanx of a toe upon the second, with ankylosis of the articulation; ingrowing of the nail of the great toe; bad-smelling feet, disqualify.

Dr. Baxter, in his "Report of the Provost Marshal General's Bureau," says that to be cause for rejection varicose veins must be "voluminous and multiplied." There is no doubt of the fact that the judgment of many surgeons is in error as to the degree of varicosity of the veins of the leg which should disqualify, and men have been discarded with veins so slightly enlarged that they could hardly be called varicose. The network of small veins so often seen in the popliteal space, and inside of the thigh, upon men of spare habit, or in those whose occupations have required them to stand a great deal, are not sufficient in degree to cause rejection; nor, indeed, is such the case when a single vein may be more or less enlarged without the function of its valves being impaired. It is only when several veins are very large and tortuous, with failure of their valves, or when there is edema, thickening of the integument, or much ulceration, that they become disqualifications. An exception to this rule should be made in cases in which hemorrhoids are present, when even slightly varicose veins are causes for rejection. One may see occasionally an instance in a very muscular man, where there has been a rupture of the sheath of some muscles in the leg, which closely resembles a varix; if the finger is placed over such a tumor during the contraction of the muscle, its true nature will be apparent. Knock-knees, if existing to such a degree as to interfere with the free use of the limbs, should disqualify; as a general rule, if the inner borders of the feet, from the heel to the ball of the great toe, cannot be brought within one inch of each other without passing the inner condyles of the femur, respectively, in front of and behind each other, the applicant should be rejected. Flatness of the feet to a degree requiring rejection is very seldom met with among applicants for enlistment, notwithstanding the fact that it is supposed to be very common among the laboring population; as a cause for rejection it has been very much exaggerated; the ordinary flatness of foot so often seen, especially among negroes, is not more likely to become a cause of disability in marching than is the more shapely foot, unless an ill-fitting shoe is worn; the anatomical peculiarity which disqualifies has been described by Gorcke, of the Prussian service, substantially as follows: The inner ankle is very prominent, and is placed lower than usual; a hollow exists below the outer ankle of a greater or less extent; the dorsum of the foot is not sufficiently arched; the foot is broader at the ankle than near the toes; the inner side is flat and sometimes convex, and when the foot is placed on the ground the sole projects so much on the inside that the finger cannot be introduced below it; the body rests on the inner side of the sole, and the usual motion of the ankle-joint is impeded.

Bunions, if large and presenting evidences of old or recent inflammation, should always reject; they are a fruitful source of disability on long marches and in hot weather, the pain produced by the pressure of the shoe setting up an irritation which extends to the entire foot. The same may be said of corns when located on the sole

of the foot; those under the head of the metatarsal bone of the great toe are the most painful, and produce lameness sooner than any others; they are, moreover, very intractable. Of the malpositions of the toes, that in which the first phalanx is flexed at right angles upon the second to such an extent that the man walks upon the end of the nail (hammer toe) is the most painful, and will disable more speedily than the others; there is no shoe which can be made that will remedy the defect, and it is in consequence an absolute cause for rejection. In-growing of the nail of the great toe, if deep and accompanied with signs of irritation, inflammation, or suppuration, renders a man unfit for service; if, however, he is very desirable otherwise, the simple operation of shaving away the redundant tissue on the border of the toe, in a majority of instances effectually cures the disease, after which he may be accepted.

The fetid odor exhaled from the feet of some men is such as to make their presence in a squad-room unbearable to their comrades. The excessive perspiration causing this odor keeps the toes and under surface of the feet soft and the skin macerated, for which reason very slight exercise produces painful excoriations and unfits the man for duty. When the feet show evidence of this condition the applicant should be rejected.

In time of war very large varicose veins, club-feet, an excessive knock-knee, loss of great toe, and flexion of the phalanges of the other toes to an extreme degree, should exempt; men having other defects of the feet, if unfit to join the active line, can be made useful in the administrative departments and should be held to service.

Charles R. Greenleaf.

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RECTO-VAGINAL FISTULÆ. See *Vagina, Diseases of.*

RECTUM, MANUAL EXPLORATION OF THE.—In 1872 Professor Simon, of Heidelberg, published in the *Archiv für klin. Chirurgie*, an article "On the Artificial Dilatation of the Anus and Rectum for Exploration and Operation," in which he first described a method of exploring the lower bowel by the introduction of the entire hand. By this method of examination he asserted that not only was he able to explore all of the pelvic organs and to distinguish any pathological changes they might have undergone, but that the greater part of the abdominal cavity could also be reached. He further asserted that this method was so entirely free from danger that he had not hesitated to practise it on patients anesthetized for other purposes.

Manual exploration of the rectum is now only of historical interest. It is no longer employed, and has been superseded by the no more dangerous and much more wide-reaching and satisfactory method of exploration, viz., by abdominal section. N. P. Dandrige.

RECTUM, SURGERY OF THE. See *Anus and Rectum. (Surgical.)*

RED BOILING SPRINGS.—Macon County, Tennessee. POST-OFFICE.—Red Boiling Springs. Hotel.

ACCESS.—Via Louisville and Nashville Railroad to Galatin; thence by private conveyance to the springs.

This resort is located in the foothills of the Cumberland Mountains, sixty-five miles northeast of Nashville and seven miles from the Kentucky line. It has an elevation of about twelve hundred feet above the sea-level. The visitor will at this resort find a cool and pleasant retreat for the summer months. The hotel is said to be well kept and comfortable, and the cuisine of an excellent character. There are three springs in the group—two red sulphur springs and one black sulphur spring. Those most generally used are the "Little Red" and the "Black Sulphur" Springs. The former was analyzed by Lucius Pitkin, analytical and consulting chemist, of New York City, in 1890, with the following results:

Little Red Spring.—One United States gallon contains (solids): Sodium chloride, gr. 5.57; sodium sulphate, gr. 0.94; calcium sulphate, gr. 8.18; potassium sulphate, gr. 0.41; calcium bicarbonate, gr. 3.20; magnesium bicarbonate, gr. 4.55; iron bicarbonate, gr. 0.15; silica, gr. 0.80. Total, 23.80 grains.

Sulphureted hydrogen gas is present in large quantities.

The following analysis was made by James T. Anderson, of the Alabama State Agricultural and Mechanical College at Auburn:

Red Spring No. 2.—One United States gallon contains (solids): Sodium chloride, gr. 10.73; sodium carbonate, gr. 1.03; calcium carbonate, gr. 9.64; calcium sulphate, gr. 15.36; magnesium sulphate, gr. 7.97; alumina, gr. 0.12; iron oxide, gr. 0.08; silica, gr. 0.58; organic and volatile matter, gr. 2.31. Total, 47.82 grains. Sulphureted hydrogen gas is present in only small quantity. The temperatures of the waters are 54° and 52° F., respectively, and they do not vary during the year.

These waters are said to be actively diuretic, and to exert a general tonic and alterative effect upon the system. Hot and cold sulphur baths may also be had at all hours. A competent physician is always at hand to explain the proper use of the waters. *James K. Crook.*

REDLANDS AND RIVERSIDE, SOUTHERN CALIFORNIA.—These two places may be taken as representing the climate of the eastern foothills of Southern California, where are to be found many resorts favorable for a winter or an all-the-year-round residence.

Redlands (1,350 feet), in San Bernardino County, lies in the East San Bernardino valley, and is surrounded by mountains from 5,000 to 12,000 feet high on the north, east, and south, and lies open to the sea on the west, from which it is distant about eighty miles. The city is beautifully situated and substantially built, and contains about six thousand inhabitants. It is a favorite place of winter residence for Eastern people, and in attractiveness of situation and the character of its inhabitants and residences is comparable to Pasadena. Parks, many churches, a fine public library, excellent schools, clubs, golf links, good hotels, are all to be found here. The soil is porous and rich, and especially favorable for the cultivation of the orange, which is the principal fruit grown here. The water-supply is a fine one, and affords irrigation for the orange groves. There is a sewer and storm-water system, and the sanitary condition appears to be of the best.

Redlands has good railroad connections and electric roads; and from it one can easily reach the various attractive mountain resorts on the one side and those of the coast on the other.

One rarely meets with a more attractive town, even in Southern California, than Redlands, exhibiting as it does so many of the natural attractions peculiar to all this region. Wherever there is irrigation, flowers of endless variety abound, and the most luxuriant vegetation flourishes. The dust of the streets is laid by the crude petroleum, so abundant in Southern California. By this process an almost perfectly dustless road is obtained, and

remains so for many weeks from a single application of the oil.

The characteristics of the climate of Redlands, as, indeed, of all this eastern foothill region, are equability, comparative dryness, abundant sunshine, and a small rainfall occurring mostly in the winter and spring. Early morning fogs, so-called "high fogs," may also be considered a climatic characteristic, for they are not of infrequent occurrence here, as elsewhere in Southern California.

The average rainfall is 15.59 inches, of which 7.45 inches falls in the spring and 6.55 in the winter. The mean annual relative humidity as given by Bridge ("The Climate of Southern California," Transactions of the American Climatological Association, 1901) is 64.4 per cent. The average mean winter temperature as given by the same authority is 54.7°; for summer, 75.3°; spring, 63°; autumn, 66° F. (Solly). Sanborn ("The Climate of the Eastern Foothills," by Dr. C. A. Sanborn, Redlands, Cal., Transactions of the American Climatological Association, 1902) gives for Redlands the following extremes of temperature from an average of three years for the three months exhibiting the greatest extremes of heat and cold:

January	Mean maximum temperature.....	62 degrees.
	Mean minimum	40 "
February	Mean maximum	about 69 "
	Mean minimum	42 "
July	Mean maximum	about 95 "
	Mean minimum	59 "
August	Mean maximum	about 91 "
	Mean minimum	58 "

The average mean relative humidity of Redlands for these months is given by the same authority as 55.7 per cent.

In the summer the temperature occasionally goes above 100° F. in the middle of the day, but with the dry atmosphere this is not so uncomfortable as might be supposed. The difference between the day and night temperatures is great, something like 20° to 30°. Similarly, there is a great difference between the night humidity and the day humidity. "This means to an invalid," as Solly remarks ("Medical Climatology"), "a climate possessing, in the course of the day, perhaps six hours of moderate dryness, and eighteen hours of positive dampness."

These two characteristics of the fall in temperature and increase in dampness at night probably account for the apparent cheeriness with which the residents open and keep open their windows, and the fear they have of sitting out of doors at night. As paradoxical as it may seem, one can evidently sit out of doors more evenings in the year in New England than in Southern California; or else the New Englander is more venturesome and hardened in enduring the evening air than is the Californian of the South.

Freezing weather is very rare.

The mountains to the north of this valley shut off the winds from the desert, but the sea breeze blows daily, beginning usually about ten o'clock in the forenoon, and lasts until sunset. There are said to be over three hundred sunny days in the year at Redlands. At San Bernardino, about eight miles to the northwest, the total number of clear days, as given by Dr. A. K. Johnson, a volunteer observer (period not given), is 235; fair days, 95; cloudy, 85; rainy, 33. According to Sanborn (*loc. cit.*) "patients with pulmonary lesions, not far advanced, do well in this climate (Redlands and vicinity), especially in that part of the valley where orange growing and the consequent dampness from irrigation do not prevail." Sanborn also refers to the irritation of the respiratory tract brought about by the extensive use of commercial fertilizers. He has noticed a prevalence of tonsillitis and pharyngitis occurring at the time of using this material. "Nervousness" is said to be increasing here as well as in other portions of Southern California, and it is attributed by Sanborn to various causes, climatic and others, such as eye strain from a succession of bright days, and nostalgia.

Five miles from Redlands, on the line of the Southern

Pacific Railroad, is the *Loma Linda Sanatorium* (about twelve hundred feet), beautifully situated on the hillside about two hundred feet above the surrounding country. It is approached through a stately avenue of pepper trees, and is surrounded by orange groves and beautiful gardens. The view from the sanatorium is extensive and grand, the lofty "Arrowhead" and its hot springs lying directly in front. The buildings of this institution are well equipped, containing operating-rooms, etc., and excellent accommodations are offered to the nervous and other invalids, as well as to those who only desire to rest under such favorable conditions of situation and climate. The tuberculous are not received here.

Riverside (elevation eight hundred and fifty feet) is a city of ten thousand inhabitants, about sixteen miles by rail southwest from Redlands. It is the most famous orange-growing district in Southern California, and is well supplied with water for irrigation and domestic purposes, from a number of artesian wells near the mountains. The drainage is good, and the city affords every opportunity for comfortable living, either for the transient or for the permanent resident. There are attractive parks, in one of which is the curious "cacti garden." There are also beautiful estates, many churches, fine school buildings, a Carnegie library, miles of pleasant roads through the orange groves, and avenues shaded by the eucalyptus, the pepper, and the palm, among them the famous Magnolia Avenue.

The vegetation, as at Redlands, is most luxuriant, and besides the orange, the pomegranate, olive, persimmon, fig, and other fruits are found here. Flowers abound in a wild profusion, and this whole area seems like one vast park or garden.

The accommodations are good. Besides the lovely drives and walks, there are opportunities for golf, polo, and tennis.

The climate is similar to that of Redlands. The average yearly rainfall for fourteen years was ten inches, February and March being the rainiest months (Solly, "Medical Climatology"). The relative humidity for the year 1888 was 65.5 per cent. The mean monthly temperature for the seasons, covering a period of twelve years is as follows: Spring, 60°; summer, 74°; autumn, 74°; winter, 51° F.* The mean for July is 76°; maximum, 106°; mean for August, 76°; maximum, 104°; mean for January, 50°; minimum, 29°. The average variation between the day and night temperatures, as given by Sawyer ("A Study of Riverside Climate," etc., Southern California *Practitioner*, 1887), for January is 20°, and for July, 34°. "The ordinary wet season at Riverside," says the same author, "is much drier, has less rain, and a larger proportion of dry, clear sunny days than the average summer in New York, Boston, or Chicago." The amount of sunshine is great, and, according to Sawyer, there were two hundred and eighty absolutely clear days from July, 1885, to July, 1886.

Thirty-five miles southeast of Colton, which is eight miles north of Riverside, is the little town of Hemet, the starting-point for the carriage ride to the health resort of *Idyllwild*. This is a journey of twenty miles, the last ten of which are up a steep mountain road. *Idyllwild* has an elevation of 5,250 feet, and is situated in the Strawberry Valley, in a large forest tract of fifteen hundred acres, which is again bounded by extensive government forest reservations. The valley is well timbered, the pine, cedar, and live oak predominating. The climate possesses the characteristics of the high altitudes in a comparatively warm latitude, the atmosphere being dry and pure; and the temperature warm but not hot in summer, and in winter cool, but not generally going below the freezing point. As is generally true of this whole region the majority of the days are sunny.

The *Idyllwild Sanatorium* occupies a well-protected situation, and besides a large, well-appointed central building containing fifty-one rooms, there are several

* Quoted by Solly from a meteorological record issued by the Riverside Board of Trade.

cottages of three and six rooms, tents, etc. There are appliances for furnishing steam heat and electricity, an ice plant, and a steam laundry. Families who come with their invalids can also find accommodations here, and means of recreation in riding, golf, tennis, etc. There is also a school for the younger children. The sanitary conditions are well looked after. The water comes from a pure mountain spring, and there is a well-constructed sewer system. The plumbing is modern and good.

Pulmonary tuberculosis in the curable stages is the principal disease treated here, and there are a resident physician and nurses.

From a personal visit the writer can testify to the wild beauty of the scenery, the delicious purity of the air, and the energy and devotion of the managers in building on this mountain plateau a well-equipped and extensive sanatorium, with all modern improvements. For one who desires to take the open-air treatment in the high altitudes, and at the same time avoid the severity of the winter climate found in the altitudes farther north, such as at Colorado and in the Alpine resorts of Europe, *Idyllwild* would seem to afford ideal conditions, not only of climate, but of accommodations. The only drawback is the long, tiresome carriage ride, but this in time will probably be obviated by a mountain railway.

Edward O. Otis.

RED SULPHUR SPRINGS.—Monroe County, West Virginia. POST-OFFICE.—Red Sulphur Springs. Hotel.

ACCESS.—Via Chesapeake and Ohio Railroad to Alderson's, thence by stage to springs.

These springs are beautifully situated on Indian Creek, and are surrounded by pine-clad mountains. They are two in number, and flow two hundred and ten gallons per hour. The water has a temperature of 51° F. It was analyzed in 1842, but the results were not very satisfactory. The total solids found to be present in one United States gallon amounted to about twenty-four grains, and approximately one-third of this consisted of sulphur.

A new analysis of this water is very much to be desired. Its virtues are presumed to rest to a great extent upon the sulphur which it contains. Aside from this substance it contains ingredients which justify us in classing it as a light saline calcic water. From abundant corroborative medical testimony there seems to be no doubt that the water causes a decided slowing of the heart's action in an excited state of the circulation. The water further seems to exert a soothing influence upon the mucous membrane of the lungs and bronchi, allaying irritation and diminishing expectoration. In virtue of these properties it has often proved decidedly beneficial in hæmoptysis, early phthisis, chronic bronchitis, chronic pharyngitis, and chronic laryngitis. In small quantities the water is said to be cathartic, while in larger doses it is diuretic. *James K. Crook.*

REDUCTION-DIVISION.—When in the course of cell division the chromatin is distributed to the daughter nuclei in such a way that the material forming one daughter nucleus has a different ancestral history from the material forming the other, the division is called a reduction, or, better, *reducing division*; and is thus distinguished from the ordinary *equal division*, in which every particle of the chromatin is divided equally between the two daughter nuclei (see article *Cell*).

Theoretical.—If we suppose that the physical basis of heredity consists of distinct units in the chromatin material of the nuclei of the germ cells, then at each union of two germ cells in sexual reproduction the number of ancestral units, or ancestral germ-plasms, will be doubled. And, unless prevented in some way, this doubling will continue with each successive sexual union, until either the germ cells will be increased to an enormous size, or else the units will be reduced in size so much that they are smaller than the proteid molecule.

Roux in 1884 published an elaborate review of the whole subject of mitotic cell division, so far as it had