and dissolving power of the medicines," bears the date March 5, 1739, and is signed by twenty justices. These dearly purchased remedies were three in number, "a powder, a decoction, and pills." The powder consisted of calcined egg-shells and snails; the decoction was a disgusting mixture of herbs, soap, and honey, boiled in water; and the pills were made of "calcined wild-carrot seeds, burdock seeds, ashens keys, hips, and haws—all burned to a blackness—soap, and honey."

Contemporary with Mrs. Stephens lived another impostor, Mrs. Mapp, sometimes known as "Crazy Sally of Epsom," and described as an "enormously fat, ugly creature, accustomed to frequent country fairs, about which she loved to reel, screaming, abusive, and in a state of beastly intoxication." This attractive lady was by profession a bone-setter, and was patronized by patients of rank and wealth, who sought her charily bestowed favors with ill-disguised contempt of her person. The town authorities of Epsom greatly esteemed Mrs. Mapp, or perhaps we should say highly valued the benefit the town derived from the influx of wealthy patients, and they offered her the sum of five hundred dollars per annum if she would continue to reside in the town.

The first half of this century has witnessed the career of a few women eminent in the art of healing. In France Madame La Chapelle had an extensive gynecological practice, and Madame Boivin attained to such distinction that she was honored with the degree of Doctor of Medicine by the University of Marburg. In Germany Charlotte Heidenreich and Frau Helland, her stepmother, were similarly honored with doctors' diplomas.

It is the glory of America that she is distinguished above all countries not only as the cradle of liberty, but also as the foster-mother of the intellectual advancement of women. Yet this has not always been the case; in the early chronicles of the colonists (themselves refugees from persecution), we find, strangely enough, many laws of an exacting and repressive character, some of which were aimed directly at the ambition and zeal of women. In the famous Blue Laws of Connecticut the following curious entry occurs under the date of March, 1698: "Jane Hawkins, the wife of Richard Hawkins, had liberty till the beginning of the third month called May, and the magistrates (if shee did not depart before) to dispose of her; and in the mean timeshee is not to meddle in surgery or phisick, drinks, plaisters, or oyles, nor to question matters of religion except with the Elders for satisfaction." ("True Blue Laws of Connecticut," by J. H. Trumbull, 1876.)

A hundred and forty years later we find marked progress in liberality in the State of Connecticut. As early as 1773, in the town of Torrington, Litchfield County, two women were greatly honored and much sought for on account of their remarkable skill as accoucheuses. The first of these, Mrs. Jacob Johnson, to quote the historian of Torrington (Rev. Samuel Orcutt), was as thoroughly known and trusted in her profession as any physician that was ever in the town. "She rode on horseback, keeping a horse for the special purpose, and traveling night and day, far and near," to meet her engagements. "She kept an account of the number of cases she had, and the success of the patients, and the newcomers, and of these last there is at least one living in the town. In the midst of her usefulness she was removed by death, and it became a great inquiry, 'Who will take the place of Granny Johnson?'" This question was answered more successfully than anticipated in the person of Mrs. Huldah Beach, daughter of Aaron Loomis, jun. Mrs. Beach became as celebrated in her calling as Granny Johnson, and continued to attend to her professional duties until an advanced age. She was a woman of remarkably fine personal appearance and decided dignity of carriage, yet marked kindness of manner. Her intellectual strength and ability were perceptible to every one, and she in consequence commanded great respect in all classes of society, and won the confidence of the people so that but few calls were made on any other physician in her specialty, on the western side of the town. She also rode as far as Winchester, Goshen, and Litchfield.

Dr. Orcutt, whose "History of Torrington" has furnished us with these particulars, remarks in this connection: "Many have imagined that, in the practice of medicine by women, a new era has arrived, but in this there is only a 'retoration of the lost arts.'"

Our allotted task is completed, yet we cannot close this address without a brief survey of the present period, in which the facilities afforded women in all branches of learning contrast strongly with the impediments and obstacles formerly well nigh insurmountable.

Women desirous of acquiring medical knowledge are no longer obliged to disguise themselves in male attire like Agnodice the Athenian, nor are practitioners liable to suffer the penalties of the law for their works of benevolence and charity. In 1880, the young woman with aspirations for intellectual culture finds open to her such excellent training schools as Holyoke, Wells, and Rutgers—such noble institutions as Vassar, Smith, and Wellesley. Does she not shrink from contact with her brothers, she may gain entrance into many universities, either expressly founded in a liberal spirit—as Oberlin, Cornell, and Ann Arbor—or which have yielded to the steady pressure of public opinion, and now open their doors more or less widely to the gentler sex. To enumerate the latter would be tedious and unprofitable; suffice it to say that even venerable and aristocratic Harvard has lately joined the number, and our own Columbia, should her president's views prevail, will not be slow to follow.

The young woman who seeks intellectual training of a more technical character, with a view to adopting a professional career, will find many avenues opening up with constantly increasing privileges and facilities. The student in art, thanks to the philanthropy of our venerable citizen, Peter Cooper, can, without incurring expense, acquire a knowledge of designing or of wood engraving which will hardly fail to secure for her a competence. The student in biology will receive her share of attention at a summer school of science on our Atlantic seaboard, or held in connection with some enterprising institution of learning. The student in pharmacy and chemistry can conduct her researches on an equality with men, or, if she prefer, in laboratories controlled and officered in large part by women themselves.

The student in medicine now gains access to medical colleges in nearly every State in the Union, and the legitimacy of her pursuit as well as her ability to grapple with it gains increasing advocates. "She is no longer regarded as too good and too stupid to study medicine." The candidate for medical honors also finds in Boston, Philadelphia, New York, and Chicago, well-appointed schools of medicine especially adapted to her needs, with corps of trained and sympathizing instructors ready to lend a helping hand.

Looking across the Atlantic, we find countries so lately intolerant of the intellectual advancement of women at last yielding, not always gracefully, to the inevitable. The little republic of Switzerland, and the mighty empire of Russia, have for many years manifested practical sympathy with the cause; and now, slowly yet surely, conservative England begins to recognize the fact that the Anglo-Saxon race, with its boasted love of liberty, has been neglectful of its duty to womankind.

To trace any more fully the history of the recent period does not fall within the province of our address; we look to the pioneers of this movement who are still with us for an exhaustive and authentic record such as participants and eye-witnesses alone can supply.—*Journal of Science.*

ON THE BENEFICENT AND TOXICAL EFFECTS OF THE VARIOUS SPECIES OF RHUS.*

By T. J. W. BURGESS, M.B.

THE paper that I have prepared for your consideration deals with a class of plants which, whether considered with reference to their beneficent or toxic effects on the human race, should be known to every practitioner—I refer to the various species of rhus.

The most noteworthy example of this genus in our own country, and the one to which the greater part of my remarks will apply, is commonly called poison ivy. So far as my own knowledge extends, but little is known of this plant to the profession at large, except through cases of poisoning by it presented for treatment. Now, when we consider how common it is, and the number of persons liable to exposure to its noxious influence—the laborer engaged in railway work and in clearing bushland, the farmer working about his fences, one of its favorite lurking places, and the child so often employed in gathering the wild flowers with which our woods abound—I cannot impress on you too strongly the necessity for a thorough knowledge of the various species, their appearance, and that of the plants with which they are most likely to be confounded, and their physiological effects, with the prevention and cure of these. Some of the varieties being used for domestic purposes and others in the practice of medicine, I will also draw your attention to their uses in the arts and their pathological effects, with the classes of cases in which they have been found most beneficial when employed as medicines.

The only representative of the large order, *Anacardiaceæ*, the Cashew family, in northern North America, is this genus rhus, a name derived from the Greek verb *reo*, "to flow," so called because it was thought to be useful in stopping hemorrhages. And, truth to tell, the name was not inaptly applied by our forefathers, all the varieties being possessed of more or less astringent properties, some of them in a very marked degree. The genus, to the non-botanical commonly known as sumac or shumac, is composed of trees or shrubs, having a resinous or milky acid juice; alternate leaves; small, regular, greenish-white or yellowish flowers; and a fruit forming a sort of dry dupe.

No less than fourteen varieties of rhus are or have been used in the arts and sciences (the term including medicine), and these I shall, for convenience of description, divide into two classes, native and foreign, dismissing the latter with but a brief mention of their uses.

Of the foreign species there are six:

Rhus cotinus, sometimes cultivated in our gardens for ornamentation, under the names "smoke plant," "purple fringe tree," and, from the curious appearance of its seed vessels, which look like a powdered wig, "periwig tree," is known

wound with this juice, and form a protection against the irritation of insects.

Rhus semi-alata, a native of China and Japan, yields a gall largely used, especially by the Chinese, in dyeing their celebrated yellow silks. It is also highly esteemed by them as an astringent medicine.

Of the native species of rhus there are eight, and, not to afflict you with their scientific distinctions, I will classify them as poisonous and non-poisonous, chiefly confining my botanical descriptions to the poisonous class, it being most important, both in a diagnostic and prophylactic point of view, to be able clearly to distinguish these from certain non-poisonous plants resembling them. The eight species are equally divided, four being innocent and four highly noxious. And first, let me draw your attention to the non-poisonous varieties, meaning by this, non-poisonous by contact with the plant, for, if administered internally, in large doses, even the innocuous ones act as irritants.

Rhus aromatica—fragrant sumac—is a straggling bush with three foliate, hairy leaves; the pale yellow flowers, in clustered spikes like catkins, precede the leaves, which are sweet-scented when crushed. It extends from Lake Superior westward and southward, in dry rocky soil, a variety, the rhus trilobata of Nuttall, chiefly affecting the Rocky Mountains and Sierra Nevadas. This plant has during the last two years, whether justly or not I cannot from my own experience say, obtained a high reputation as an astringent, and is at present being lauded in journals devoted to materia medica. In hæmaturia and chronic cystitis, where the ordinary remedies—ergot, gallic acid, and muriated tincture of iron—have failed, it is said to have been used with the happiest results. In phthisis, though not advanced as at all curative, it has a favorable effect in checking the hemorrhage, night sweats, and diarrhoea, often so exhausting and distressing. Five to twenty drops of the fluid extract may be given every hour in extreme cases of hemorrhage, and lessened as relief is obtained. For the diarrhoea fifteen drops may be given after each stool, while the night sweats are best treated with a dose of ten to twenty drops each night at bedtime. In the diarrhoea of children, where the stools are frequent, the pulse soft and feeble, the skin pale, the eyes sunken, and there is loss of flesh and general sense of lassitude, it is by some regarded as invaluable. Its use is also advocated in menorrhagia, dysentery, and diabetes insipidus, but it is in enuresis (incontinence of urine) that it has gained its highest reputation. Dr. Cooper, of Bellefontaine, Ohio, regards it almost as a specific in this complaint, and in the November, 1879, number of *New Preparations*, records a number of cases cured by its use. From the strong testimony to its value, I would urge upon you, who are much more likely to see cases of this not uncommon affection than one engaged in asylum practice, to give it a fair trial, if you have not already done so. It is given in fifteen-drop doses four times a day, the last being administered just before retiring, till improvement takes place, when only the night dose is given, and continued until the habit is cured. At the same time the patient should strictly adhere to the rules of drinking but little during the evening, and voiding urine just before going to bed. The best form for use is the fluid extract, and a nice formula for its administration is:

R. Fl. ext. rhus aromatica 3 i.
Glycerine 3 ss.
Aqua ad 3 iv.
M.—Sig. One drachm four times daily.

Several medical friends, who have been using this drug in various affections, have furnished me with records of cases treated by it, which may be thus tabulated:

Disease.	No. of cases treated.	Result.
Chronic cystitis..	1	Much improved.
Phthisis.	5	In all, attacks of diarrhoea and night sweats were relieved.
Diarrhoea of children.	9	Six cured; three died.
Diarrhoea of adults.	2	One cured; in the other the drug seemed to have no effect whatever.
Menorrhagia	5	In all there was a wonderful effect in checking the discharge at the time. In three cases, after use at two menstrual periods, the discharge was normal, and has since, now five months, continued so. The fourth case is improving, but the fifth shows no radical change.
Enuresis	3	Two cured; one improved.

in commerce as Venice sumac. It is a small tree with purplish-green flowers, supported on hairy peduncles, and is a native of Siberia, Austria, and Northern Italy. It is not used as a medicine or pharmacy, but yields one variety of a wood known in trade as *fustic*, which has been largely employed for producing a yellow dye. A noticeable peculiarity about this species of rhus is that its leaves are simple, like those of the elm and maple, and not compounded, like the horse-chestnut and ash, as is the case with the rest of the genus.

Rhus Coriaria.—Of this, both the leaves and berries have been used as astringents and tonics, and the ground twigs as a dyestuff. It is a native of the Ukraine, in Russia, and has been regarded by the inhabitants of that country, combined with a decoction of genista tinctoria leaves, as a preventive of hydrophobia. It is employed both internally and locally, and the peasantry have great faith in its curative virtues, but extended trials in other parts of Europe have shown it to be useless in this much-dreaded affection.

Rhus succedanea is indigenous in Japan. From its berries is expressed a wax sometimes used in pharmacy, known as Japan wax. It is of medium quality, ranking between bees-wax and the ordinary vegetable tallow.

Rhus vernicifera, varnish or Japan sumac, inhabits India and Japan, where it is highly prized for its yielding, from incisions made in the stem, a gum from which is made one of the best of varnishes.

Rhus metopium is found in the West Indies, chiefly Jamaica, and is said to be one of the sources of "hog-gum" so extensively used by bookbinders in the process of marbling paper. This peculiar, and certainly not euphonious, name, is derived from the fact that hogs, when wounded, are reputed to rub themselves against this tree, so as to cover the

This record speaks strongly in favor of an extended trial of the remedy in the class of cases enumerated, though its greatest benefit would seem to be shown in menorrhagia and enuresis.

Rhus glabra, variously known as sleek, smooth, Pennsylvania and upland sumac, official in the United States Pharmacopœia, is found over the greater part of North America, south of the Arctic circle. It is a shrub two to twelve feet high, with straggling branches, covered with smooth, light gray or somewhat reddish bark. The compound leaves, consisting of eleven to thirty-one leaflets, whitened beneath, in autumn change to a beautiful red. Growing along fences, borders of woods, and in rocky fields, its flowers open about July, and the fruit, often eaten by the country people, ripens in early fall. Excrescences produced on the under surface of the leaves have been used as a substitute for the official galls obtained from the oak, *Quercus infectoria*. Like galls, these excrescences are due to puncture of the young shoots by a hymenopterous insect to deposit its eggs. This irritates the part, and a tumor arises, the result of morbid growth. The eggs enlarge with this growth, and are converted into larvæ, which feed on the vegetable matter. Finally the larvæ become flies, and escape by eating their way out. For use, these excrescences should be collected when of full size, just before the eggs are hatched. All parts of this plant contain a large amount of gallo-tannic acid, and the bark is often used in tanning. The berries have a sour astringent taste, and owe their acidity to malic acid, which, according to Mr. Cossens, is not contained in the berries themselves, however, but in the pubescence which covers them. An infusion of the fruit has been used as a refrigerant drink in febrile complaints, and as a detergent astringent gargle in common and ulcerated sore throat. It has also been employed with great success in mercurial ptyalism, but for this, an infusion, or still better, a fluid extract of the inner bark of the root, is best adapted.

* Read before the Canada Medical Association, at Ottawa. From the *Canadian Journal of Medical Science*.

The fluid extract also possesses tonic properties, and may be used in doses of one-half to one drachm.

Rhus copallina, dwarf sumac, mountain sumac, or the gum copal tree, is a shrub with running roots, one to seven feet high, inhabiting rocky hills. Its branches are downy, and the petioles between the leaflets are wing-margined. Gum copal, so largely employed in making varnishes, is the product of a number of different trees, one of which, according to some authorities, is the *rhus copallina*. This plant possesses similar, but less strongly marked, properties to *rhus glabra*, and may be used as a substitute therefor.

Rhus typhina, staghorn sumac, grows very commonly throughout Canada along railway tracks, and on sterile hill-sides. It forms a tree ten to thirty feet high, with orange-colored wood. The branches and stalks are densely, velvety hairy, with serrate leaflets, pale beneath. This, the fourth and last of the innocuous native species, also possesses properties similar to *rhus glabra*, and may be substituted when that plant cannot be had.

Of the four indigenous species which possess poisonous properties, one is an inhabitant of the Southern States, and a second of California, while the third and fourth are common in all parts of North America, between the 35th and 60th parallels. Since their poisonous, and probably their therapeutic, effects are similar, I will first give a short description of each species, and devote the remainder of my remarks to the physiological and therapeutic actions of *rhus toxicodendron*, the common form of poison ivy in Canada.

Rhus pumilum, growing only in the Southern States, and very common in North Carolina, is a pubescent shrub, about a foot high, said to be the most poisonous of the Eastern varieties. Its pinnate leaves, consisting of about eleven oblong, coarsely-toothed leaflets, are downy beneath. The three upper leaflets are often confluent, the terminal one, when distinct, being attenuate at the base. The flower panicles are nearly sessile, while the drupes are covered with a red, silky pubescence.

Rhus diversiloba of Torrey and Gray, or *rhus lobata* of

ports of poisoning by honey in particular localities, it would be a point well worthy of investigation whether this form of poison ivy does not also abound there. The berries, ripe in October, are whitish or dun-colored, with striate stones, and look somewhat like bunches of small grapes—a similarity, however, which is immediately dissipated by the slightest glance at the leaves, in the grape *simple*, in the *rhus compound*. Taken altogether, this tree makes one of the handsomest shrubs imaginable when in blossom, but is, unfortunately, one of the most deadly. *Rhus venenata* has been thought to be identical with the *rhus vernicifera* of Japan, and when incisions are made into its bark there is a copious flow of viscid fluid, yellowish at first, but soon changing to a deep black, which, when boiled, makes a fine varnish. The poisonous properties of this tree are said to be more powerful than those of *rhus toxicodendron*; persons exposed to its influence being more apt to suffer, and more severely. I have known several cases of poisoning due to this plant being mistaken for the common elder, an error which could never arise were the fact borne in mind that both varieties of elder, found in this country, have the margins of the leaves toothed, whereas in *rhus venenata* they are entire. In addition, the elders have dense masses of flowers, and a fruit which, when ripe, is either red or black, while this form of poison ivy has slender, scattered bunches of flowers, and a fruit whitish in color when mature.

Rhus toxicodendron may be made to include *rhus radicans*, as botanists are now pretty well agreed that it is merely a variety of the former; its differing form and characters, viz., more entire leaflets and high climbing stem, being dependent on the circumstances of its *habitat*. *Rhus toxicodendron* was first described in 1635 by Cornutus, in his works on Canadian plants, as a species of ivy. The Indians were well aware of its properties, and its effects were mentioned by Kalm and other travelers in North America. Poison oak, poison ivy, poison vine, poison creeper, and sometimes poison mercury, are names applied to it. It is found within the same range of territory as the *rhus vene-*

principle is in great measure dissipated in the process of drying, and hence dried preparations of the plant are much less apt to act noxiously, though even these should be handled with great care by such as are susceptible to poisoning by it. The plants for which *rhus toxicodendron* is most often mistaken are the Virginian creeper or American ivy (*Ampelopsis quinquefolia*), with which the climbing variety often entwines itself, and the *Aralias*, *Nudicaulis*, and *Quinquefolia*, commonly known as wild sarsaparilla and ginseng, often found growing with the low form. The plants are very easily distinguished if one will take the trouble to remember a single simple distinctive mark, viz., five leaflets on a single leaf-stock, whereas *rhus toxicodendron* has only three. Other distinguishing marks are, that the *aralias* have regular serrate leaves, and in *nudicaulis* the flower stem is separate from the leaf-bearing one.

DON COSSACK.

NEAR Joliet, Ill., is the extensive stock farm of Judge J. D. Caton, the well-known writer and agriculturist. Among the splendid animals with which his domain is stocked is the subject of our sketch, the four-year-old stallion, Don Cossack, probably as fine a specimen of good breeding as exists anywhere. Don Cossack is a handsome mahogany bay, with small white spots on inside hind ankles; foaled April 8, 1876; 16½ hands high, and weighs 1,200 lb.: bred at Glenview Stud Farm, Jefferson Co., Ky., by J. C. McFerran & Son; got by August Belmont, son of Rysdyk's Hambletonian; first dam Laytham Lass by Alexander's Abdallah; second dam by Mambrino Chief; third dam sent from Ohio to Kentucky, to be bred to Mambrino Chief, and said to be by Bellfounder.

Don Cossack, as a two-year-old, trotted a full mile in 2:45. As a three-year-old, he trotted a quarter in 37 seconds and a full mile in 2:39. He won the three-year-old race at the Fair at Louisville, in September, 1879, winning the third heat in 2:42, trotting the last half of this mile in 1:17, at the time

DON COSSACK.—PREMIUM FOUR YEAR OLD STALLION.

Hooker, approaches very nearly to *rhus toxicodendron*. It is generally a shrub, but sometimes a climber, and is said to be the most poisonous of all the *rhuses*. It is chiefly a native of California, where it is known by the Spanish name of "hiedra." Its leaves consist of three, rarely five, obtuse, lobed leaflets; its flower panicles are shorter than the petioles; and its fruit is white and pubescent. With her usual generosity, Nature, according to Dr. Canfield, provides an antidote to poisoning by this species, in the shape of another Californian plant, the *grindelia hirsutula*, of which either the bruised plant itself, or a decoction, is applied to the parts.

Rhus venenata, formerly called *Rhus vernix*, is known by the different names of poison dogwood, poison elder, poison ash, poison sumac, swamp sumac, white sumac, and varnish tree. Affecting rich, swampy ground in shaded situations, it is a shrub or small tree, usually growing from six to eighteen feet high, and one of the largest of our native species of *rhus*. The trunk seldom exceeds three inches in diameter, and, branching at a height of three to five feet, usually makes a repeatedly two-forked ramification, the final twigs terminating in thick clusters of leaves. The smooth bark is dark gray on the trunk, lighter on the branches, and reddish on the twigs and petioles. The leaves, expanding in May, are at first dark yellow in color, but become deep green with a paler under surface when mature, and finally, at the first touch of frost, assume a beautiful deep crimson hue, that can fairly vie with the maple for brilliancy of effect. The seven to thirteen leaflets forming the compound leaves are obovate oblong in shape, and entire. The small yellowish flowers are arranged in loose and slender axillary panicles, forming large masses of fragrant bloom, at the ends of the branches, which attract innumerable swarms of bees. Whether the honey derived from this source possesses any poisonous properties I am unable to say, but, as at various times there have been re-

nata, and is by far the commonest form throughout Canada. It generally grows in fertile and low grounds, but will thrive in barren and elevated places, and attaches itself to any bodies in its vicinity by numerous thread-like rootlets given off from the stem. Sometimes it climbs spirally to the tops of our tallest trees, attaining a height of forty or fifty feet; again, it is met with along the sides of fences, which serve as a convenient support, or crawling over bush, or rocks, or along the ground, in which cases it never exceeds from one to three feet in height. This low form sends off many small branches, the pendulous extremities of which often give the plant a bushy appearance. The stems are from one-quarter to two inches in thickness, and covered with a grayish-brown bark. The leaves, which are said to be eaten by cattle with impunity, are trifoliate; the leaflets being rhombic ovate, pointed, pubescent beneath, and variously notched, of a shining red when they first appear in the spring, but bright green at maturity. The flowers are small, greenish-white in color, and disposed in simple axillary racemes. The fruit is a round dry berry, as large as a pea, of a pale green color, ripe in October. Like *rhus venenata*, from the bark, when wounded, exudes an acrid, milky juice, which, exposed to the air for a few hours, changes to an intense black, which will leave indelible stains on linen or cotton, not effaceable by any known chemical, and which has been used as a marking ink. According to Dr. Jos. Khittel, the principal chemical constituents of poison ivy are gallo-tannic acid and a volatile alkaloid, to which it owes its poisonous and medical properties. The later researches of Prof. Maisch, however, have proved that the acidity of the juice is due to the presence of a hitherto unknown volatile acid, analogous to, but distinct from, formic and acetic—toxicodendric acid, which, when isolated, is found to affect the skin, either by direct contact or by its vapor, exactly as the fresh plant itself does, proving beyond doubt that the poisonous properties of the plant are due to it. This

weighing 1,175 lb., thus proving himself to be a colt of rare individual merit. As a four-year-old Don Cossack was kept in the stud, but was exhibited at the Illinois State Fair, held at Springfield, and was awarded first premium as the best stallion, four years old and over, defeating a field of thirteen stallions; he was also awarded first premium as the best driving stallion of any age, speed considered. In his breeding he unites the two great and popular trotting families, the Hambletonians and the Mambrinos.

SCIENTIFIC BREEDING.

By J. D. CATON.

THE scientific breeding of domesticated animals involves, first, a knowledge of the principles of biology and generation, which may be learned by careful observation and experiment; then the art of applying these laws, so that, by training or discipline, we may create characteristics which, in obedience of these laws, we have ascertained may become hereditary. Then, by cultivating these desirable characteristics and breeding from those individuals in which they appear to be the most highly developed, an improvement may be hoped for in each succeeding generation. In the same way undesirable characteristics may be eliminated. This may be called scientific breeding, which, so far as our domesticated animals are concerned, is perfectly under the control of man. Could the same laws be applied to man with the same rigor, the improvement in the race would, no doubt, be more pronounced than it is possible to make it in the brute creation. When circumstances compel the cultivation of certain characteristics, whether physical or mental, in a race of men, we may be surprised to see how rapidly they grow and how soon they become hereditary.

But it is only where these laws have been studied, and are arbitrarily applied by the intelligence of man, that we see the