

staple in the rich counties in the northern central part of the State, bordering upon the Missouri river. No State raises so many mules, asses, and hogs. The production of cereals in 1880 was—corn, 202,487,723 bushels; wheat, 24,966,627 bushels; rye, 535,426 bushels; oats, 20,670,953 bushels; barley, 123,031 bushels; buckwheat, 57,640 bushels. The production of tobacco for the same year was 12,015,657 lb from 15,521 acres, valued at \$800,256. Three-fourths of this amount was raised in Chariton, Marion, Randolph, Howard, Callaway, and Saline counties.

Wild Animals.—Red-deer are found in every part of the State, especially in the thinly-settled and mountainous districts. Venison, indeed, in its season, is as cheap as good beef in the markets of St. Louis. Wild turkeys are numerous in the swampy and mountainous districts, and are found in all parts of the State. Prairie chickens, or pinnated grouse, are found in the prairie portion of Missouri, and are shipped in great numbers to Eastern markets. In all parts of Missouri are found the quail or Virginia partridge, thousands of barrels of which are shipped from the State each season. The rabbit, a species of hare, is so common as to be considered a pest. The grey squirrel and the red fox-squirrel are also found in large numbers all over the State. Black bass, perch, catfish, buffalo fish, suckers, and pike are the leading varieties of native fish.

Manufactures.—In 1880 Missouri had about 20,000 manufacturing establishments, in which a capital of about \$125,000,000 was employed. The products of these establishments were valued at upwards of \$300,000,000. The leading manufacturing counties outside of the city of St. Louis are Jackson, Buchanan, St. Charles, Marion, Franklin, Greene, Cape Girardeau, Platte, Boone, and Lafayette; but more than three-fourths of the manufactures are produced at St. Louis, which is the fourth manufacturing city of the Union. The chief manufacture is that of flour, which employs about 900 mills, and is rapidly increasing. Twenty-four mills made in St. Louis, in 1880, 2,142,949 barrels of flour, having a daily output of more than 11,000 barrels. St. Louis millers and dealers sent in 1880 to Europe and South America 619,108 barrels of flour; and at the world's fairs at Paris, Vienna, and Philadelphia, Missouri flour received the first award. The iron industry, which stands second in importance, is yet only in its infancy, and St. Louis seems destined to be one of the great centres of iron and steel manufacture. The amount of iron made in Missouri in 1880, in twenty-two establishments employing 3139 hands, was 125,758 tons. St. Louis made the same year 102,664 tons of pig-iron, steel, and rolled iron and blooms. The yearly values of a number of other industries are estimated as follows:—meat packing, \$20,000,000; lumber, \$10,000,000; bags and bagging, \$7,000,000; saddlery, \$7,000,000; oil, \$6,000,000; printing and publishing, \$5,500,000; furniture, \$5,000,000; carriages and waggon, \$4,500,000; marble and stone, \$4,000,000; tin, copper, and sheet-iron, \$4,000,000; agricultural implements, \$2,000,000. The manufacture of glass and glass-ware is carried on to a considerable extent, especially in St. Louis. At Crystal City, on the Mississippi, 30 miles below St. Louis, is a very large deposit of sand suitable for the manufacture of plate-glass, and a company has been organized and is now in successful operation, with a capital of \$1,000,000.

Commerce.—The extensive commerce of Missouri centres at St. Louis, between which city and the ports on the Mississippi and Missouri rivers steamboats are constantly plying. Railroad transportation has, in recent years, furnished superior and cheaper facilities for much of the trade which formerly depended upon the rivers. The trade in cotton especially has been greatly increased in Missouri since 1870 by the use of railroad transportation, which has made St. Louis one of the great cotton centres of the United States. Extensive cotton presses were built in St. Louis in that year, and the receipts of cotton from the more southern States has increased rapidly—from 12,264 bales in 1869-70 to 457,563 bales in 1879-80. Railroad connexions have made the interior portions of Arkansas and Texas more accessible to St. Louis than to the southern ports of shipment, and the trade with the south-west, with the Indians, and with Mexico is constantly increasing. In 1870 St. Louis was made by Act of Congress a port of entry to which foreign merchandise could be brought in bond. The value of the direct imports for the year ending 30th June 1882 was \$1,634,342.

Population.—Missouri is divided into 114 counties. The following table gives the number of inhabitants since 1850:—

Year.	Males.	Females.	Total.	Density per square mile.
1850	357,832	324,212	682,044	14.37
1860	622,201	559,811	1,182,012	18.08
1870	896,347	824,948	1,721,295	26.34
1880	1,127,187	1,041,193	2,168,380	31.55

In 1880 the foreign-born residents numbered 211,578, or 9.7 per cent., of whom 103,974 were Germans and Scandinavians; there were also 145,046 of African descent. The early settlers of the State

were French, and their descendants are still found in St. Louis and Ste Genevieve and a few other smaller towns. Many Germans have recently settled in all parts of the State, while English, Irish, Scotch, and Swedes have also made Missouri their home in considerable numbers. The native American population is mostly descended from immigrants from the States of Kentucky, Tennessee, North Carolina, and Virginia. During recent years there has been a large accession to the population from the eastern and north-western States.

St. Louis, the chief city of the Mississippi valley, situated upon the Mississippi river about 12 miles below the mouth of the Missouri, has a population of 350,518; Kansas City, a thriving town on the western border, situated on the banks of the Missouri, has 55,785; St. Joseph, in the north-west, has 32,431; Hannibal, in the north-east, has 11,074; and Jefferson City (the State capital), in the centre, has 5271.

Education.—Missouri has a public school system of education first adopted in 1839. There are district schools, elementary and ungraded; city schools, graded, with high school courses; four normal schools, and a State university. Free public schools for white and coloured children between the ages of six and twenty years are required by law for every district in the State. Besides these public institutions supported by the State there are many private schools and colleges for both sexes. Chief among these are the St. Louis University, an institution managed by the Jesuits; the College of Christian Brothers, also under the control of the Roman Catholics; and Washington University, a non-sectarian endowed school, which has property estimated at \$1,000,000, and more than 1300 students. The Baptists have a college at Liberty called William Jewell College; the Congregationalists one at Springfield called Drury College; and the Methodists and Presbyterians several colleges and seminaries.

Religion.—The early settlers of Missouri were Roman Catholics, and in the river towns may be found to-day a large number of that faith. The Baptists have 88,999 members, with 1385 churches; the Methodists, 96,270 members and 918 churches; the Protestant Episcopal Church, 25,000 members and 65 church buildings; the Presbyterians, with their various branches, 34,628 members and 705 churches.

Administration.—The legislative power is vested in a body consisting of a senate and a house of representatives, which meets once in every two years, on the Wednesday after the first day of January next after the election of the members thereof. Members of the legislature are paid a sum not to exceed \$5 a day for the first seventy days of the session, and after that not to exceed \$1 a day for the remainder of the session. They are also allowed mileage. The executive department consists of a governor, a lieutenant-governor, a secretary of state, a State auditor, State treasurer, an attorney-general, and a superintendent of public instruction; these are all elected by the people. The supreme executive power is vested in the governor, who is chosen for four years, as also are the other members of this department. The governor has a qualified veto upon the acts of the legislature, and such other powers as are common to that officer in the several States. The judicial power of the State is lodged in a supreme court, the St. Louis court of appeals, circuit courts, criminal courts, probate courts, and municipal courts. All judicial officers are elected by the people. Judges of the supreme court are elected for ten years, those of the St. Louis court of appeals for twelve years, those of the circuit courts for six years. Executive and judicial officers are liable to impeachment by the house of representatives. All impeachment cases are tried by the senate.

Every male citizen of the United States, and every male person of foreign birth who may have declared his intention to become a citizen of the United States, according to law, not less than one year nor more than five years before, he offers to vote, who is over the age of twenty-one years, is entitled to vote at all elections by the people, if he has resided in the State one year immediately preceding the election at which he offers to vote, and has resided in the county, city, or town where he shall offer to vote at least sixty days immediately preceding the election.

History.—On the 9th April 1682, the French voyager and discoverer La Salle took possession of the country of Louisiana in the name of the king of France. Its limits were quite indefinite, and in name of the king of France. Its limits were quite indefinite, and in name of the king of France. The first settlements of Missouri were made in Ste Genevieve and at New Bourbon, but uncertainty exists as to the exact date. By some the year is fixed at 1763; by others, and by many traditions, as early as 1735. St. Louis was settled by Pierre Laclède Lignest, a native of France. The site was chosen in 1763, and in February 1764 Auguste Chouteau went at the order of Liguest to the spot previously selected, and built a small village. For a long time the settlements were confined to the neighbourhood of the river. On the 31st of October 1803 the Congress of the United States passed an Act by which the president was authorized to take possession of the territory according to the treaty of Paris, and the formal transfer of Lower Louisiana was made on 20th December

1803. In 1804 Congress divided the territory into two portions. The northern part, commonly called Upper Louisiana, was taken possession of in March 1804. In June 1812 Missouri was organized as a Territory, with a governor and general assembly. The first governor (1813-1820) was William Clarke. In 1818 Missouri applied for admission to the Union as a State. Two years of bitter controversy followed, which convulsed the country and threatened the dissolution of the Union. This controversy followed a resolution introduced into Congress which had in view an anti-slavery restriction upon the admission of Missouri to the Union. This was at last settled by the adoption of the "Missouri compromise," which forbade slavery in all that portion of the Louisiana purchase lying north of 36° 30' except in Missouri, and on 19th July 1820 Missouri was admitted to the Union. A convention to frame a constitution had already been called, and the constitution then adopted remained without material change until 1865. The first general assembly under the constitution met in St. Louis in September 1820, and Alexander M'Nair was chosen governor in August. The seat of government was fixed at St. Charles in 1820, and removed to Jefferson City, the present State capital, in 1826. The first census of the State was taken in 1821, when the number of inhabitants was found to be 70,647, of whom 11,254 were slaves. In the Black Hawk war in 1832, the Florida war in 1837, and the Mexican war in 1846 Missouri volunteer troops did their share of the work. In the troubles in Kansas, and the bitter discussion upon the question of slavery, Missouri was deeply involved. A strong feeling in favour of secession showed itself in many parts of the State. Governor Jackson, in his inaugural address on the 4th of January 1861, said that Missouri must stand by the slaveholding States, whatever might be their course. The election of a majority of Union men, however, as delegates to a convention called to consider the affairs of the nation, showed that public sentiment was hostile to secession, and the convention adjourned without committing the State to the secession party. United States troops were soon gathered at St. Louis, and forces were also sent to Jefferson City, and to Rolla. Governor Jackson fled from the capital, and summoned all the State troops to meet him at Booneville. General Lyon defeated these troops, 17th June 1861, and soon most of the State was under the control of the United States forces. The State convention was reassembled. This body declared vacant the offices of governor, lieutenant-governor, and secretary of state, and filled them by appointment. The seats of the members of the legislature were also declared vacant. Governor Jackson soon issued a proclamation declaring the State out of the Union, and Confederate forces were assembled in large numbers in the south-western part of the State. General Lyon was killed at the battle of Wilson's Creek near Springfield, and General Fremont, commanding the department of the west, decreed martial law throughout the State. For a year matters were favourable to the Confederates, and at the opening of 1862 their troops held nearly half the State; but in February a Federal force under General Curtis drove General Price into Arkansas. He returned in 1864, and overran a large part of the State, but was finally forced to retreat, and but little further trouble arose in Missouri during the war. Missouri furnished to the United States army during the war 108,773 troops. In 1865 a new constitution was adopted by the people. In 1869 the XV. Amendment to the United States constitution was adopted by a large majority. In 1875 still another State constitution was drawn up by a convention called for that purpose, and ratified by the people, and is now the fundamental law of the State. (M. S. S.)

MISTLETOE¹ (*Viscum album*, L.), a species of *Viscum*, of the family *Loranthaceæ*. The whole genus is parasitical, and seventy-six species have been described; but only the mistletoe proper is a native of Europe. It forms an evergreen bush, about 4 feet in length, thickly crowded with (falsely) dichotomous branches and opposite leaves. The leaves are about 2 inches long, obovate-lanceolate, yellowish green; the dioecious flowers, which are small and nearly of the same colour but yellower, appear in February and March; the fruit, which when ripe is filled with a viscous semitransparent pulp (whence birdlime is derived), is almost always white, but there is said to be a variety with red fruit. The mistletoe is parasitic both on deciduous and evergreen trees and shrubs, and "it would be difficult to

¹ Greek *ἱξία* or *ἱξός*, hence Latin *viscum*, Italian *vischio* or *visco*, and French *gui*. The English word is the Anglo-Saxon *mistellean*, Icelandic *mistelleinn*, in which *tan* or *teinn* means a twig, and *mistel* may be associated either with *mist* in the sense of fog, gloom, because of the prominence of mistletoe in the dark season of the year, or with the same root in the sense of dung (from the character of the berries or the supposed mode of propagation).

say on what dicotyledonous trees it does not grow" (London). In England it is most abundant on the apple tree, but rarely found on the oak. The fruit is eaten by most frugivorous birds, and through their agency, particularly that of the thrush (hence *mistle-thrush* or *mistle-thrush*), the plant is propagated. (The Latin proverb has it that "Turdus malum sibi cacat"; but the sowing is really effected by the bird wiping its beak, to which the seeds adhere, against the bark of the tree on which it has alighted.) The growth of the plant is slow, and its durability proportionately great, its death being determined generally by that of the tree on which it has established itself. See Loudon, *Arboretum et Fruticetum Britannicum*, vol. ii. p. 1021 (1838). The mistletoe so extensively used in England at Christmas tide is largely derived from the apple orchards of Normandy.

Pliny (*H. N.*, xvi. 92-95; xxiv. 6) has a good deal to tell about the *viscum*, a deadly parasite, though slower in its action than ivy. He distinguishes three "genera." "On the fir and larch grows what is called *stelis* in Eubœa and *hyphear* in Arcadia." *Viscum*, called *dryos hyphear*, is most plentiful on the esculent oak (*quercus*), but occurs also on the robur, *Prunus sylvestris*, and terebinth. *Hyphear* is useful for fattening cattle if they are hardy enough to withstand the purgative effect it produces at first; *viscum* is medicinally of value as an emollient, and in cases of tumour, ulcers, and the like; and he also notes it "conceptum foeminarum adjuvare si omnino secum habeant." Pliny is also our authority for the reverence in which the mistletoe when found growing on the robur was held by the Druids. The robur, he says, is their sacred tree, and whatever is found growing upon it they regard as sent from heaven and as the mark of a tree chosen by God. Such cases of parasitism are rare, and when they occur attract much attention (*est autem id rarum admodum inventu et reperit magna religione petitur*), particularly on the sixth (day of the) moon, with which their months and years and, after the lapse of thirty years, their "ages" begin. Calling it in their own language "all heal" (*omnia sanantem*), after their sacrifices and banquets have been duly prepared under the tree, they bring near two white bulls whose horns are then for the first time bound. The priest clothed with a white robe ascends the tree, cuts [the mistletoe] with a golden hook; it is caught in a white mantle. They then slay the victims, praying God to prosper His gift to them unto whom He has given it. Prepared as a draught, it is used as a cure for sterility and a remedy for poisons. The mistletoe figures also in Scandinavian legend as having furnished the material of the arrow with which Baldur (the sun-god) was slain by the blind god Höder. Most probably this story had its origin in a particular theory as to the meaning of the word mistletoe.

MITAU (the Lettish Jelgava), a town of Russia, capital of the government of Courland. It is situated 27 miles by rail to the south-west of Riga, on the right bank of the river Aa, in a fertile plain which rises only 12 feet above sea-level, and which probably has given its name to the town (*Mitte in der Aue*). At high water the plain and sometimes also the town are inundated. Mitau is surrounded by a canal occupying the place of former fortifications. Another canal was dug through the town to provide it with water; but this now receives the sewage, and water is brought in cars from a distance of 3 miles. Though so near Riga, Mitau has quite a different character. It has regular broad streets, bordered with the low pretty mansions of the German nobility who reside at the capital of Courland either to enjoy the social amusements for which Mitau is renowned or to provide education to their children. Mitau is well provided with educational institutions. A gymnasium occupies a former palace of the dukes of Courland, and has a rich library; and there are about forty other schools. The town is also the seat of a society of art and literature, of a natural history society, which has a good local museum, and of the Lettish Literary Society. The old castle of the dukes of Courland, which has witnessed so many conflicts, was destroyed by the Duke Biron, who erected in its place a spacious palace, now occupied by the governor and the courts. Mitau has 22,200 inhabitants, mainly Germans, but including also Jews (about 6000), Letts (5000), and Russians. Manufactures are few, those

of wrought-iron ware and of white-lead being the most important. The river Aa brings Mitau in connexion with the trade of Riga, small vessels carrying goods to the amount of about £150,000 a year.

Mitau is supposed to have been founded in 1266 by the grand-master Conrad Mandern. It has often changed its rulers. In 1345, when it was plundered by Lithuanians, it was already an important town. In 1561 it became the residence of the dukes of Courland. During the 17th century it was thrice taken by the Swedes. Russia annexed it with Courland in 1795. At the beginning of this century it was the residence of the count of Provence (afterwards Louis XVIII.). In 1812 it was taken by Napoleon I.

MITCHEL, ORMSBY M'KNIGHT (1810-1862), American general and writer on astronomy, was born in Union county, Kentucky, August 28, 1810. He began life as a clerk, but, obtaining an appointment to a cadetship at West Point in 1825, he graduated there in 1829, and became assistant professor of mathematics in 1831. Subsequently he was called to the bar, but forsook law to become professor of mathematics and natural philosophy at Cincinnati college. There he established an observatory, of which he became director. From 1859 to 1861, he was director of the Dudley observatory at Albany. He took part in the war as brigadier-general of volunteers, and for his skill and rapidity in seizing certain important strategic points was on April 11, 1862, made major-general. He died of yellow fever at Beaufort, South Carolina, October 30, 1862. Besides making important improvements on several astronomical instruments, Mitchel was the author of several works on astronomy, the principal of which are *The Planetary and Stellar Worlds* (1848) and *The Orbs of Heaven* (1851). See *Memoir* by Headley (1865).

MITCHELL, SIR THOMAS LIVINGSTONE (1792-1855), Australian explorer, was a son of Mitchell of Craigend, Stirlingshire, where he was born, June 16, 1792. From 1808 to the end of the Peninsular War he served in Wellington's army, and for his services received the medal and five clasps, and was raised to the rank of major. He was appointed to survey the battlefields of the Peninsula, and his map of the Lower Pyrenees is still admired. In 1827 he was appointed deputy surveyor-general, and afterwards surveyor-general, of New South Wales. He devoted himself to the exploration of Australia, making four expeditions for that purpose between 1831 and 1846. During these expeditions he discovered the Peel, the Namoi, the Gwyder, and other rivers, traced the course of the Darling and Glenelg, and was the first to penetrate into that portion of the country which he named Australia Felix. His last expedition was mainly devoted to the discovery of a route between Sydney and the Gulf of Carpentaria, and during the journey he explored the Fitzroy Downs, and discovered the Balonne, Victoria, Warrego, and other streams. In 1838, while in England, Mitchell published the narrative of his first three journeys, *Three Expeditions into the Interior of East Australia* (2 vols.). In 1839 he was knighted and made a D.C.L. of Oxford. During this visit he took with him some of the first specimens of gold and the first diamond found in the country. In 1848 the narrative of his second expedition was published in London, *Journal of an Expedition into the Interior of Tropical Australia*. In 1851 he was sent to report on the Bathurst gold-fields, and in 1853 he again visited England and patented his boomerang propeller for steamers. He died at his residence at Darling Point, Sydney, October 5, 1855.

Besides the above works, Mitchell wrote a book on *Geographical and Military Surveying* (1827), an *Australian Geography*, and a translation of the *Lusiad* of Camoens.

MITE. Mites (*Acarina*) are minute creatures which form a large division of the *Arachnida*, distinguished by

the absence of any constriction between the cephalothorax and abdomen. Linnaeus included all in the single genus *Acarus*. They are now divided into several families (mostly containing numerous genera), viz., *Trombididae* (harvest mites), usually scarlet specks seen running on stones, grass, &c., in hot weather; *Tetranychidae*, which, although not bright red, are the red spider of our green-houses, and are distinguished by feet with knobbed hairs; *Bdellidae*, long-snouted mites with antenniform palpi; *Cheyletidae* (fig. 1), the so-called book mites,—ferocious, predatory little beings, quite unconnected with books; *Hydrachnidae*, freshwater mites with swimming legs, mostly beautiful creatures of brilliant colours; *Limnocaridae*, crawling freshwater or mud mites; *Halicaridae*, chiefly marine; *Gamasidae*, hard-skinned brown mites often parasitic on insects, and best known by the females, and young of both sexes, found on the common dung beetle (*Geotrupes stercorarius*); *Ixodidae*, the true ticks, not to be confounded with the sheep-tick, &c., which

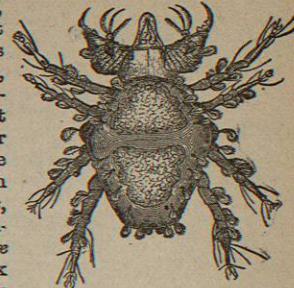


FIG. 1.—*Cheyletus flabellifer*.

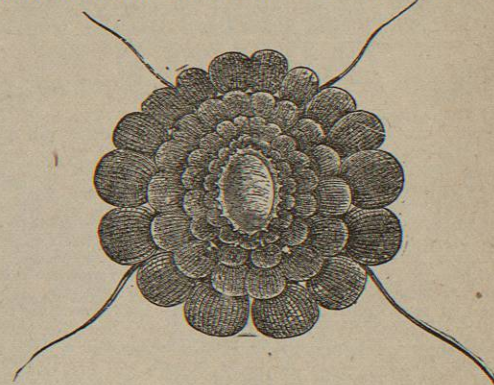


FIG. 2.—*Leiosoma palmicinctum*; nymph.

are wingless flies; *Oribatidae*, beetle mites, so called from their resemblance to minute beetles (these are never parasitic; they undergo transformations almost as strange as those of insects, many of the immature forms being quaint and beautiful, see fig. 2); *Myobiidae*, bizarre parasites of the mouse, &c., with peculiar holding claws; *Tyroglyphidae*, the cheese mites; *Analgidae*, found on the feathers of birds; *Sarcoptidae*, the itch mites; *Arctisconidae*, the water bears; *Demodicidae*, found in the sebaceous follicles of the human nose, &c.; and *Phytoptidae*, the gall mites, which attack the leaves of plants, making tiny gall-like excrescences.

The sexes are distinct individuals; the reproduction is oviparous; the larva is almost always hexapod, though the later stages have eight legs; that answering to the pupa of insects is active, and is called the nymph. The breathing in the first-named eleven families is tracheal, the position of the stigmata varying greatly; in the last-named six families it is by the general body surface. No heart or circulation of the blood is known to exist; the alimentary canal is usually somewhat on the insect type, but with caecal prolongations to the stomach, the reproductive organs often more on the crustacean type. There is generally a single very large nerve-ganglion above the oesophagus, sending nerve-branches to the various parts. The legs have ordinarily five to

seven joints, rarely three; the feet are usually terminated by claws or suckers, or both, sometimes by bristles. The mandibles are generally large, oftenest chelate (like a lobster's claw), sometimes style-like piercing organs, and of other forms. The maxillae vary much: they may be piercing or crushing organs, or may coalesce to form a maxillary lip; there is usually one pair of maxillary palpi, no others. Sometimes there is a lingua, and in the *Gamasidae* a galea. Antennae are not found.

Mites are distributed all over the known world. They have been found in Franz-Josef's Land and Spitzbergen and in the hottest tropical regions, as well as the temperate zones. Often very similar species come from all parts. They are numerous in amber of the Tertiary epoch.

The best-known species are probably those which injure man or his works, viz., the itch mite, the cheese mite, the so-called harvest-bug, and the red spider. The dog-tick is also well known.

The itch mite (*Sarcoptes scabiei*, fig. 3) is a minute, almost circular, flattened, colourless creature, with skin covered with wavy wrinkles, and a number of triangular points arising from that of the back; legs short, the two front pairs and the fourth pair in the male terminated by suckers on long stalks, the two hind pairs in the female and third pair in the male having long bristles instead. It is parasitic on human beings: the males and young remain chiefly on the surface of the skin, but are difficult to find; the female burrows under the scarf-skin, causing the intense itching of scabies by the action of her chelate mandibles as she eats her way. A small watery pustule is raised near where the acarus has entered the skin, and others arise; the creature is not found in the pustule, but at the further end of a short tunnel which may be half an inch long. The eggs are laid in the tunnel after the acarus has passed; they hatch and multiply rapidly. The disease can be certainly cured; the usual mode is to rub the whole body with sulphur ointment, which is best done after a warm bath, allow it to remain on all night, and wash off in the morning. This treatment should be repeated once or twice at intervals of a day or two. Other applications of sulphur, as sulphurous acid, sulphur vapour baths, &c., are efficacious. All clothes which have touched the skin must be disinfected by heat. The disease is highly contagious. Most mammals have their peculiar varieties of itch mite.

The cheese mite (*Tyroglyphus siro*) is an elliptical, fat-bodied, colourless acarus with smooth skin and very long hairs. It breeds in thousands in old cheese, flour, grain, &c., and does much damage. There are numerous allied species; some belonging to the genus *Glyciphagus* are elegantly ornamented with plumes or leaf-like hairs.

The red-spider (*Tetranychus telarius*) attacks the leaves of plants or trees, and is a great pest in green-houses. It spins a slight web on the surface of the leaves, and lives in companies on the web; it is of a rusty red or brown.

The harvest bugs, thought by some writers to be a species, and by them called *Leptus autumnalis*, are simply the larvae of several species of *Trombidium*. They are predatory, but will attach themselves temporarily to the human skin, and produce the violent itching felt on the lower parts of the legs after walking through dry grass in autumn. On inspection with a glass the creature may be seen as a

minute scarlet point. A drop of benzine will probably get rid of the intruder.

The dog tick, like the harvest-bug, is not really parasitic on mammals, though it attaches itself temporarily; its ordinary food may probably be vegetable. (A. D. M.)

MITFORD, MARY RUSSELL (1786-1855), born at Alresford, Hampshire, on the 16th of December 1786, retains an honourable place in English literature as the authoress of *Our Village*, a series of sketches of village scenes and characters unsurpassed in their kind, and after half a century of imitations as fresh as if they had been written yesterday. Washington Irving was Miss Mitford's literary model, but her work is thoroughly original and spontaneous, the free outflow of a singularly charming character. The shortest account of her life would be incomplete without a reference to the scapegrace father who was the centre of her affections, and the "only begetter" of all that is most delightful and characteristic in her writing. Dr Mitford first spent his wife's fortune in a few years; then he spent also in a few years the greater part of £20,000 which his daughter drew (in 1797, at the age of ten) as a prize in a lottery; then he lived, for most years of his life, on a small remnant of his fortune and the proceeds of his daughter's literary industry. In the little village of Three Mile Cross, near Reading, in a small cottage which Miss Mitford says was "a fine lesson in condensation," the doctor was the stay, support, and admiration of all the loafers in the neighbourhood, while his daughter, who had called herself his mamma, and treated him as her little boy from the time when she was herself a little girl, found an unflinching charm in his "friskings," and was the loving slave of all his good-humoured exactions. The father kept fresh in his daughter the keen delight in incongruities, the lively sympathy with self-willed vigorous individuality, and the womanly tolerance of its excess which inspire so many of her sketches of character. The woman who lived in close attendance on such an "awful dad," refused all holiday invitations because he could not live without her, and worked incessantly for him, except when she broke off her work to read him the sporting newspapers, evidently wrote from the heart in her bright portraits of such characters as the Talking Lady, the Talking Gentleman, Joel Brent, Jack Rapley, Tom Cordery, Lizzy, Lucy, and Harriet. Her writing has all the charm of perfectly unaffected spontaneous humour, combined with quick wit and exquisite literary skill. She died January 10, 1855.

Miss Mitford's youthful ambition was to be "the greatest English poetess," and her first publications were poems in the manner of Coleridge and Scott (*Miscellaneous Verses*, 1810, of sufficient mark to be reviewed by Scott in the *Quarterly*; *Christine*, a metrical tale, 1811; *Blanche*, 1813). Later on she essayed writing plays (*Julson*, 1823; *The Foscari*, 1826; *Dramatic Scenes*, 1827; *Ivanhoe*, 1828; *Charles the First*, 1828). But the prose to which she was driven by domestic necessities has rarer qualities than her verse. The first series of *Our Village* sketches appeared in 1824, a second in 1826, a third in 1828, a fourth in 1830, a fifth in 1832, and *Belford Regis*, a novel in which the neighbourhood and society of Reading were idealized, in 1835. Her *Recollections of a Literary Life* (1853) is a series of *causeries* about her favourite books. Five volumes of her *Life and Letters* were published in 1870 and 1872, showing her to have been a delightful letter-writer; two volumes of letters to her appeared in 1882.

MITHRADATES, or, as it is often wrongly spelt, MITHRIDATES (*i.e.*, "given by the god Mithras"), was a favourite name of the Pontic kings in the third and second centuries B.C., and was also common in Persia and the neighbouring countries. The dynasty of Pontus was a Persian family, claiming descent from the Achæmenidae, and the earliest of them known in history was satrap under the Persian empire. When that empire was destroyed Mithradates II. made himself king of Pontus; and he and his successors gradually spread their power over a great

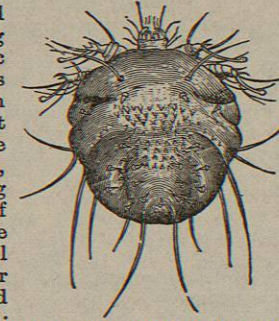


FIG. 3.—The Itch Mite (*Sarcoptes scabiei*); female. After Meguin.

part of Cappadocia and Paphlagonia. Several of them intermarried with the Seleucidae and other Greek royal families, and something of the Hellenic civilization was engrafted on the native non-Hellenic character of the kingdom. The names Mithradates, Pharnaces, and Ariobarzanes, all non-Hellenic, alternate in the family. The province of Phrygia was sold in the most scandalous way by the Roman consul Aquilius to Mithradates V., who died probably in 120 B.C. He was succeeded by his son Mithradates Eupator, sixth of the name, one of those remarkable conquerors that arise from time to time in the East. He was a boy when his father died, and for seven years lived the wandering life of a hunter pursued by assassins. His courage, his wonderful bodily strength and size, his skill in the use of weapons, in riding, and in the chase, his speed of foot, his capacity for eating and drinking, and at the same time his quick and penetrating intellect, his wonderful mastery of twenty-two languages,—all these qualities are celebrated by the ancients to a degree which is almost incredible. With a surface gloss of Greek education, he united the subtlety, the superstition, and the obstinate endurance of an Oriental. He was a virtuoso, and collected curiosities and works of art; he assembled Greek, men of letters round him; he gave prizes to the greatest poets and the best eaters. He spent much of his time in practising magic arts, the interpretation of dreams, and other superstitious ceremonies; and it was believed that he had so saturated his body with poisons that none could injure him. He trusted no one; he murdered his nearest relations, his mother, his sons, the sister whom he had married; to prevent his harem from falling a trophy to his enemies he murdered all his concubines, and his most faithful followers were never safe. He once disappeared from his palace, no one knew whither, and returned after some months, having wandered over all Asia Minor in disguise. Except in the pages of romance or the tales of the *Thousand and One Nights* it would be difficult to find anything to rival the account given of Mithradates by the gravest of historians. These qualities fitted him to be the opponent of Roman arms in Asia Minor, to be the champion of the East in its struggle against the destroying and yet civilizing power of the West. He resisted the Romans for eighteen years, yet we can hardly credit him with much real generalship or organizing power. He could collect masses of men and hurl them against the Roman legions; everything that boundless energy and boundless hatred could do he did; but the strength of his opposition to the Romans lay in the fact that all the dislike inspired by Rome in the worst and most cruel time of her rule was arrayed on his side.

No direct collision took place between the Romans and Mithradates for thirty-two years, though the republic took away Phrygia from him in 120 B.C., and several times thwarted his designs in Paphlagonia and Cappadocia. The rupture came about the time of the Social War. Mithradates, prompted, it is said, by envoys from the Italian allies, took advantage of the intestine struggles in Italy. War broke out in 88, on the ostensible cause of disputes about the kingdom of Bithynia; Mithradates rapidly overran Galatia, Phrygia, and Asia, defeated the Roman armies, and made a general massacre of the Romans resident in Asia. He also sent large armies into European Greece, and his generals occupied Athens. But Sulla in Greece and Fimbria in Asia defeated his armies in several battles; the Greek cities were disgusted by his severity, and in 84 B.C. he concluded peace, abandoning all his conquests, surrendering seventy ships, and paying a fine of 2000 talents. Murena invaded Pontus without any good reason in 83, but was defeated in 82. Difficulties constantly arose between the two adversaries, and in 74 a

general war broke out. Mithradates defeated Cotta, one of the Roman consuls, at Chalcedon; but Lucullus worsted him in several engagements, and drove him finally in 72 B.C. to take refuge in Armenia with his son-in-law Tigranes. After two great victories in 69 and 68, Lucullus was disconcerted by mutiny among his troops and the defeat of his lieutenant Fabius (see vol. xv. p. 56). In 66 he was superseded by Pompey, who completely defeated both Mithradates and Tigranes. The former established himself in 64 at Panticapæum, and was planning new campaigns against the Romans when his own troops revolted, and, after vainly trying to poison himself, he ordered a Gallic mercenary to kill him. So perished the greatest enemy that the Romans had to encounter in Asia Minor. His body was sent to Pompey, who buried it in the royal sepulchre at Sinope.

MITHRAS was a Persian god whose worship spread over the Roman world during the 2d and 3d centuries after Christ. His name is found in the oldest records of the East Aryan races. In the Rig-Veda, Mitra, *i.e.*, the friend, and Varuna, *i.e.*, *Ṛṣavos*, are a pair of gods regularly associated: they denote the heaven of day and the heaven of night. Mithras is therefore by origin the god of the bright heaven and of day, closely related in conception to, and yet expressly distinguished from, the sun. In the developed Old Persian religion of Zoroaster Mithras retained a place; he was not one of the greatest gods, but was first of a triad which, while less pure embodiments of the divine nature, were more easy for men to comprehend and to worship. The seventh month, which bears his name, and the sixteenth day of every month were sacred to Mithras; prayers were offered to him at sunrise, at mid-day, and at sunset. When the Persians conquered Assyria and Babylonia their religion was much affected by the worship of these more educated races. The worship of foreign deities was introduced, that of Persian deities was changed in character; and the gods were represented by images. The cultus of Mithras now became far more prominent, he was identified with the sun, and an elaborate ritual with the non-Aryan accompaniment of mysteries was established. This revolution had begun before Herodotus (l. 131) could identify Mithras with the Assyrian goddess Mylitta, and it became more thorough during the 4th century B.C.

It is in this most developed form that we know the cultus of Mithras. The god of light becomes by a ready transition, which is made in the very oldest Aryan records, the god of purity, of moral goodness, of knowledge. There goes on in the world as a whole, and in the life of each man, a continual struggle between the power of good and the power of evil; Mithras is always engaged in this contest, and his religion teaches all, men and women alike, to aid in the battle. Victory in this battle can be gained only by sacrifice and probation, and Mithras is conceived as always performing the mystic sacrifice through which the good will triumph. The human soul, which has been separated from the divine nature and has descended to earth, can reascend and attain union with God through a process of fasting and penance which is taught in the mysteries; the sacrifice which is being always offered by Mithras makes this ascent and union possible. Those who were initiated in the mysteries of Mithras had to pass through a long probation, with scourging, fasting, and ordeal by water, and were then admitted as soldiers fighting on behalf of Mithras. This was the lowest terrestrial grade, but there were still two others to attain, the Bull and the Lion, each involving further probation, before the soul could rise above the earth. It then ascended by the grades of Vulture, Ostrich, and Crow through the region of ether; and then it strove to become pure fire through the grades of Gryphon, of Perses, and of the Sun. Finally

the soul attained complete union with the divine nature through the grades of Father Eagle, of Father Falcon, and of Father of Fathers. A holy cave on a hill was the central point in the worship; and the mystic rites involved watching and fasting all night till sunrise brought the triumph of light.

The worship of Mithras became known to the Romans through the Cilician pirates captured by Pompey about 70 B.C. It gained a footing in Rome under Domitian, was regularly established by Trajan about 100 A.D., and by Commodus about 190. Finally the mysteries were prohibited and the holy cave destroyed in 378. Dedicatory inscriptions to *Deo Soli Invicto Mithrae*, and votive reliefs of Roman work, are very common. The usual representation shows Mithras in the mystic cave performing the mystic sacrifice; a young man in Oriental costume kneels with one knee on a prostrate bull, grasping the head and pulling it back with the left hand, while with the right he plunges his sword into its neck. A dog, a snake, and a scorpion drink the blood that flows from the bull; a crow sits on the rock behind Mithras; the figures of the sun and of the moon occupy the two sides of the relief.

See Lajarde, *Recherches sur le Culte de Mithras*.

MITRE. See COSTUME, vol. vi. p. 463; and HERALDRY, vol. xi. p. 711.

MITSCHERLICH, EILHARDT (1794-1863), was born January 7, 1794, at Neuende near Jever, in the grand-duchy of Oldenburg, where his father was pastor. He was educated at the gymnasium of Jever under the historian Schlosser. In 1811 he went to Heidelberg, where he devoted himself to philology, giving special attention to the Persian language. In 1813 he went to Paris, partly for study, partly with the view of obtaining permission to join a French embassy to Persia. The political events of 1814 put an end to this scheme, and Mitscherlich returned to Germany. He then set to work on a history of the Ghurides and Kara-Chitayens, manuscript materials for which he found in the university library of Göttingen, and a portion of which he published in 1815. Still anxious to visit Persia, he resolved to study medicine in order that he might enjoy that freedom of travel usually allowed in the East to physicians. He began at Göttingen with the study of chemistry, and this so completely arrested his attention that he gave up the idea of the journey to Persia and the medical profession. In 1818 he went to Berlin, where he worked in the laboratory of Professor Link. He made analyses of phosphates and phosphites, arseniates and arsenites, confirming the observations of Berzelius as to their composition. In the course of these investigations he observed that corresponding phosphates and arseniates crystallized in the same form.

This was the germ from which grew the theory of isomorphism. In order to follow out his discovery Mitscherlich set to work to learn crystallography. His teacher was a fellow student, Gustav Rose, to whose penetrating mind and profound knowledge of mineralogy have been due some of the most interesting developments and illustrations of the theory of isomorphism. Having measured the inclinations of the faces of a vast number of natural and artificial crystals, he established the principles of isomorphism very much as we now hold them.

It is right that we should remember that Mitscherlich was not the first to notice the fact that two different substances might have the same crystalline form, or that one element could partially replace another without great change of form. Romé de l'Isle in 1772 mentions mixed vitriols containing variable proportions of iron and copper, and Leblanc in 1802 showed that the crystalline form remains the same although the proportions vary both in the case of these mixed vitriols and in that of mixed

alums. Vauquelin had already, in 1797, proved that alum might contain variable quantities of ammonia without any corresponding variation of crystalline form.

The authority of Haüy, who laid down as one of his principles that each compound has its own crystalline form, for a time kept these observations in the background. Further cases were, however, observed. Wollaston (1812) accurately measured the angles of the rhombohedral carbonates, and proved that the forms of these minerals, although nearly the same, are not absolutely identical. He showed that a similar close approximation to identity exists in the case of the vitriols. Fuchs in 1815 brought forward his theory of "vicarious constituents." Gay-Lussac proved that a crystal of common alum continues to grow when placed in a solution of ammonia alum, and cases of crystallized mixtures were pointed out by the French mineralogist Beudant. But notwithstanding these foreshadowings, of which we know, on the evidence of Gustav Rose, that Mitscherlich was wholly ignorant, there was at the time of which we are now speaking no trace of a theory, but merely isolated observations. The theory of isomorphism is the work of Mitscherlich. It was communicated to the Berlin Academy on December 9, 1819.

In that year Berzelius paid a visit to Berlin, and was so struck with Mitscherlich's ability that he suggested him to the minister Altenstein as the most fitting successor to Klaproth in the chair of chemistry in that university. It is not surprising that this idea was not carried out. It was only four years since Mitscherlich had begun to study chemistry; he had never lectured, nor had he published anything on the subject.

Although Altenstein did not at that time carry out the proposal of Berzelius, he was so far impressed by it that he obtained for Mitscherlich a Government grant to enable him to continue his studies under Berzelius.

In 1820 he went to Stockholm, where he worked for a year in Berzelius's laboratory. In 1822 he was appointed extraordinary and in 1825 ordinary professor in Berlin. In the course of an investigation into the slight differences discovered by Wollaston in the angles of the rhombohedra of the carbonates isomorphous with calc-spar, Mitscherlich observed that the angle in the case of calc-spar varied with the temperature. On extending his inquiry to other non-isotropic crystals he observed a similar variation, and was thus led, in 1825, to the discovery that non-isotropic crystals, when heated, expand unequally in the direction of dissimilar axes. In the following year he discovered the change, produced by change of temperature, in the direction of the optic axes of selenite. The discovery (also in 1826) that sulphur can be obtained in two absolutely distinct crystalline forms threw much light on the fact that the two minerals calc-spar and aragonite have the same composition but perfectly different forms. Other cases of this property, to which Mitscherlich gave the name of dimorphism, were arrived at not long after.

In 1833 he made a series of careful determinations of the vapour densities of a large number of volatile substances, and proved that Gay-Lussac's law as to the proportions by volume in which oxygen, nitrogen, hydrogen, and chlorine unite with one another holds generally for volatile elements, and that the simplicity of the relation of the volume of the compound to that of the component gases is also general.

In pure chemistry Mitscherlich's discoveries were mainly connected with isomorphism. Thus he obtained selenic acid in 1827, and showed the isomorphism of its salts with the sulphates, and examined with great care the manganates and permanganates, showing their isomorphism with the sulphates and with the perchlorates respectively. But he did much important work unconnected with this special