

THE BERTILLON SYSTEM OF IDENTIFICATION BY MEASUREMENT.

It is estimated that there are about 1,500,000,000 people upon the face of the earth at the present time. If any one had been so bold as to affirm, only a few years ago, that it would be possible to give such a description of any one individual that he could be positively identified among all these millions, his statement would have been met with ridicule. To-day, however, thanks to the researches of Quetelet, the Belgian scientist, and the subsequent labors of Dr. Alphonse Bertillon, a celebrated French anthropologist, we are able to record such a detailed description of any given individual that his identification becomes a matter of absolute certainty.

Although it is true that the Bertillon System of Anthropometric Identification, as it is called, is primarily intended for the prevention of crime, this is only one of the objects of the system. In every case where the establishment of the identity of an individual is desirable, whether for his own benefit or that of his family, or the State, this ingenious and highly scientific system may be applied. The victims of the cable car or the railroad accident, the slain upon the battlefield, the unclaimed bodies at the city morgue, all present cases for which Bertillon has made full provision; and in instances where the body has been mutilated beyond all possibility of recognition by the usual methods of identification, the system would be simply invaluable. Further instances of its possible usefulness would have been the prevention of frauds on the United States Pension Bureau by parties who have assumed the name and condition of others, the detection of false claimants to estates, the prevention of the landing of Chinese who come to this country bearing the name and papers of others of their countrymen who have returned to China. It requires a long acquaintance with this race to be able to distinguish one celestial from another, and by the present methods of identification it is almost impossible for the government officials to detect a fraud of this kind.

Perhaps there is no sphere in which the benefits of the system would be more immediately felt than in the army, where it would act as a check upon desertion from the very day of its introduction. In time of war, moreover, it would serve as an infallible identification of the killed and wounded, and in subsequent years, as suggested above, it would prevent fraud upon the Pension Bureau of the country. The question of its introduction into the army is being actively urged by Dr. Paul R. Brown, United States Army, to whom we are indebted for valuable assistance in the preparation of the present article.

The Bertillon system for measuring criminals has received its most extensive trial in France, where it has been carried out for over ten years with the thoroughness for which the police of that country is famous. It is in general use also in Belgium, Switzerland, Russia and several South American republics, and is being tested in England. It was introduced into the United States by Major R. W. McClaughy in 1887, and is now in operation in Illinois, Michigan, Wisconsin and the State of Massachusetts. It was adopted by the police department of the city of New York on March 6, 1896, and in May of the same year its use was made obligatory in all the prisons and penitentiaries of the State of New York.

The accompanying illustrations show the practical operation of the Bertillon system at police headquarters in this city. It varies in no essential particulars from that of the countries and States above mentioned, only such slight modifications as were suggested by local conditions having been made in minor details. The system is made up of three distinct parts. First, the measurement of certain unchangeable "bony lengths" of the body; second, a careful description of the features of the face; third, a careful localization of all the scars and marks upon the body. Of these three the first records are by far the most important, because the most permanent and unalterable. Bertillon states that the experience of the last ten years has shown the "almost absolute immutability" of the human frame after the twentieth year is passed. The great diversity of dimension which the skeleton shows in different subjects, and the facility and precision with which it may be measured, render this means of identification by far the most reliable that could be adopted. Increasing age and mutilation will produce changes in the features, but they cannot affect the measurements of the frame. The analysis of the features of the face, and the description and localization of scars upon the body, add their accumulated testimony to the unchanging record of the measuring apparatus.

The bony or skeleton lengths adopted by the police department as admitting of easy measurement and description are as follows: The length and width of the head; the cheek width; the lengths of the foot, the middle finger, the little finger and the cubit, that is, from the elbow to the tip of middle finger; the height standing; the height seated; and the stretch; and in addition to these the right ear length, which, while not a skeleton measurement, remains virtually the same through life.

The apparatus which is used for taking these dimensions is very simple, as will be seen by reference to the illustrations. In taking the height the criminal is made to stand barefooted with his back to the wall and his

BUREAU OF IDENTIFICATION.—Police Department, City of New York.

NAME _____ Reg. No. _____
 Alias _____ Color _____
 Residence _____ Date Arrest _____ 189__
 Crime _____ Held by Judge _____
 Officer _____ Precinct _____
 Disposition of Case _____
 Previous Arrests _____

ORDER	MARKS, SCARS, MOLES, DEFORMITIES, ETC.
I	
II	
III	
IV	
V	
VI	

Peculiarities of Habit and Action _____
 Criminal History _____

BACK OF IDENTIFICATION CARD.

backbone to the left of the graduated vertical scale. The square is then brought down with its vertical edge in contact with the vertical edge of the scale and the height read off. About three feet to the left of the scale is a vertical strip which projects about an inch from the wall, and on the opposite side of the scale is a horizontal scale with long graduation lines, as shown in the illustration. The criminal, with his back still to the wall, is made to extend his arms and move to the right or left until the tip of the middle finger of the right hand touches the vertical strip. The measurer then presses the arms of the subject lightly against the wall and reads off the "stretch" as indicated by the middle finger tip of the left hand. The trunk measure-

over the back of the head. The thumbscrew is then tightened and the measurement checked by passing the instrument again over the head. The width of the head and over the cheeks is taken in the same way.

The measurement of the foot is taken with a caliper rule somewhat similar to that used by a shoemaker. The subject is placed on the stool, standing on his left foot and steadying himself as shown in the illustration. The graduated stem is placed against the inside of the foot with the fixed arm in contact with the heel, and the sliding arm is then brought in lightly against the toe. Care is taken as before to check the reading.

In measuring the left middle and little fingers, the back of the caliper rule is used, two small projections being provided on the fixed and sliding arms. The finger to be measured is bent at right angles to the back of the hand, and the measurement is taken from the tip of the finger to the knuckle, as shown.

The cubit measurement is taken from the elbow to the tip of the middle finger. The forearm and hand are placed, with the palm of the hand downward, upon the surface of a trestle on which is a caliper rule; the edge of the table, the axis of the forearm and hand, and the graduated stem of the rule all being parallel. The elbow is placed against the fixed arm of the rule, and the loose arm is then brought up to the middle finger and the measurement read off on the scale.

The measurement of the right ear is taken with a caliper rule, which has a flat fixed branch which is steadied by pressing it against the head and is brought down until it grazes the upper border of the ear. The stem is held parallel with the axis of the ear, and the loose arm is pushed up until it just touches the lobe of the ear.

It will be apparent to the reader from this description and the illustrations that this system will give a series of very accurate measurements. As each one is read off it is written down on a printed card, similar to the one which is shown on this page.

The measurements being all taken, the next analysis is that of the features of the face. As these are liable to change with age or disfigurement, no measurements are taken, but, instead, an elaborate and exhaustive description is given. Taking the nose as an example, the profile of the bridge may be rectilinear, convex or concave, and the term sinuous might be applied to qualify each of the above descriptions. Thus a nose might be convex sinuous, that is it might be generally convex and also somewhat undulating in contour. Then again each of these types might vary so far as its base was concerned, this being either elevated, horizontal or depressed. The subdivision might be carried still further by certain arbitrary marks as follows: [concave], concave, concave, where in brackets the word would mean slightly concave, without brackets or underlining it would mean moderately concave, and underlined, it would mean extremely concave. This system of seriation could be applied to any features of the face. The eyes will vary from the pale blue of the Scandinavian to the very dark brown of the negro. In the Bertillon system there are seven distinct classes of eyes enumerated, with nine subdivisions. The mouth, the chin, the brow, have all been analytically classified, divided and subdivided—even the complexion being noted in respect of its coloration, which may vary from the sanguineous coloration of the florid Englishman to the pigmentary coloration of a dark Italian, with all the intermediate gradations between the two extremes.

The third step in registering a criminal is to make an exact record of all scars, marks or deformities. To assist in locating these on the body, certain anatomical points, known as "guiding points," are employed, and the particular mark is described as being such a distance from one of these points.

Finally, the subject is placed before the camera, two negatives, a full face and profile, being taken, and the photographs are mounted in the center of the identification card.

We reproduce a fac-simile of the style of cards in use at the police department of the city of New York. In addition to the data recorded on the face of the card, there is provision on the reverse side for recording the particulars of the name, aliases, crime, date of sentence, peculiarities of habit, criminal history, etc., and there are six ruled spaces for inserting

details regarding the marks, scars, etc., upon the body. After each card has been made out in duplicate and filed, the examination is complete, and the department is in possession of a means of future identification which may be said to be absolutely infallible.


The method of filing the cards adopted at the identification bureau in Paris, over which Dr. Bertillon still presides, is as follows: The cards are filed in two large cases, in one of which they are classified alphabetically,

(S) (M) (L)

Height 1 m.....	Head lgh.....	L Foot.....	Class.....	Age.....	Born in 18.....
Stretch 1 m.....	Head wth.....	L Mid F.....	Color L Eye.....	Apparent Age.....	
Trunk.....	Cheek wth.....	L Lit F.....	Areola.....	Nativity.....	
Curv.....	R Ear lgh.....	L Cubit.....	Periph.....	Occupation.....	
Pecul.....					

Remarks relative to Measurements.....

(P)



(E)

(D)

(C)


(U)

(B)

(H)

(G)

(T)



(1)

(2)

(3)

(4)

(5)

(6)

(7)

(8)

(9)

Forehead	Inc.....	Nose	Bridge.....	R Ear	Border.....	Hair.....	Beard.....
	Hght.....		Base.....		Lobe.....		Complexion.....
	Width.....		Height Projection Breadth		Teeth.....		Weight.....
	Pecul.....		Pecul.....		Ch.....		Build.....

POLICE DEPARTMENT,
CITY OF NEW YORK.
BUREAU OF IDENTIFICATION.

IDENTIFICATION CARD.

Examined..... 189__
 By..... at.....
 Re-examined..... 189__
 By..... at.....

ment, or the height of a man when seated, is taken by placing a stool against the wall, seating the criminal squarely upon it with his back to the wall, and taking the height as before with the portable square.

The measurements of the head are taken while the subject is still seated and are read off on a pair of calipers provided with a graduated arc. In taking the length the left point of the calipers is held at the root of the nose, and the right point is brought down

and in the other according to measurements or anthropometrically. The latter case is divided horizontally into three equal compartments for lengths of head, and into three vertical divisions for breadths of head, and there are other subdivisions for the three classes of finger, foot, and cubit lengths. The cards are filed in boxes numbered I to V according to the above leading measurements. If the police desire to know whether a criminal has been previously measured, he is identified or otherwise by looking in the alphabetical collection; that is if he gives his right name. If the prisoner claims that he has never been arrested before, he is measured and search is made in the measurement collection. The head is say 187 millimeters. The medium head measures from 185 to 190 millimeters; so the card is put in the medium class. This eliminates 100,000 cards from the 150,000 in the collection. The breadth of head being below medium, two-thirds of the 50,000 are eliminated, leaving 16,666. The middle finger eliminates some thousands more, bringing the remainder down to 5,555. The length of the foot reduces the number to 1,850, and the cubit length brings it to 620. Following out the process in respect of the height, little finger, ear, trunk and stretch, the remainder is represented by a dozen cards which are classified according to the color of the eye. The card is now located, and the photographs and facial description place the identity of the two cards beyond the possibility of a doubt. Our sketches were made at the Identification Bureau of the New York Police Department through the courtesy of Commissioner Andrews.

Luminous Photographs.

These photographs, according to J. A. Randall in an article on "The Magic and Mystery of Photography," published in the American Journal of Photography, January, were first introduced at a ball in Vienna, where programmes were decorated with a luminous picture representing an alchemist at work. "There are several ways of making luminous photographs, the simplest being that of W. B. Woodbury. A sheet of cardboard is coated with a luminous paint and exposed to light under a glass positive or transparency. On removing the cardboard to a dark room a striking and brilliant phosphorescent image is seen, with all the gradations of the positive. The effect may also be produced by arranging a series of glass tubes, containing a phosphorescent substance, behind a thin glass positive; on exposure to light the luminosity of the tubes will shine through the positive in proportion to its density. When viewed in the dark, a glowing image is the result. Another method, which can be applied to an ordinary print on thin paper, is as follows: Take a sheet of cardboard, and spread over it as evenly as possible a thin coating of starch paste; when still tacky dust over it an even layer of powdered calcium or barium sulphide, rubbing it well over with a brush to make it adhere in every part. Then take the print, which should be light, and fixed and toned as usual, and saturate it with a mixture of castor oil and oil of turpentine, taking off all excess with a clean rag. The print, thus made semi-transparent, is next pasted upon the prepared cardboard, and the whole well dried before the fire. A print thus prepared, when exposed to light, receives the rays on the phosphorescent sulphide beneath, which becomes luminous in proportion to the absorption which has taken place; it is therefore luminous in the dark by the light transmitted. A silver print is soon destroyed by this process, for the sulphide attacks the image; it can be applied to the carbon or other processes not having silver as a basis. Moonlight pictures and landscapes give the most striking effects as luminous photographs."

Some Water Uses Well to Remember.

The Phrenological Journal gives the following useful hints on the applications of water in severe attacks of illness. The adult members of a family should keep them in mind for an emergency.

A strip of flannel or a soft napkin, folded lengthwise and dipped in hot water and wrung out, and then applied around the neck of a child that has the croup, will usually bring relief in a few minutes.

A proper towel folded several times, and dipped in hot water, quickly wrung and applied over the site of toothache or neuralgia, will generally afford prompt relief.

This treatment for colic has been found to work like magic.

Nothing so promptly cuts short a congestion of the lungs, sore throat, or rheumatism as hot water, when applied early in the case and thoroughly.

Hot water taken freely half an hour before bedtime is an excellent cathartic in the case of constipation, while it has a soothing effect upon the stomach and bowels.

This treatment, continued a few months, with the addition of a cup of hot water slowly sipped half an hour before each meal, with proper attention to diet, will cure most cases of dyspepsia.

Ordinary headaches almost always yield to the simultaneous application of hot water to the feet and back of the neck.

Science Notes.

The roller steamer Ernest Bazin has been finished at Rouen and will shortly have a sea trial.

P. Regnard and T. Schloesing have examined the gases obtained from a liter of blood, and found that they contained 20.4 c. c. of nitrogen and argon, the latter gas accounting for 0.419 c. c. of the mixture. In addition to satisfying themselves that argon is dissolved in the blood, they state that if there is an increase in the amount of nitrogen present, there will also be an increase in the amount of argon.—Comptes Rendus, cxiv, 302.

The Swiss government has sanctioned the manufacture and use of weights made of glass. They are of slightly conical shape with rounded bottom edge, and provided on top with a knob to facilitate handling. The designation is moulded into the knob. The glass used for these weights is of special composition, highly refined, and carefully annealed so as to reduce to a minimum the danger of breakage.

We regret to record the death of Mr. Harry Proctor, youngest son of the late R. A. Proctor, whose name was for many years so closely associated with the English scientific journal Knowledge. He died on December 20 last, after having recently attained his majority. The young man, like his father before him, betrayed a predilection for things scientific; but, unfortunately, constitutional weakness thwarted all serious efforts in this direction.

The largest spectroscope in the world has just been completed by Mr. John A. Brashear, of Allegheny, Pa., the well known astronomical instrument maker. It was made for the private research laboratory of Dr. Hans Hauswaldt, a wealthy scientist of Magdeburg, Germany. The instrument contains a concave diffraction grating with 110,000 lines per inch, made on the famous ruling machine of Prof. Henry A. Rowland, of the Johns Hopkins University.

"It has been found by M. J. Puluje," says the Electrical World, "that substances which fluoresce most brightly under the visible cathode rays give off the greatest amount of Roentgen radiation. M. Puluje believes that Roentgen ether waves originate in the bombardment by negatively charged molecules from the cathode and in the abrupt loss of charge in these. He finds that these Roentgen ether waves may cause fluorescence of calcium sulphide, but believes that invisible as well as visible radiations emanate from a screen of this substance. M. Puluje states that vacuum tubes of all kinds glow when subjected to the action of Roentgen rays.

M. B. Renault has long worked at the indications of bacteria found in geological strata, and now publishes the general result of his observations in a paper illustrated with a large number of drawings. As might be expected from their simple structure, bacteria appear to have been coeval with the first appearance of organic life on the earth, the coccoïd form being apparently earlier than the bacillar. Indications of their presence are found in bone, teeth, scales, and coprolites, as well as abundantly in vegetable tissues, the spores and sporanges of ferns appearing to have been especially subject to their attacks. The species are, as a rule, distinct from those at present in existence.—Ann. des Sciences Naturelles (Botanique), 1896.

Professor Meidinger, of Carlsruhe, finds wonderfully little difference between the heat radiating power of a Bunsen flame and that of an illuminating gas flame, per unit of area, that is. In this he confirms the conclusions reached in 1865 by Prof. Magnus, who also found that making a Bunsen flame luminous by means of salt, etc., did not increase its radiative power. The inference would be that there is next to no actually solid substance in a luminous flame, or else that the higher temperature of a Bunsen flame (1,750° C. as against 1,300° C.) makes up for its deficiency in solid particles. A gas blowpipe flame, on the other hand, rapidly falls off in heat radiating power as the air is more and more forcibly driven through it. From an ordinary Bunsen flame, says the Progressive Age, about one-seventh of the heat passes away by direct radiation.

Prof. F. Plateau, of the University of Ghent, has for many years carried on a series of observations on the mode in which insects are attracted to flowers, the results of which are published in the Bulletin of the Royal Academy of Sciences of Belgium. His conclusions are not in accord with those of Darwin, that the bright color of the corolla acts as a beacon to attract insects. He believes that they are attracted chiefly by some other sense than that of sight, probably that of smell. In the case of the dahlia (single) and other species of Compositæ, the removal of the conspicuous ray florets had but little effect on the visits of insects; nor had the removal of the conspicuous part of the corolla in other flowers, as long as the nectary remained. On the other hand, says Nature, the artificial placing of honey on otherwise scentless flowers resulted in their being immediately visited by numbers of insects. Where the same species varies in the color of the flower, as between blue and white, or red and white, insects visit quite indifferently flowers of different colors belonging to the same species.

Archæological News.

An excellent guide to the archæological treasures of Rome has recently been published by a well known German archæologist, Herr Helbig. It is a most useful work for any one who wishes to make a study of the art treasures of the Eternal City.

In a paper read before a late meeting of the Paris Academy of Sciences, by M. Berthelot, on "The Age of Copper in Chaldea," the author said the analysis of a spear carrying drawings and inscriptions, and at least 4,000 years old, showed that the metal was nearly pure copper, neither tin, lead, arsenic, nor antimony being present in appreciable quantities. The oxidized portion was nearly pure atacamite, $3\text{Cu}\cdot\text{CuCl}_2 + 4\text{H}_2\text{O}$. The description of these and similar objects as bronze is shown to be erroneous. Copper appears to have preceded bronze in the manufacture of tools.

The plans for the restoration of Malmaison, which were prepared with the aid of M. Daumet, are now complete, says the Architect. The estimated cost of the works is 480,000 francs, and does not comprise the outlay on the decoration of the interior or on the gardens. M. Osiris, who has enriched France with so many costly memorials, intends to have the restoration scheme carried out in its integrity. Malmaison will recall associations of Bonaparte and Josephine for many a year to come. The charge of the building will be undertaken by the Department of Fine Arts. The coming international exhibition has incited M. Osiris to further generosity. In 1889 he offered 100,000 francs to reward the author of the work which was considered to be most interesting as an example of art, industry or public utility. A similar sum will be available for the exhibition for 1900, and as in the former case, the selection will be left to the syndicate of the press.

Under the will of the late Lady Wallace, the whole of the collections at Hertford House, Manchester Square, London, so far as they are contained on the ground floor, the first floor, and the galleries, have been bequeathed to the British nation, on condition that the government shall provide a site in some central part of London and build a museum to contain the collections, which are to be kept together and styled the "Wallace Collection." The collection is probably the finest private one in the world, and its money value is roughly estimated at considerably over \$5,000,000, and some experts have even estimated the value as high as \$17,000,000. The Borghese, the Lichtenstein, the Ellesmere, and perhaps one or two of the collections of the Rothschild family may equal or surpass it in pictures alone; three or four houses in Europe may have as much old furniture of the highest class; possibly in Germany or Austria some one might be found with as good armor. But it is the combination of all these things, and of many other departments, that makes the Wallace collection unapproachable.

The fiftieth anniversary of the founding of the French school at Athens, Greece, is to be commemorated by an archæological congress to be held in Athens from April 26 to 28 of the present year, says Architecture and Building. The announcement is made by a committee composed of the rector of the University of Athens, the general ephor of antiquities at Athens, and the heads of the various archæological schools under the presidency of M. Homolle, director of the French School. It is proposed that this congress, in case the experiment proves a success, shall be the first of a continuous series of such congresses, to be held at such places and times as the congress itself may determine. In case this congress is made a permanent institution, it may meet in future years at different cities of Europe and America. The subjects proposed for discussion in the congress are such as have a general interest and bearing. The discussion of purely scientific problems is not proposed so much as the consideration of practical questions of method in the organization of work and questions of educational interest.

We have several times, says Nature, called attention to Dr. G. Folgheraiter's interesting observations on the magnetization of Etruscan vases. Hitherto there has been a slight uncertainty as to whether the magnetization may not have undergone some modification during the many centuries that have elapsed since these vases were baked. In his latest contribution to the Atti dei Lincei, Dr. Folgheraiter dispels any doubts on the matter by his observations on some vases which were pieced together from scattered fragments discovered in excavations at Arezzo. If the magnetization of the terra-cotta had in any way altered since they were broken, it is clear that the different portions would have been differently affected, and the mended vases would have shown somewhat irregular magnetization. So far from this being the case, they were found to be as regularly magnetized as those which had been excavated entire, the opposite poles at the mouth and base being exactly 180 degrees apart. The only remaining element of uncertainty is what was the orientation of the vases in the kiln; and Dr. Folgheraiter hopes that further excavations may lead to the discovery of potteries of the Etruscan epoch containing vases in situ. Should he be successful, we may look forward to exact determinations of the magnetic elements, which will greatly add to our knowledge of terrestrial magnetism.