THE OPACITY OF BONES TO ROENTGEN RAYS AS AN INDICATION OF AGE.

BY JACQUES BOYER.

According to the law of Flourens, the duration of the period of growth bears a definite relation to longevity and, in particular, the time occupied by any animal in attaining its maximum stature is a definite fraction, constant for all the individuals of the species, of the duration of the animal's life. Now, the

third joint of the middle finger. Finally, one of the films was taken as a standard, the aluminium strip of that film being compared in the photometer with the aluminium strip of each of the other films. The source of light for the photometer measurements was an Auer burner, the light of which was diffused by a ground glass screen. The opacities of the bones were expressed in thickness of aluminium.

From his examinations of subjects of various ages

Physicians, however, will derive useful information from Prof. Henry's radiographic studies, for the determination of the percentage of mineral salts in the bones of a patient should facilitate both diagnosis and treatment.

Memory of Time Exhibited by Pigeons.

M. Xavier Raspail, who has ascertained that the period of incubation of the common dove is 18 days.

Child aged 15.

Man aged 20.

Woman aged 45.

Woman aged 75.

Radiographs of Hands of Persons of Various Ages.

The second and fourth pictures show the radiograph of the graduated aluminium standard; in the first and third pictures this standard and a finger joint have been cut out for photometric measurements.

maximum stature is attained simultaneously with the maximum development of the skeleton and, as the weight of the skeleton is a function of the amount of mineral salts which it contains, the law may be expressed in a more mathematical form by saying that the percentage of mineral salts in the bones of all animals of the same species may be represented by similar curves of growth and decline, which will differ solely in the values of individual constants.

Prof. Charles Henry, taking advantage of the possibility of determining, indirectly, the mineral content of bones in the living subject, by means of their opacity to Roentgen rays, has been examining the hands of a large number of human subjects of various ages in order to verify the law of Flourens.

Henry used a Roentgen tube with a double anode, a Carpentier coil and Lumière Sigma photographic plates. In order to eliminate the influence of variations in the tube and the coil, simultaneous radiographs were made of the hand and of a strip of aluminium foil of varying thickness, which served as a standard. After the plates had been developed, the films were stripped from the glass and the degree of transparency of certain parts was measured with a D'Arsonval diaphragm photometer. As the films are negatives, the transparency of the film is evidently proportional to the opacity of the bone. The portions of the film selected for photometric measurement were the image of the aluminium foil and, usually, that of the

Prof. Henry has deduced a maximum opacity at from 30 to 32 years (the age at which the height and weight normally reach their maxima), and a minimum opacity at 45 years. Tribob has supplemented these radiographic results by analyzing the ash of bones of deceased persons of various ages and both sexes, with special reference to the percentage of calcium phosphate. The results of the chemical analysis confirm those of the radiographic examination, but appear to indicate a second minimum of opacity at 65 years of age.

The measurements that have already been completed are too few to warrant the drawing of more definite conclusions. A great many determinations will be required in order to establish the mean curve, and find the positive or negative deviation corresponding to any given age. After all this has been done it will be possible to draw conclusions with respect to mean longevity and to calculate the "expectation of life" of a person of given age and measured opacity. It will then be possible, also, to calculate the personal coefficient of correction and from this to establish life insurance premiums on a more equitable basis than is furnished by tables of mortality. But it would be a waste, perhaps, to ask insurance companies to change a system which they have found so profitable, or to endeavor to induce the insured to submit to an examination which would result in condemnation to death at a more or less distant date.

has seen brooding doves and pigeons abandon their nests on the 18th day, leaving eggs which showed no turbidity. M. Raspail is convinced that in these cases the female abandons the eggs because she knows that the period of incubation has expired and further brooding would be a waste of labor. If she were able to take cognizance of the absence of turbidity in the eggs she would have abandoned them at an earlier date. The common dove, although endowed with an acuteness of perception which immediately informs her that her eggs or her young have been touched by human hands during her absence from the nest, and causes her to desert them forthwith, is not able to distinguish fertile from sterile eggs, but is compelled to wait until the normal period of incubation has expired in order to be convinced of the hopelessness of her task. The hen, on the contrary, has no notion of the proper time of incubation and will, if permitted, continue to sit on infertile eggs until she is completely exhausted. This is a fresh confirmation of the law that domestication blunts the senses and faculties of animals.

Evidence of the industrial progress of Germany is given by the increase in its coal consumption which, according to the Mechanical World, increased nearly 40 per cent between 1902 and 1907. In 1907, the increase in the coal consumption over that of 1906 was 9 per cent.

Radiographing a Hand. The Aluminium Standard Lies by the Side of the Little Finger.

Measuring the Transparency of Films with D'Arsonval's Diaphragm Photometer.