on the subject of "regeneration," that before I ceased my work I found there exists a method that should be of value when, from accidental causes, degeneration is threatened.

It is acknowledged, from causes not yet explained, that it is only in a small percentage of cases that inoculation of the calf with small-pox virus is followed by a crop of vesicles. Nevertheless, in certain instances, whilst no local eruption is found, constitutional disturbance occurs, and is exhibited by fever and various skin conditions that I need not here detail. If an animal that has undergone this modified form of variolation be inoculated with animal vaccine, there result vesicles abnormally slow in their progress, but of perfectly typical character. Lymph so gained, when transmitted, is found to be fully regenerated, and is highly active. In these two facts—which I verified repeatedly—lies, I think, the possibility of some explanation of the true nature of vaccine at the hands of the bacteriologist.

ON THE NIPPLE REFLEX.

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ERECTION of the nipple was formerly ascribed to vasomotor action, and to the engorgement of erectile tissue with blood. At present physiologists assign a very minor part to vascular engorgement and a prominent part to the contraction of the unstriated muscle of the nipple. To quote from the most recent edition of *Quain's Anatomy* (vol. iii, part 4, p. 286):—"The tissue of the nipple contains a large number of vessels, together with much plain muscular tissue, and its papillæ are highly sensitive. It becomes firmer and more projecting from mechanical excitement—a change caused by contraction of the muscular fibres, which form concentric circles round the base of the nipple, and radiating bands running from base to apex." Playfair writes:—"When the nipple is irritated it contracts and hardens, and by some this is attributed to its erectile properties. The vascularity, however, is not great, and it contains no true erectile tissue; the hardening is, therefore, due to muscular contraction."

I wish to draw attention to a simple method by which this reflex action of the nipple muscle may be plainly demonstrated. A marked reflex contraction of the subcutaneous muscular layer of the nipple and areola can be excited in the following way. With the finger and thumb of one—or, better, of both hands—grasp the nipple and areola, and compress them for a few seconds as firmly as is consistent with the avoidance of pain. Contraction will take place during the following minute. It will be noticed (1) that the areolar tissue becomes wrinkled, corrugated, and reduced in area; (2) that the areolar glands become more prominent; (3) that the nipple becomes more erect and prominent; (4) that the tissues are harder; (5) that there is often puckering around the nipple in the secondary areola and in the adjacent skin of the breast. The contraction soon passes off, and the reflex can be repeated. I have observed this reflex slightly marked in girls before puberty, and even in males. I have found it well marked in young women after puberty, in pregnancy, in lactation, in non-pregnant multiparæ, in women who have passed the menopause, also in patients who are unconscious through the administration of anæsthetics. It is specially obvious when the mammae are functionally active, but I have never failed to elicit some degree of reflex after puberty. The shape of the contracted areola varies partly with the direction in which the nipple has been compressed. The phenomenon is specially well seen in women who have had several children, and who have large flaccid areolas with scarcely prominent nipples. On exciting the reflex the areola quickly contracts, showing all its glands, the nipple rises up well defined and erect, and the skin of the mammae all round the nipple is slightly wrinkled.

When lactation is active milk may be ejected from the ducts through the simultaneous contraction of the muscle which surrounds them. During the act of suckling the infant's lips and gums, by compressing the nipple, excite nipple reflex. At the same time during suckling there is increased activity of the gland secretion and increased vascu-

larity in the gland, for it is at this time that the vasomotor element comes more into action.² Some degree of nipple reflex is also excited by cold. No doubt many medical men, as well as many mothers and nurses, are familiar with the contraction thus caused by squeezing the nipples, but it does not seem to be fully described in textbooks. For instance, in Osler's admirable *Principles and Practice of Medicine*, published last year, there is a very full table of the various spinal reflexes, but nipple reflex is omitted. Yet if anyone will make observation on a dozen female patients he will see that this nipple reflex is a phenomenon as constant and as marked as almost any reflex in the body. It will be interesting to study its pathological relations in diseases of the nervous system and in local mammary disease.

My attention was drawn to the subject in clinical gynaecological work, where one has so frequently to examine the mammae in relation to the diagnosis of early pregnancy, when the fact that fluid can be obtained from the nipples is, within certain limits, a valuable clinical sign. Conversation and correspondence with various authorities lead me to think that it is worth while to make this communication to the profession, and I hope I may thus obtain information from other observers, which, with any references to the literature of the subject, will be most welcome. Professor Michael Foster has been kind enough to refer me to articles by Eckhard³ and Röhrig.⁴ These refer incidentally to nipple reflex, though not very fully. These authors seem to take it for granted that erection is due to the contraction of plain muscular fibres, and little part is assigned to vascular engorgement.

DERMATITIS CAUSED BY ROENTGEN X RAYS.

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A GENTLEMAN, aged about 35, having symptoms of renal calculus, was exposed to x rays to determine, if possible, the presence or absence of a stone. On May 22nd, 1896, the first exposure took place; it occupied one hour. To produce the current five cells were used at first, and later five more cells were added. The patient had on an inside thin woollen vest and a linen shirt: a penny was placed for localising purposes on the photographic film, which was applied to the back in the kidney region. The tube was in front of the middle of the abdomen, distant from one to two inches, a celluloid plate intervening between it and the patient's clothing. About three hours after the exposure was over the patient felt some nausea, but set it down to the stuffy smell of the laboratory, and thought little of it as he occasionally suffered from attacks of so-called biliousness. The plate, on being developed, not proving very satisfactory, he was again exposed, six days after—namely, May 28th, this time for an hour and a-half, the details mentioned above being the same on this occasion, except that ten cells were used from the beginning. The current also was occasionally momentarily reversed. After the patient left the laboratory he again felt great nausea, and soon felt so weak that he had to get brandy on his way home. Next evening he noticed the abdomen slightly red, as if sun-burned; a patch about 1½ inch square, just below the umbilicus, being redder than the rest. This part was that exactly opposite the platinum plate in the tube. There was no itching nor pain. The third day the redness was more intense; on the fourth some very small vesicles appeared; these very slowly increased in number and size during the next few days. This was looked upon as a simple eczema and treated accordingly. The vesicles increased to large "blebs" and became ruptured; there was, however, no pain or itching, the patient going about his usual occupation and riding a bicycle.

On June 14th, eighteen days after the second exposure, I saw the sore for the first time. It had begun to cause a great deal of discomfort from the abundant discharge pouring from it. I found a patch 7½ inches across by 8¼ inches long, extending from the ensiform cartilage to about two inches below the umbilicus. It had all the appearance of an acute

² Landois and Stirling, *Physiology*, p. 345.
Beiträge z. Anat. u. Phys., i, 12 and viii, 117.

⁴ *Archiv f. path. Anat.*, 1876.