of plant life. In one sense it is perhaps unfortunate that the article on surgery has to be written at the present time, because, while there are few who now hold that these or­ganisms are inert, there are some who do not grant that they are the cause of disease ; and there are many differ­ences of opinion as to the best methods of applying this scientific knowledge to practical use. In other words, although much of the surgical practice of the present day is founded on a scientific basis, the practical details are still matter of dispute.

It is impossible in the present sketch to go with any fulness into the details of the experimental research by which the truth of the germ theory was proved; but some allusion must be made to the salient points which have a bearing on the work of the surgeon. It has long been known that subcutaneous injuries follow, as a rule, a very different course from open wounds ; and the past history of surgery gives evidence that surgeons not only were aware of this great difference but endeavoured, by the use of various dressings, empirically to prevent the evils which were matters of common observation during the healing of open wounds. Various means were also adopted to pre­vent the entrance of air, *e.g.,* in the opening of abscesses by the “ valvular method ” of Abernethy, and by the sub­cutaneous division of tendons in the common deformity termed “club-foot.” Balsams, turpentine, and various forms of spirit were the basis of many varieties of dress­ing. These different dressings were frequently cumber­some, difficult of application, and did not attain the object aimed at, while at the same time they retained the dis­charges, and gave rise to other evils which prevented rapid and painless healing. In the beginning of the 19th cen­tury these complicated dressings began to lose favour, and practical surgeons went to the opposite extreme and applied a simple dressing, the main object of which was to allow a free escape of discharge. Others applied no dressing at all, laying the stump of a limb after amputa­tion on a piece of dry lint, avoiding thereby any unneces­sary movement of the parts. Others left the wound open for some hours after an operation, preventing in this way any accumulation, and brought its edges and surfaces to­gether after all oozing of blood had ceased and after the effusion, the result of injury to the tissues by the instru­ments used in the operation, had to a great extent sub­sided. As a result of these various improvements many wounds healed in a thoroughly satisfactory manner. But in other cases inflammation often occurred, accompanied by pain and suppuration or the formation of pus, and various feverish conditions, due to and in some way con­nected with the unhealthy state of the wound, were ob­served. These constitutional sequelæ frequently proved fatal and the general impression of surgeons was either that the constitution of the patient rendered him liable to these conditions, or that some poison had entered into the wound, and, passing from it into the veins or lymphatic vessels that had been cut across, reached the general circu­lation, contaminating the blood and poisoning the patient. The close clinical association between suppuration (or the formation of pus) in wounds and many of those fatal cases encouraged the belief that the pus cells from the wound entered the circulation (whence the word “ pyæmia ”). It was also frequently observed that a septic condition of the wound was associated with the constitutional fever, and it was supposed that the septic matter passed into the blood (whence the term “septicæmia”). It was further observed that the crowding together of patients with open wounds increased the liability to these constitutional disasters, and every endeavour was made by surgeons to separate their patients and to improve the ventilation of the larger hospitals. In building hospitals the pavilion and other

systems, with windows on both sides and cross ventilation in the wards, were adopted in order to give the patients as much fresh air as was attainable. Hospital buildings were spread over as large an area as possible ; the blocks were restricted in height, and if practicable were never higher than two stories. The term “hospitalism” was coined by Sir J. **Y.** Simpson, who collected statistics com­paring hospital and private practice, by which he en­deavoured to show that private patients were not so liable to those constitutional sequelæ.

This was very much the condition of affairs when Lister in 1860, from a study of the experimental researches of Pasteur into the causes of putrefaction, stated that the evils observed in open wounds were due to the admission into them of organisms which exist in the air, in water, on instruments, on sponges, and on the hands of the surgeon. These organisms, finding a suitable nidus for their growth and development in the discharges and surrounding tissues, germinate in them and alter their chemical constitution, forming various poisonous compounds, which, if absorbed into the blood, give rise to pyæmia and septicæmia. Having accepted the germ theory of putrefaction, he ap­plied himself to discover the best way of preventing these organisms from reaching the wound from the moment that it was made until it was healed. He had to deal with a plant and he desired to interfere with its growth. This was possible in one of two ways,—either (1) by directly destroying or paralysing the plant itself before it entered the wound or after it had entered, or (2) by an interference with the soil in which it grew, for example, by facilitating the removal of the discharges and preventing their accumu­lation in the wound cavity, and by doing everything to prevent depression of the wounded tissues, because healthy tissues are the best of all germicides. Several substances were then known possessing properties antagonistic to sepsis or putrefaction, and hence called “ antiseptic.” Act­ing on a suggestion of Lemaire’s, Lister chose for his ex­periments carbolic acid, which he used at first in a crude and impure form. He had many practical difficulties to contend with,—the impurity of the substance, its irritating properties, the difficulty of finding the exact strength in which to use it : on the one hand, he feared to use it too strong, lest it should irritate the tissues to which it was applied and thus prevent healing ; on the other hand, he feared to use it too weak, lest its true antiseptic qualities should be insufficient for the main object in view. It is unnecessary to dwell on the details of his tentative ex­periments. As dressings for wounds he used various chemical substances, which, being mixed with carbolic acid in certain proportions, were intended to give off a quantity of carbolic acid in the form of vapour, so that the wound might be constantly surrounded by an antiseptic vapour which would destroy any organisms approaching it and at the same time not interfere with its healing. At first, although he prevented pyæmia in a marked degree, he, to a certain extent, irritated his wounds and prevented rapid healing. He began his experiments in Glasgow and con­tinued them after his removal to the chair of clinical surgery in Edinburgh. After many disappointments, he gradually perfected his method of performing operations and dressing wounds, which will be best understood by an illustration.

A patient is suffering, let us say, from a diseased con­dition of the foot necessitating amputation at the ankle joint. The part to be operated on is enveloped in a towel which has been soaked with a 5 per cent. solution of car­bolic acid. The towel is applied two hours before the operation, with the object of destroying the (putrefactive) organisms present in the skin. The patient is placed on the operating table, and brought under the influence of