A Report of the Work

CARRIED OUT AT

THE RADIUM INSTITUTE

FROM AUGUST 14TH, 1911, TO DECEMBER 31ST, 1912.

RY

A. E. HAYWARD PINCH, F.R.C.S.,

MEDICAL SUPERINTENDENT.

(Published with the Authority of the Committee.)

This report deals with all the cases which have presented themselves for treatment at the Radium Institute during the period extending from August 14th, 1911, to December 31st, 1912. For its correct appreciation it is necessary to state at the outset that the cases treated were in no instance selected. Ever since the opening of the Institute applications have been received for the treatment of patients many of whom have exhausted all the known resources of medicine and surgery, their condition being almost hopeless.

The only cases refused have been those in which the patients were practically moribund, or where the disease was of a kind for which radium therapy was manifestly unsuitable.

It has been the purpose of the Committee to give equal prominence to the cases in which radium has appeared to be useful, as well as to those in which it has been useless or possibly harmful.

It is one object of this report to point out the conditions under which radium is therapeutically of no service.

The repute of radium therapy has suffered severely from that irrational enthusiasm and that unthinking expectation which often attend the début of a new remedy. These distorting influences have been especially marked in the present instance, for radium has astounding physical qualities, and it seems to have been assumed that its therapeutic powers must be equally penetrative and marvellous.

It is important to note that no examples of malignant disease—rodent ulcer alone excepted—have been treated, other than those in which operation had been declared to be unjustified or in which operation had been absolutely declined by the patient.

The term "apparent cure," used in relation to cases of malignant disease, must be interpreted as representing a condition in which all trace of the original lesion or lesions has disappeared, in which there is no sign of any recurrence, and in which the patient is, so far as can be determined by a thorough and careful examination, free from any indication or symptom of the disease.

With reference to the figures appearing in the column headed "abandoned treatment," it must be explained that in not a few instances treatment was given up because the patient had been obliged to leave London or was unable to defray the cost of repeatedly travelling from the country to the Institute.

THE APPARATUS.

APPLICATORS.

The method by which the apparatus is prepared is explained more fully in the appendix on the work of the Chemico-Physical Laboratory by Mr. W. L. S. Alton. Here it will be sufficient to give the following particulars:—

The apparatus employed in treatment is of several types:

(a) *Flat varnished applicators*, rectangular, square, and circular; the superficial area of the various applicators ranging from 0.7 sq. cm. to 28 sq. cm.

They are either—

1. Full strength, containing an amount of radium sulphate equivalent to 10 mg. of radium bromide to each square centimetre.
2. Half strength, containing an amount of radium sulphate equivalent to 5 mg. of radium bromide to each square centimetre.
3. Quarter strength, containing an amount of radium sulphate equivalent to 2.5 mg. of radium bromide to each square centimetre.

The smallest applicator contains ... 7 mg.
The largest " " ... 150 mg.

(b) *Capillary glass tubes, filled with radium sulphate, closely packed so as to prevent any movement of the salt.*

Their length varies from	... 2 to 4 cm.
Their diameter	... 0.2 to 0.3 cm.

The amount of radium sulphate contained is the equivalent of 25, 30, 50, 60 or 100 mg. of radium bromide.

(c) *Radium emanation.* This may be—

1. Collected in glass tubes or metal containers, and used with appropriate screens, exactly as the radium salts themselves are used, due regard being paid to the gradual fall in radio-activity resulting from the decay of the emanation.
2. Dissolved in distilled water or a weak saline solution, and administered by drinking or injection.

SCREENS.

The screens employed as filters for the different rays are:

(a) *Aluminium*—0.01, 0.02, 0.04, 0.08 mm. thick. These are principally used with short exposures in the treatment of capillary naevi, pruritus, neuro-dermatitis, and superficial skin lesions.

(b) *Silver*—0.5 and 1 mm. thick. These are most useful as shields for the glass tubes of radium when introduced into tumours, and also in the treatment of keloid and vicious cicatrices.

(c) *Lead*—0.1, 0.2, 0.4, 0.5, 1, 1.5, and 2 mm. thick. Screens less than 0.5 mm. in thickness are valuable in the treatment of flat superficial epitheliomata, leucoplakia fibromata, and granulomata.

Those exceeding 0.5 mm. are used when it is desired to employ the hard beta and gamma rays only, and to give prolonged applications without causing any surface irritation.

METHODS OF APPLICATION.

DURATION OF APPLICATIONS (EXPOSURES).

Very short exposures of half a minute to three minutes' duration, according to the age of the patient and the character of the lesion. Principally used in the treatment of superficial skin troubles. The apparatus is applied without any screen beyond that afforded by a covering of thin rubber sheeting.

Short exposures of five minutes to one hour's duration. Most frequently resorted to when treating warts, senile keratoma, some forms of naevi, shallow ulcers, lupus erythematosus, etc. The screening in these exposures rarely exceeds 0.04 mm. of aluminium.

Moderately long exposures of one to eight hours, adopted when it is desired to obtain the destructive action of the rays. Used in cases of rodent ulcer, rapidly growing epithelioma, lupus vulgaris, etc. No screening beyond thin rubber sheeting is employed, and a total exposure of three to eight hours is extended over two, three, or four days.

Prolonged exposures of twelve to one hundred hours, or longer. These are employed in the treatment of deep-seated malignant growths, in cancer of the rectum, uterus, breast, etc. Lead screens are always employed, usually of 2 mm. thickness. Exposures are given in periods of six to twelve hours, with an interval of at least twelve hours between successive exposures.

SCREENS AND APPLIANCES.

A varnished applicator is always covered with a thin layer of rubber sheeting, thus effectively protecting it from contact with any excretions or moisture, and avoiding the necessity of repeatedly cleaning the apparatus.

When silver or lead screens are used, the passage of the gamma rays through these metals gives rise to secondary rays, which are very irritating, though their action is superficial only, and it becomes necessary to absorb these rays. With this object, from six to twenty-four sheets of black photographic paper and one or two layers of lint are interposed between the metal screen and the outer rubber covering. When tubes shielded with lead or silver screens are introduced into the vagina, rectum, uterus, etc., they are enveloped in rubber tubing of 3 mm. thickness for the same purpose. These secondary rays vary greatly in amount according to the nature of the metal and the thickness of the screen employed.

The lesion to be treated is gently cleaned and dried, and all crusts or flakes of secretion are removed. The healthy skin and tissues surrounding the lesion must be carefully protected by a layer of lead-rubber sheeting—similar to that used in x-ray work—an aperture being cut in the sheeting the exact size and shape of the lesion. For external lesions the apparatus is best fixed in position with some non-irritant adhesive rubber plaster.

To retain tubes in the vagina or uterus the employment of a tampon is generally necessary. In the rectum, nasal and buccal cavities the apparatus is attached to

a handle of thick silver wire, which can be easily bent and fastened to the gluteal fold, cheek, or ear by adhesive plaster.

THE REACTION.

All tissues when treated with radium respond in some manner, but the nature and extent of this response vary very greatly, and depend upon:

1. *The apparatus, screening and dosage employed.*
2. *The nature of the tissue treated.*
3. *The condition of the tissue treated.* If x rays, ionization, CO₂ snow, etc., have been previously used in the attempts to bring about a cure, the reaction in such cases is frequently atypical, and repair is exceedingly slow.
4. *The extent of the area treated.* The reaction is dependent not only upon the strength of the applicator, but also upon its superficial area. For example, the reaction from an applicator of half strength applied over an area of 4 sq. cm. is often not more intense in degree than that obtained with an applicator of quarter strength over a surface area of 16 sq. cm.
5. *Personal idiosyncrasy.* This is most important and often productive of curiously puzzling results. In this respect factors to be considered are age, sex, and temperament, susceptibility to actinic rays generally—for example, as in persons who suffer much from freckling or solar eczema—hyperidrosis, exalted vasomotor sensibility, etc.

Nature of Reaction.

The reaction usually appears between the seventh and fifteenth days and may vary in character from a slight erythema to a destructive ulceration.

Four degrees may be clearly distinguished:

1. Simple erythema.
2. Erythema followed by desquamation.
3. Vesication with superficial ulceration.
4. Deep ulceration; sometimes accompanied by the production of an eschar.

With some patients the time of reaction is much delayed, with others the response is exceedingly prompt, and it is difficult, if not impossible, to say why this difference should be. It is particularly noticeable in the treatment of capillary naevi, and cases have been seen in which, instead of the reaction appearing on about the seventh or eighth day, it has been evident three days after the exposure. In others a period of four weeks has elapsed before any effect has been perceptible, though in all of these cases the applicators employed, the screening, and the times of exposure have been identical.

The increased susceptibility to changes of temperature over areas that have been treated with radium is very remarkable, and many patients who have had rodent ulcers and superficial skin lesions cured with radium state that they experience great discomfort at the site of the old lesion when very cold or very warm air plays upon it. This susceptibility, however, gradually returns to the normal in two or three months.

A very marked condition of lethargy is frequently, it might almost be said invariably, noted in patients receiving prolonged exposures with large quantities of heavily screened radium. It generally makes its appearance about the fourth day of the treatment, and passes off within a few days of the cessation of the exposures.

RESULTS OF TREATMENT OF DISEASE.

The results of treatment in 578 cases treated by radium or its emanation at the Radium Institute are given in the following tables. It will be noted in Table I, which contains a summary of 657 cases, that 38 were examined but not treated, and that in 41 the treatment is too recent to enable any conclusion as to the results of treatment to be stated. In Table II the cases are arranged according to the nature of the disease and its site. The tables are followed by a general discussion in which typical cases of the various conditions are reported in detail.

TABLE I.—SUMMARY OF CASES.

Examined but not treated	...	...	...	38	Improved	...	...	...	...	...	245
Recently treated and results not yet noted	...	...	...	41	Not improved	...	...	...	...	...	70
Received prophylactic irradiation only	...	...	...	39	Abandoned treatment	...	...	...	...	...	88
Apparently cured	...	...	...	53	Dead	...	...	...	...	...	55
Cured	...	...	...	28							
					Total	...	...	...	...	...	657

TABLE II.—CLASSIFICATION OF CASES.

Disease.	Examined but not Treated.	Recently Treated, but Results not yet Noted.	Received Prophylactic Irradiation only.	Apparently Cured.	Cured.	Improved.	Not Improved.	Abandoned Treatment.	Dead.	Total.
CARCINOMATA.										
<i>Squamous-celled (Epitheliomata) —</i>										
Buccal, lingual, and pharyngeal mucous membranes	6	3	8	—	—	10	15	9	9	60
Oesophagus ...	3	—	—	—	—	2	—	1	5	11
Larynx ...	2	1	—	—	—	—	—	—	3	6
Cheek and hand ...	—	3	2	4	—	3	2	2	—	16
Neck and scalp ...	1	—	1	—	—	1	—	—	—	3
Vagina and vulva ...	—	—	3	—	—	3	1	1	—	8
Uterus ...	—	1	1	3	—	19	2	10	5	41
Penis ...	1	—	—	—	—	1	—	—	—	2
<i>Spheroidal-celled—</i>										
Breast ...	2	5	9	1	—	34	11	15	12	89
Liver and gall bladder	—	—	—	—	—	—	—	—	3	3
Thyroid ...	—	—	1	—	—	1	—	—	—	2
<i>Paget's Disease ...</i>	—	—	1	—	—	1	—	—	—	2
<i>Columnar-celled—</i>										
Large intestine ...	2	—	3	—	—	1	—	1	—	7
Rectum ...	3	1	2	1	—	9	6	17	4	43
Stomach ...	—	—	—	—	—	2	1	2	2	7
Vulva ...	1	—	—	—	—	2	—	—	2	5
Testicle ...	—	—	—	—	—	—	—	1	—	1
Prostate ...	—	—	—	—	—	1	1	—	—	2
RODENT ULCER ...	10	1	31	—	—	41	12	6	—	101
SARCOMATA—										
Spindle-celled ...	3	1	7	—	—	4	2	1	1	19
Round-celled ...	1	—	—	1	—	2	3	2	2	11
Melanotic ...	—	—	—	—	—	—	—	2	1	3
Endothelioma ...	—	—	—	—	—	—	—	—	1	1
Lymphosarcomata ...	—	—	—	1	—	1	—	—	2	4
Lymphadenoma (Hodgkin's disease)	—	—	—	—	—	4	—	—	—	4
Malignant disease of glands	—	1	—	—	—	3	1	2	2	9
Parotid tumour ...	1	—	—	2	—	4	—	—	—	7
Abdominal tumours ...	—	—	—	—	—	2	—	1	1	4
Mediastinal tumours ...	—	—	—	—	—	1	—	—	—	1
Villous tumour of bladder	3	2	2	—	—	2	—	1	—	10
Granulomata ...	1	—	—	—	2	1	—	1	—	5
Adenoma of breast ...	—	—	—	—	—	1	—	1	—	2
Adenoma of thyroid ...	—	—	—	—	—	—	1	—	—	1
Fibroid disease of uterus	1	1	—	—	—	3	—	—	—	5
Fibroma of penis ...	—	—	—	—	—	2	—	—	—	2
Enchondroma ...	—	—	—	—	—	—	1	—	—	1
Leucoplakia ...	—	—	—	—	—	2	1	—	—	3
NAEVI—										
Capillary ...	—	2	—	—	—	3	25	1	—	31
Cavernous ...	—	1	—	—	—	2	7	—	—	10
MOLES AND WARTS AND PAPILLOMATA										
Of glands ...	2	1	—	—	—	6	6	1	2	18
TUBERCULOSIS—										
Of periosteum ...	—	—	—	—	—	—	—	1	—	1
Of skin (lupus vulgaris)	1	—	—	—	—	—	2	—	—	3
Of conjunctiva ...	—	—	—	1	—	—	—	—	—	1
Trachoma ...	—	—	—	—	—	—	4	—	—	4
Spring catarrh ...	—	—	—	1	—	—	4	—	—	5
Chronic mastitis ...	—	—	—	—	1	—	—	—	—	1
Endocervicitis ...	—	—	—	—	—	1	—	—	—	1
Urethritis ...	—	—	—	—	—	—	1	—	—	1
Hypertrophic nasal mucosa	—	—	—	1	—	—	—	—	—	1
Varicose ulcer ...	—	—	—	—	—	—	1	—	—	1
Tropical ulcer ...	1	—	—	—	—	—	1	—	—	2
Rectal stricture ...	—	1	—	—	—	—	—	—	—	1
SKIN DISEASES (various)—										
Keloid and keloid	1	2	—	—	3	8	—	3	—	17
Lupus erythematosus	—	—	—	—	1	5	—	—	—	6
Psoriasis ...	—	—	—	2	—	5	—	—	—	7
Pruritus ...	—	—	—	—	1	2	—	2	—	5
Chronic eczema ...	—	—	—	—	1	—	—	—	—	1
Lichenification of skin	—	—	—	—	2	1	—	1	—	4
Hyperkeratosis of nipple	—	—	—	—	1	—	—	—	—	1
Ichthyosis hystrix ...	—	—	—	—	—	1	—	—	—	1
Mycosis fungoides ...	—	—	—	—	—	1	—	—	—	1
Xeroderma pigmentosa ...	—	—	—	—	—	—	1	—	—	1
Locomotor ataxy ...	—	—	—	—	—	—	1	—	—	1
Diabetes mellitus ...	—	—	—	—	—	—	—	1	—	1
Arthritis deformans ...	1	4	—	—	1	9	5	1	—	21
Dupuytren's contraction	—	1	—	—	—	—	—	—	—	1
Neuralgia ...	—	—	—	—	—	1	1	1	—	3
Totals ...	38	41	39	53	28	245	70	88	55	657

CARCINOMATA.*Squamous-celled (Epitheliomata) of the Skin.*

Very different results are obtained with epitheliomata affecting the glabrous skin as opposed to those involving mucous surfaces.

Epitheliomata of the face, trunk, or extremities, if flat and superficial and accompanied by little or no ulceration, give satisfactory results when treated with quarter or half strength apparatus, screened with 0.2 mm. of lead, the exposures varying from six to twelve hours' duration, spread over a period of three or four days. The retrogression of the growth is quickly brought about and little or no scarring results.

Ulcerating epitheliomata without much subjacent infil-

tration, require treatment with quarter or half strength apparatus applied unscreened for a total exposure of two to six or eight hours, spread over a period of four or five days, and repeated after an interval of six weeks if necessary. A destructive reaction follows, but the result is usually quite good, and there is but little cicatricial contraction.

Ulcerated epitheliomata with great infiltration, require prolonged treatment with heavily-screened apparatus emitting "ultra-penetrating" rays. Exposures of thirty to sixty hours given during one week, and repeated in five or six weeks' time are best; but if the growth shows signs of rapid extension the borders should be given a vigorous treatment with unscreened apparatus.

CASES.

Epithelioma of Cheek.

M., aged 82 (Case No. 47). The growth began as a small warty nodule six months before the patient was seen at the Radium Institute. It had grown steadily in size until October, 1911, when it was submitted to radium treatment. It was then an oval tumour measuring 2.7 by 2 cm., and projected 0.5 cm. above the surface of the skin. The whole mass was wartlike, with an ulcerated apex, situated over the zygoma, and surrounded by a zone of infiltration. The infiltration reached to the ear; the pre-auricular gland was enlarged and hard. The nature of the disease had been verified by microscopical examination. The patient had refused operation.

He was treated for two hours with a half-strength apparatus screened by aluminium foil 0.01 mm. in thickness, and a similar treatment of one and a half hours was given a month later.

In January, 1912, the patient's medical attendant reported that no sign of the carcinoma remained.

Epithelioma of Right Hand.

M., aged 53 (Case No. 231). The patient's skin had always been peculiarly susceptible to the influence of light. When he was examined in May, 1912, the exposed parts of his body (face and hands) were deeply freckled and had several small warty growths upon them. The condition strongly resembled an early case of xeroderma pigmentosa. Eighteen months previously a small tumour was removed from the back of the patient's right hand, and proved to be carcinomatous on microscopical examination. He came for the treatment of a circular ulcer 1.5 cm. in diameter, with everted edges and indurated base, which had originated at the extremity of the scar of the previous operation. It was situated over the centre of the middle metacarpal bone of the right hand. No pain was associated with the growth.

A full strength apparatus without a metal screen was applied to the ulcer for fifty minutes.

In July the patient reported that there had been a very sharp reaction, but that the ulcer had healed completely and that no sign of the lesion remained.

Epithelioma of Hand.

F., aged 67 (Case No. 5,034). The patient had for ten years a small wart on the back of the right hand. In April, 1911, it commenced to grow rapidly and became very painful. The growth was excised, but recurred, and subsequent treatment with caustics and ointments produced no improvement. In September, 1912, an oval tumour, 3 cm. by 2.5 cm. and 1 cm. in height, was situated on the back of the right hand. Its raised centre was covered by a dry irregular crust. It was immovable, and the site of almost constant severe pain. The axillary glands were not enlarged. The patient refused operation. Seven treatments of two hours each were given with a half-strength apparatus, an interval of one month intervening between the applications. No screen was employed.

The growth steadily improved from the beginning, and in April, 1912, no sign of it remained except a smooth cicatrix.

Epithelioma of Neck and Scalp.

M., aged 65 (Case No. 39). Disease of ten months' duration. Its nature had been determined by microscopical examination.

The patient was first seen on October 10th, 1911. He then had an enormous ulcerated epithelioma extending from a point 2 in. above and behind the tip of the left ear to 3 in. below the mastoid process. There was a deep and wide fissure just behind the ear cleaving the growth in a vertical direction, with which a cavity left by a previous mastoid operation communicated. The whole auricle was greatly swollen and infiltrated with carcinomatous deposit. There was a profuse and offensive purulent discharge. The patient complained of constant and intense pain.

He was treated with 250 mg. of radium, both tubes and flat applicators being used, with screens of silver of 1 mm. and 1.5 mm. respectively, and received in all an exposure of twelve hours on October 10th and 11th. There was a slight reaction about a fortnight afterwards; the ulceration commenced to heal and the pain was considerably lessened.

On October 28th, in compliance with the urgent request of the patient's friends, the injection of Coley's fluid was commenced by the surgeon in charge of the case, and half a minim was injected every second day until December 7th.

Under the action of either the radium or the Coley's fluid, or perhaps the combination of the two remedies, the patient's condition slowly but steadily improved, and when seen on December 12th a remarkable change was apparent.

The greater part of the ulceration had healed, and much of the surrounding carcinomatous infiltration had disappeared. The vertical fissure behind the ear had closed at its lower extremity, was much shallower and covered with epithelium, save for one small ulcerated area at the spot where it communicated with the mastoid cavity. The auricle was much less swollen. Discharge was scanty and non-offensive. During the last four weeks the pain had returned with increasing severity, and the patient desired a further application of radium with the object of relieving the pain. On December 16th and 17th he received a further treatment of twelve hours' duration in all, with 460 mg. of radium screened with 2 mm. of lead.

On January 17th, 1912, his surgeon reported that the wound had completely healed, and that the whole of the previously ulcerated area now presented an almost keloidal appearance. The pain had been much lessened but not entirely abolished.

The patient was, however, suffering from vomiting, which was found to be due to acetonuria.

The patient died on February 6th, 1912, from acetonæmia.

EPITHELIOMATA IN RELATION WITH MUCOUS MEMBRANES.

Epitheliomata of the tongue, buccal, gingival, and pharyngeal mucous membranes are almost uniformly disappointing in their ultimate response to radium-therapy.

Temporary improvement is infrequently seen, and this sometimes goes as far as disappearance of the original lesion; but the treatment has practically no effect in preventing or delaying the appearance of metastatic deposits in the cervical glands and elsewhere.

The rate of growth of the infected glands can often be retarded by the prolonged and persistent use of the "ultra-penetrating" rays. If the dose given be a large one, the glands sometimes break down and discharge a milky-white fluid through a small sinus, and it is remarkable that ulceration of glands thus treated rarely occurs.

Considerable difficulty is experienced in giving satisfactory exposures within the oral cavity, as patients are often unable to tolerate the presence of applicators in their mouth for the necessary length of time, and should the reaction be at all pronounced the congestion of the tissues occasions great discomfort. There is the further danger that a severe reaction may act as a stimulus to the original growth, increase its size, and hasten metastasis.

CASES.

Epithelioma of the Lower Jaw.

M., aged 72 (Case No. 87). A malignant epulis was removed from the right side of the lower jaw of this patient, together with a portion of the mandible, in March, 1911. The microscopic diagnosis was squamous-celled carcinoma. The incision healed well save at one small spot, which closed up under radium treatment. The glands became enlarged on the right side of the neck, and were removed in May, 1911.

A recurrence took place in the jaw at the beginning of November, 1911. Later in the month a small circular nodule, 1.5 cm. in diameter, was evident in the mucous membrane over the lower jaw, immediately to the right of the middle line. It was ulcerated, bled freely when handled, and had a sinus at its centre leading to the bone. The left submaxillary glands were enlarged and hard. A tube of 50 mm. of radium unscreened was placed for two hours in the middle of the growth. In a month the tumour had disappeared, leaving an oozing cavity. The glands of the right side of the neck had much increased in the meantime.

In January, 1912, three half-strength applicators containing 250 mg. radium were placed over the enlarged glands of the right side of the neck with 2 mm. of lead interposed, and an exposure of thirty hours given. In February the enlargement of the glands had made steady progress, but the nodule on the gum had disappeared entirely. The patient died in March, 1912.

Epithelioma of Left Superior Maxilla.

F., aged 69 (Case No. 307). The history of this case was very indefinite, but the first symptom which attracted the patient's attention was a persistent muco-purulent discharge from the left nostril. This was first noted in August, 1912. At the end of September the left nostril was becoming obstructed. She consulted a leading hospital surgeon, who diagnosed a malignant growth in the left superior maxilla, and advised operation, but this the patient refused.

She was seen at the Institute on October 15th, 1912. Transillumination showed great opacity of the left antrum extending up to the orbital margin. The left cheek was much swollen and the left naso-labial fold obliterated. Complete occlusion of the left nostril and slight epiphora were noted. The left half of the palate was pushed downwards, so that the patient was unable to wear her upper dental plate. There was one hard, enlarged gland just below the left mandible.

On the evening of October 15th an incision was made through the mucous membrane over the socket of the first bicuspid in the left upper jaw, and a silver tube, 1 mm. in thickness, containing radium emanation equivalent to 95.6 mg. radium bromide, was inserted into the antrum and left there for twenty-four hours. The patient was again examined on November 5th. The swelling of the cheek was no longer appreciable externally, and the naso-labial fold was distinct. The epiphora had disappeared. She could breathe easily through her left nostril and wear her upper dental plate with comfort. The gland under the left jaw had increased considerably in size and was becoming fixed. Transillumination showed the opacity of the antrum to be much diminished, but still existent.

The treatment was therefore repeated on November 6th. An emanation tube of the initial activity of 114.8 mg. in a screen of 1 mm. silver was inserted into the growth for twenty-four hours.

At the urgent solicitations of her friends the patient consented to have the gland excised a few days later. The gland

was examined microscopically, and the growth found to be a squamous-celled carcinoma.

The patient's doctor reported on December 13th that the patient had no pain or trouble in her face, and was in excellent health.

Epithelioma of the Mucous Membrane of the Right Cheek.

M., aged 68 (Case No. 5,023). In this case three operations had been performed to eradicate an epithelioma of the angle of the mouth on the right side, but after the last operation, in which a piece of the lower jaw had been removed, recurrence again took place.

When examined, the patient was capable of only very limited movement of the lower jaw. A small ulcerated surface, 1 by 0.5 cm., could be seen far back on the buccal mucous membrane in the angle between the cheek and the mandible. It was hard on palpation and fixed. A large mass of hard immovable glands was present in the right submaxillary and sublingual regions.

The ulcer was treated for three hours with two tubes, each of 25 mg., of radium screened with 1 mm. of lead, and over the glands were placed two full-strength applicators (80 mg.) screened with 2 mm. of lead for six hours on five successive days.

In a month the glands were scarcely palpable and the buccal ulcer was smaller and less indurated. Two similar treatments were repeated, with the result that the ulcer steadily improved. No fresh enlargement of glands took place. The patient died from an unrelated illness.

EPITHELIOMATA OF THE VAGINAL AND UTERINE MUCOSA.

These conditions are more amenable to the action of radium, and some distinctly encouraging results have been obtained.

Small primary growths of the vaginal mucosa unaccompanied by much deep infiltration of the vaginal tissues may be completely eradicated by treatment with full strength or half strength apparatus and an unscreened exposure of one to three hours.

With larger ulcerated and deeply infiltrating growths radium is best applied heavily screened, and with prolonged exposures of from thirty to sixty hours extending over a week or ten days. This frequently checks the rate of growth, heals the ulceration, and lessens the amount of infiltration.

Secondary non-ulcerated deposits in the cellular tissue of the vagina often respond extremely well to treatment with the "ultra-penetrating rays," and in some instances the deposits completely disappear.

CASE.

Epithelioma of Vulva.

In March, 1912, the patient, aged 73 (Case No. 253), had a squamous-celled carcinoma removed from the region of the clitoris. In May it recurred near to the urinary meatus. Further operation was refused.

When she came to the Institute for treatment, there was a hard malignant ulcer, 1.7 cm. in diameter, extending into both labia, and surrounded by a dense zone of infiltration. Its surface bled easily, and it was tender to the touch. On two successive days a tube of 50 mg. of radium was applied for one and a half hours without metal screen. The improvement was marked in a month. The same treatment was then repeated for two hours. Two months later no sign of the growth remained.

CARCINOMA OF THE UTERUS.

In cases of inoperable malignant disease in this situation radium will often bring about results which cannot be attained by any other known method of treatment.

The haemorrhage is arrested, the discharge is diminished in amount and rendered inoffensive in character, the ulceration is healed, and the pain is greatly relieved.

The rate of growth is checked, sometimes completely arrested, and the surrounding infiltration and induration are so much lessened that in a few instances cases previously declared to be inoperable become operable.

The treatment is best carried out by the introduction of a tube containing 50 to 100 mg. of radium, screened with 2 mm. of lead and 3 mm. of rubber into the cervical canal, or, if this be not practicable, into the posterior fornix, a large flat strong applicator screened with 2 mm. of lead being placed on the abdominal wall over the fundus of the uterus. The exposures should be prolonged, and should be from thirty to sixty hours' duration, spread over a period of from five to ten days.

The series of exposures should be repeated at intervals of not less than six weeks.

The action of radium is, however, only local, and though it may, and often does, check the rate of growth,

yet in most cases dissemination will sooner or later occur, and the disease spread to parts beyond the effective range of radium.

CASES.

Carcinoma of Uterus.

The patient, aged 63 (Case No. 14), had been married forty years, and had had six pregnancies, the last child being still-born.

The duration of the disease was three years. The first symptom was a slight vaginal discharge which slowly increased in amount through a period of two years, finally becoming profuse and purulent. In June, 1911, she had a sudden severe haemorrhage followed by others of less degree.

On examination on September 7th, 1911, the cervix uteri was found to be surrounded by a fungating mass which bled when touched, and the vaginal walls were indurated almost to the vulva on the right side and anteriorly. The uterus was enlarged and fixed. The patient complained of pain and a feeling of weight in the lower abdomen, increased frequency of micturition, and an offensive vaginal discharge.

She had one series of treatments for twelve days of sixty-six hours in all, a tube containing 50 mg. in a screen of 2 mm. of lead being inserted daily into the cervical canal for five and a half hours.

Three months later she reported that all the symptoms had so lessened in degree that she could perform all her duties in comfort. Her general health was much improved, and she went to Australia.

Carcinoma of Uterus (Recurrent).

This patient, aged 61 (Case No. 167), had had a subtotal hysterectomy performed fifteen years before coming for treatment, her previous trouble having been increasing menorrhagia for nearly eleven years. She remained well until September, 1910, when she noticed a slight vaginal discharge, which after continuing some months became sanguineous. She consulted a well-known surgeon, who refused to operate, as he found carcinoma of the cervix with implication of the bladder wall. Treatment with x rays was begun, and some improvement followed. She was then advised to try radium.

On examination on March 18th, 1912, the cervix uteri was found to be enlarged, hard, and ulcerated. The anterior fornix was obliterated, and the posterior fornix very shallow, the walls of the vagina being much indurated. The growth projected into the rectum about 7 cm. from the anus, but the mucous membrane covering it was normal. The patient complained of sacral pain, constipation, and vaginal haemorrhages, the last of which occurred on any slight exertion.

She had one series of treatments, five days of six hours each, a tube containing 100 mg. of radium screened with 1.5 mm. of lead being placed in the vagina. During four of these sittings an emanation tube, initial activity 73 mg., screened with 2 mm. of lead, was fixed opposite the tumour in the rectum.

Three months later she reported that no haemorrhage had occurred since a week after the treatment ceased. The pain had lessened very much, and the constipation was less troublesome. Her general health was much improved.

Carcinoma of Uterus.

The patient (Case No. 178), aged 56, was perfectly well until within eighteen months of coming for treatment, when she noticed a slight occasional discharge from the vagina. A sudden profuse haemorrhage led to examination in February, 1912, and a leading provincial surgeon pronounced her to be suffering from inoperable carcinoma. The cervix was enlarged, indurated, and ulcerated, and the uterus was fixed. The anterior wall of the vagina was ulcerated, and both the fornices were full and infiltrated. She had frequent uterine haemorrhages and was quite unable to get about.

On March 25th, 1912, an emanation tube, initial activity 85 mg., with a screen of 2 mm. of lead, was passed into the cervix and left in for two periods of eighteen hours, with twenty-four hours' interval. This produced diminution of the induration.

Two months later the cervical canal was dilated and the uterus curetted, and an emanation tube, initial activity 80.5 mg., with a screen of 1.5 mm. of lead, was placed in the cervix for thirteen and a half hours, and after an interval of one day, in the uterus for thirty-two hours.

A month later the os was contracted almost to normal size, and covered with healthy epithelium. There was much less induration. Pain, haemorrhage, and discharge had ceased, and the patient had resumed her usual duties.

Carcinoma of Uterus (Recurrent).

The patient, (Case No. 180), aged 53, had hysterectomy (Wertheim's operation) performed on November 19th, 1911, for carcinoma uteri. She made an excellent recovery, and kept well until the end of February, 1912, when recurrence took place in the upper part of the recto-vaginal septum. The condition was declared to be inoperable.

She was seen on April 1st, 1912. Examination per rectum revealed a definite ridge-like growth stretching transversely across the recto-vaginal septum 5 cm. from the anal orifice.

She was treated with two tubes of radium containing 75 mg., and screened with 1.5 mm. lead, one tube being placed in the rectum and one in the vagina; she had in all twenty hours' treatment—five hours for four consecutive days.

She was examined by her surgeon on June 7th, who reported

that all trace of the growth had disappeared and that the patient looked and felt perfectly well. She wrote at the end of October, 1912, saying she was in excellent health.

Carcinoma of Uterus.

The patient (Case No. 291), aged 62, had no symptoms, save a slight vaginal discharge during the three months before coming for treatment. The appearance of blood in the discharge so alarmed her that she consulted a surgeon in August, 1912, who found inoperable carcinoma of the cervix. The uterus was quite fixed, both rectum and bladder were implicated, and the induration at the right side extended up almost to the iliac vessels. The growth was curetted and the thermo-cautery applied.

The patient received two treatments. A 100-mg. tube in a screen of 1.5 mm. of lead was inserted in the vagina for six hours daily for five consecutive days. This led to slight general improvement, and five weeks later the treatment was repeated, a screen of 2 mm. of lead being used.

Seven weeks later the patient was almost free from pain, the discharge had nearly ceased, and the cervix uteri was covered with healthy epithelium externally. Her general condition was much improved. She expressed her intention to continue the treatment at a later date.

Carcinoma of Uterus (Recurrent).

In this patient (Case No. 5,109), aged 53, the disease was of four years' duration. Hysterectomy (Wertheim) had been performed in July, 1908. The patient made a good recovery and kept well until the end of 1911, when she began to suffer from a purulent vaginal discharge. She again consulted her surgeon, who detected a recurrence (inoperable) and advised radium.

The patient was first seen on February 7th, 1912. The scar at the vaginal roof was healthy. There was a hard, rounded lump the size of a walnut above and a little anterior to the scar on the right side, and there was a similar but smaller swelling the size of a muscat grape just behind the left angle of the scar.

The patient had three series of treatments, the first of ten days' duration in February, six hours each day; the second of five days' duration in April, six hours each day; the third of five days' duration in May, six hours each day; 60 mg. of radium in a screen of 1.5 mm. lead were used throughout.

The nodules of recurrence gradually decreased in size and the discharge ceased.

Her surgeon wrote on June 11th saying that he had examined the patient and that the nodules had completely disappeared. The patient reported herself for examination at the Institute on June 28th. She expressed herself as feeling perfectly well. No trace of the nodules in the vagina could be felt or seen.

Carcinoma of Uterus.

The patient (Case No. 5,037, aged 46) had suffered from intermittent haemorrhages from the vagina for nearly four years, but did not consult a surgeon until six months before coming for treatment on September 8th, 1911. She was then found to have inoperable carcinoma of the cervix. The uterus was fixed and the cervix ragged and ulcerated; induration extended laterally almost to the pelvic wall, and filled up the fornices of the vagina. In the anterior vaginal wall was a hard mass continuous with the cervix, extending to the ostium vaginae. The patient suffered from very severe pain and much discharge.

The first treatment was with a tube containing 60 mg. of radium in a screen of 2 mm. of lead inserted for six hours daily for twelve days. For the first four days a plate containing 40 mg. with a similar screen was placed on the abdomen. This caused a rapid cessation of pain, and a month later the induration and ulceration were appreciably less. A second treatment of five days, six hours each, with a 60 mg. tube and screen of 2 mm. of lead followed; and similar treatments, eleven in all, have been carried out at intervals of about five weeks, a screen of 1.5 mm. being sometimes used instead of 2 mm. As a rule the symptoms increased at the end of the interval, and lessened at once after each treatment. The ulceration returned after the fifth treatment, and the hard mass in the anterior vaginal wall ultimately gave way, leaving a vesical fistula.

The patient is now slowly going downhill, and her general health is failing, but at no time has her pain been as constant and severe as it was before she was treated. It is sixteen months since she first came, and she is still under observation.

Carcinomatata of Uterus (Recurrent).

The patient (Case No. 5,199), aged 52, had suffered from occasional haemorrhages for some time before the disease was diagnosed. Abdominal hysterectomy was performed in April, 1909, and four months later two recurrent nodules were removed from the vagina. In the spring of 1912 she noticed some vaginal discharge, and had abdominal pain with occasional vomiting in June.

Examination on June 28th, 1912, revealed a large, hard, movable tumour in the upper abdomen, and in the anterior vaginal wall were two almond-sized swellings which bled when touched, surrounded by much induration. She was very weak and cachectic. She was treated by two 80 mg. plates, with a screen of 2 mm. of lead, placed on the abdomen over the tumour, and a 100-mg. tube in a screen of 2 mm. of lead inserted in the vagina. She did not come back for further treatment as arranged, but on September 16th, 1912, the surgeon wrote to say that all sign of growth in the vagina had disappeared.

Two months later the patient died from intestinal obstruction.

CARCINOMA OF THE RECTUM AND ALIMENTARY CANAL.

Rectum and Intestine.

Radium therapy not infrequently proves of considerable value in the treatment of these carcinomata, but it is extremely difficult to say what are the factors which determine or contribute to the success of the treatment.

Speaking in general terms, the application of radium results in the arrest of haemorrhage, the healing, partial or complete, of any ulcerated surface, a diminution of the amount of the discharge, less pain, and a retardation of the rate of progress.

In some instances more striking changes manifest themselves. The growth shrinks in size, undergoes a fibrous transformation, and becomes much less fixed to the underlying tissues, so that a carcinoma which before radium treatment was regarded as inoperable can be easily and completely removed.

A few patients manifest an unusual degree of susceptibility to radium when applied within the rectum, and a relatively short treatment of eighteen to twenty-four hours with heavily screened radium is followed by a severe though transient proctitis.

The routine method of treatment in rectal cases is the introduction—through an operating sigmoidoscope, if necessary—of 50 to 100 mg. of radium, screened in 2 mm. of lead and 3 mm. of rubber. It is maintained in position by a stem of soft silver wire, which is bent at an acute angle at the anal orifice, and fastened by strapping and a T bandage in the fold between the buttocks. Each exposure is from six to twelve hours in duration, and is repeated daily until a total treatment of thirty to sixty hours has been given. The series should be repeated after an interval of six weeks.

CASES.

Carcinoma of Rectum.

The patient (Case No. 35), M., aged 53, on account of severe rectal haemorrhage, sought the advice of a leading London surgeon; he diagnosed carcinoma of the rectum, but refused to operate, and suggested radium.

When first seen, on October 9th, 1911, there was a craggy, hard, annular ulcerated growth, the lower margin of which was 3 cm. from the anal orifice, while the upper margin was 9 cm. above the orifice. It was moderately fixed, its chief attachment being posteriorly. It bled on examination.

The patient was treated with a tube of 60 mg. radium screened with 2 mm. of lead, and received an exposure of sixty hours' duration, spaced over ten days.

He was examined six weeks later; the growth was found to be much reduced in size, and no longer ulcerated. It was much less fixed to surrounding tissues.

He was examined by his surgeon again on December 6th, who declared the condition to be so greatly improved that it was quite operable, and performed Kraske's operation.

On March 4th, 1912, the patient returned to the Institute for a course of prophylactic irradiation, and received thirty hours' treatment with 60 mg. of radium screened with 2 mm. lead.

He reported himself on June 18th, 1912, as being perfectly well and in excellent general health. No sign of recurrence could be detected after a most thorough examination.

Carcinoma of Rectum.

In this case (No. 48), M., aged 61, there was a six months' history of alternating diarrhoea and constipation. Immediately before coming to the Radium Institute he had been examined by a well-known surgeon, who declared him to be suffering from an inoperable carcinoma of the rectum.

The patient complained of "pressure" in the rectum, with difficulty in defaecation, and the passage of a mucoid discharge. No bleeding had taken place. On rectal examination a growth could be felt 5 cm. above the anus. It was firmly fixed, annular, and ulcerated, and affected chiefly the anterior wall of the rectum. The lumen of the growth admitted the tip of the little finger. Fifty mg. of radium in a tube, covered by a screen of 2 mm. of lead, were applied in the lumen of the growth for six hours a day for ten days.

A month later considerable improvement was noted. The growth was much smaller and covered with smooth intact mucous membrane. Above the stricture could be felt one or two nodules. Treatment as before was repeated for five days.

Five months later no infiltrating growth could be felt, and only what was apparently an easily dilatable fibrous stricture remained.

Carcinoma of Rectum.

The patient (Case No. 108), M., aged 55, was first seen on December 15th, 1911, and found to be suffering from recurrent carcinoma on the posterior wall of the rectum, which had appeared five years after a Kraske's operation. Colotomy had been performed on November 24th, 1911.

The rectal opening was close to the sacrum, and extremely contracted by malignant infiltration, so that no digital examination could be made. One or two nodules were visible at the

posterior border of the orifice of the bowel. The patient complained of much persistent pain in the rectum and left thigh and of frequent bleeding.

The first treatment consisted of thirty hours' application in the rectum of a 50 mg. tube of radium in a screen of 1.5 mm. of lead.

Two months later the patient felt better; all haemorrhage had ceased, the pain had nearly disappeared, and the induration round the anus was much less.

The patient remained in this condition for some months, but the bleeding and pain reappeared, a rectal discharge developed, and the buttocks on either side of the anus became infiltrated. The patient was treated with the same tube three times, but in May, September, and November, 1912, flat half-strength applicators containing 180 mg. radium were screened with 2 mm. of lead and placed over the infiltrated buttocks. This resulted in considerable improvement. The induration appreciably diminished, the discharge became less, the pain was alleviated.

The patient's general condition is good. He attends business at his office. He is still under treatment.

Carcinoma of Rectum.

This patient (Case No. 117), M., aged 68, who was the subject of advanced mitral disease, had suffered from persistent diarrhoea for six months. He was examined by a leading provincial surgeon, who diagnosed carcinoma of the rectum, but considered operation inadvisable by reason of the patient's age and ill health.

He was first seen on December 29th, 1911. Sigmoidoscopic examination revealed a flat hard carcinomatous plaque ulcerated at its upper part. It was confined principally to the posterior rectal wall, and its lower border was 16 cm. from the anal orifice. The patient experienced constant pain, which was very severe on defaecation.

He was treated by inserting a tube of 50 mg. of radium screened by 2 mm. of lead into the lumen of the bowel and received an exposure of thirty hours' duration, spread over five days.

Following the treatment the patient slept well, ate well, the diarrhoea ceased, and all pain disappeared. Seven months later he died, but his medical attendant stated that the freedom from pain persisted right up to the day of his death.

Carcinoma of Rectum.

This patient (Case No. 185), F., aged 56, was seen in April, 1912. She had an indefinite history of abdominal pain and obstinate constipation. A surgeon examined her and declared her to be suffering from an inoperable carcinoma of the rectum.

Examination revealed a hard annular growth of the bowel 16 cm. above the anus. It was slightly ulcerated anteriorly, bled readily on examination, and invaded the surrounding tissues. The lumen was very small and irregular, the size of a crow quill, and a very offensive discharge was continuously present. There was constant rectal pain. The patient was very weak and emaciated.

On April 3rd, 1912, an emanation tube, initial activity 83 mg., screened with 1.5 mm. of lead, was placed in the lumen of the growth and left there for twenty-four hours. Six weeks later a severe reaction was reported, but afterwards the patient's health improved much, the discharge ceased to be offensive and the pain was only slight. The lumen of the bowel was much larger and the ulceration had disappeared.

On June 5th the patient was again treated with an emanation tube, initial activity 63.2 mg., placed in a screen of 2 mm. of lead, and an exposure of twenty-four hours was given. In October the patient had no discharge and no pain, was having natural actions of the bowel, attending to her household duties, and improving much in general health. She had gained nearly 2 st. in weight. She declined examination on the ground that she was perfectly well.

Carcinoma of Rectum.

This patient (Case No. 5088), M., aged 37, had suffered from tenesmus and the passage of blood-stained mucus from July, 1910. He steadily became worse. In July, 1911, inoperable carcinoma of the rectum was diagnosed and the nature of the growth verified microscopically. A month later colotomy was performed.

In December, 1911, the patient was examined at the Radium Institute. He was in constant pain, had much bleeding and discharge, and was thin, worn, and anxious. On rectal examination an annular growth could be felt 2.5 cm. from the anus. It was hard, craggy, ulcerated, and firmly fixed. The lumen was small and tortuous.

Treatment consisted of the insertion of a tube, containing 60 mg. of radium screened by 2 mm. of lead, into the lumen of the growth for periods of six hours for five days. This was repeated five weeks later, and in March, 1912, the patient's weight had increased. He slept well, and the discharge was much diminished. The pain had gone. The growth was still large and hard, but the ulceration had disappeared. The same treatment was then given for four days.

In November, 1912, the patient again presented himself for examination. He looked in good health and had been doing four hours a day of manual labour. During the last few weeks he had some return of pain. The growth was harder and smaller. Treatment is being continued.

CARCINOMA OF THE STOMACH.

A few inoperable cases of cancer of the stomach have been treated by radium, not in the hope of cure, but with the object of checking the growth and alleviating the symptoms.

Some slight degree of benefit has resulted from the application of powerful apparatus screened with 2 mm. of lead over the gastric region, the pain being lessened, the frequency of vomiting decreased, and the general health improved.

CARCINOMA OF THE BREAST.

The results of radium therapy in the treatment of cancer of the breast are, on the whole, encouraging, and this is especially the case when the primary growth is of the sclerotic rather than of the medullary type, when the secondary deposits occur in the skin lymphatics and lymphatic glands, and there are no internal metastases.

Radium should never be used as a substitute for operative interference, but when the case is inoperable it will do much to relieve pain, promote the healing of ulcerated surfaces, and check the growth of the secondary deposits. In not a few cases it will bring about the almost complete absorption of superficial carcinomatous nodules and infected glands. Instances have been noted in which the physical signs were strongly suggestive, if not positively indicative, of carcinomatous deposits in the lungs, and the prolonged application of from thirty to forty hours of a large quantity of radium screened through 2 mm. of lead has brought about an apparent resolution. In rapidly growing cancers of the encephaloid type radium can do little but relieve pain. The post-operative lymphatic engorgement of the arm on the affected side is sometimes distinctly benefited by the application of a heavily screened tube of 50 to 100 mg. of radium placed at the apex of the axillary cavity, an exposure of twenty-four to thirty hours spread over five days being given.

CASES.

Carcinoma of Breast.

In this case (No. 89), F., aged 46, the disease had existed for five years before the patient consulted a surgeon. The condition was then quite inoperable.

In December, 1911, she came for treatment. The right breast was densely indurated, firmly fixed, and surmounted by a superficial ulcer 6 by 4.5 cm. in area, which had completely destroyed the nipple. The right axillary, supraclavicular, and infraclavicular glands were all enlarged and hard. She complained of a cough and pain in the right side of the chest, where the expansion was relatively much diminished. She had also pain in the right arm, and the movements of the shoulder-joint were much restricted.

The first treatment consisted in placing a half-strength plate containing 50 mg. of radium over the ulcer, with a 30 mg. tube in the axilla. The screening was 2 mm. of lead; the exposure was six hours daily for five consecutive days. This produced a local improvement, but at the end of January her respiration was much embarrassed and the cough much more troublesome.

In February a second treatment was given, the screening and time being exactly the same as at first, the apparatus employed being two quarter-strength plates containing 40 and 70 mg., two full-strength plates containing 30 mg. each placed directly over lesions, and a tube of 30 mg. in the axilla. This was followed by local and general improvement.

In April, during a third treatment, a half-strength plate containing 150 mg. was also used, with the view of acting on the implicated pleura and lung tissue.

In May the air entry to the lung was free, the pain and cough were gone, and the induration of the breast was much less. A fourth treatment was then given, resembling the third, and in July the ulcer had healed completely, the induration was almost gone, and all the glands were smaller. Unmistakable signs, however, pointed to an extension of disease within the chest below the axilla, and a fifth treatment was undergone.

In September the superficial lesions were all negligible, but the dullness below the right axilla had increased, and respiration was hurried and embarrassed, the patient having to use oxygen. She then had a sixth similar treatment, and at the end of November was feeling better and breathing more comfortably, whilst the physical signs were no worse. She is to come again early in 1913.

Carcinoma of Right Breast (Recurrent).

In March, 1910, the patient's right breast and right axillary glands (Case 129, F., aged 52) were removed for carcinoma, and a recurrence which appeared in August, 1911, was not shown to the surgeon till the end of the year, when the condition was inoperable.

In January the patient came for treatment with many nodules and a diffuse induration around the operation scar, the latter extending to both folds of the axilla. The right supraclavicular and infraclavicular glands were enlarged, hard, and fixed. At

the centre of the scar was an ulcer 2 cm. in diameter. The left breast was hard, and some glands could be felt in the left axilla.

She was treated with a 30 mg. tube in each axilla, and five flat applicators containing 200 mg. of radium placed directly over the affected parts. The screening was 2 mm. of lead throughout, and the period of exposure six hours daily for five consecutive days.

Two months later the ulceration had healed, and all the enlarged glands, as well as the mass in the left breast, were reduced in size. The induration was less, except in the anterior axillary fold, where it had increased slightly.

A second similar treatment, using only 180 mg. radium, was then given.

Later in the year the medical attendant reported that the condition was quiescent, that the patient was feeling very well, and attending to all her duties.

Carcinoma of Right Breast (Recurrent).

The patient (Case No. 151), F., aged 64, had the left breast removed and the axilla cleared in June, 1911, for carcinoma. In February, 1912, some progressive induration appeared at the upper end of the scar incision, and the left arm began to swell.

She was treated by three applicators containing 130 mg. of radium and a tube of 30 mg. placed in the axilla. The screens were 2 mm. of lead throughout, and the duration of exposure six hours daily for five consecutive days. By the end of April much of the induration had disappeared and the swelling of the arm was greatly reduced.

A second treatment by one 30 mg. applicator and the 30 mg. tube was repeated with the same screen and exposure.

The patient was seen last in November. There was then no induration perceptible, the swelling of the arm had disappeared, and her health was excellent.

Carcinoma of Left Breast (Recurrent).

The patient (Case No. 191), F., aged 49, had the left breast and left axillary and supraclavicular glands removed in July, 1907. A recurrent nodule was excised from the scar in November, 1909. A second recurrence early in 1912 was considered inoperable.

When she came for treatment in April a nodule of 1.5 cm. diameter was adherent to left fifth rib, the overlying skin being ulcerated, and the tissues over the fifth and sixth costal cartilages were much indurated. Some small hard glands were left behind the left sterno-mastoid. She was losing weight.

Applicators containing 160 mg. with a tube of 60 mg. radium were applied for six hours daily for five consecutive days, all screens being 2 mm. of lead. Six weeks later the nodule had disappeared, the glands and induration were less, and she had gained in weight.

After a further six weeks fresh induration appeared over the third and fourth left costal cartilages, and there was considerable dyspnoea on exertion. Applicators containing 300 mg. and a tube of 60 mg. of radium were applied, time and screens being as before. Three months later all the induration had disappeared and the glands were as small as swan shot; there was no longer any dyspnoea.

In October a gland was discovered at the apex of the axilla with some redness over the fifth rib. She was again treated for the same period as before, with the same screens, with applicators containing 300 mg. She is still under treatment, steadily improving in general health, and gaining weight.

Carcinoma of Right Breast.

In this case (No. 295), F., aged 55, the disease had existed for one year before the patient consulted her medical attendant in September, 1912. The whole of the right breast was then indurated and firmly fixed to the underlying tissues, and in the upper and outer quadrant was a rounded mass of 6 cm. in diameter, bright red in colour, and ulcerated. On the inner side of this and extending to the edge of the sternum was a leather-like area of "cancer en cuirasse," while numerous small nodules could be felt at the lower border of the breast. In the right axilla, supraclavicular fossa, and posterior cervical triangle enlarged glands were felt. The patient complained of excessive pain.

A tube of 30 mg. was placed in the axilla and three half-strength plates, containing 50, 80, and 150 mg., applied over breast and glands. The screening was 2 mm. lead, and the exposure five consecutive days of six hours each.

Two months later the mass on the breast was much reduced in size and the ulcer had healed. The infiltrated area by the sternum had become quite soft, and the glands and affected areas were smaller. The pain was quite gone and the patient had gained in weight.

The same treatment was given a second time, and the improvement continued. She is still under treatment.

Carcinoma of Right Breast (Recurrent).

In this case (No. 5,100) F., aged 60, the disease was of five years' duration. An operation had been performed by a leading hospital surgeon in January, 1906, when the breast was removed and the axilla cleared. Recurrence took place in June, 1910, with several small nodules arranged in the form of a circle 6 cm. in diameter, having its centre at the middle of the breast incision. These nodules were treated with x rays for some time, but steadily increased in size.

The patient was first seen on February 1st, 1912. She then had six hard nodules arranged as above described, each the size of a small walnut and very tender on pressure.

She was given two series of treatments, with half-strength applicators screened with 2 mm. lead—the first of five days' duration, six hours each day, February 1st to 7th; the second of five days' duration, six hours each day, April 22nd to 26th. The nodules steadily decreased in size and the tenderness disappeared.

She came for examination on June 4th. All the nodules had gone. There was no longer any tenderness, and she was in excellent general health. She was afterwards seen by the surgeon who operated on her, who expressed his great satisfaction at the result of the radium treatment.

Carcinoma of Breast (Left).

In Case No. 5,216, M., aged 72, the duration of disease was about three years. The nipple of the left breast became hardened and retracted, and finally ulcerated. The patient was not considered a suitable subject for operation.

Examination revealed an oval tumour of 5 cm. diameter surmounted by an indurated ulcer 1.7 by 1.3 cm., which occupied the site of the nipple. In the skin towards the inner side five hard nodules could be felt.

He was treated in July, 1912, with applicators containing 110 mg. of radium with screens of 2 mm. of lead. Over the ulcer a screen of only 1 mm. of lead was used. The time of exposure was five hours daily for five consecutive days.

In September, 1912, the ulcer was smaller and the swelling less. A fresh treatment for a similar period was carried out, the screens being 1.5 mm. of lead and applicators containing 190 mg. of radium being used for the same time as previously.

In October the ulcer was much softer, and a similar treatment was carried out. In November the tumour had disappeared, the ulcer was healed over, and the nodules were scarcely perceptible. The patient is still under treatment.

Carcinoma of Right Breast (Recurrent).

This patient (Case No. 5,008), F., aged 53, came in August, 1911, for treatment of some small hard nodules in and below the right axilla. The right breast had been removed with the glands of the right axilla in June, 1904, and two earlier local recurrences had been excised in 1908 and 1910. She had much pain in the axilla and right arm, and was taking morphine.

Screens of 2 mm. of lead were used throughout. The nodules were treated with an applicator containing 30 mg. of radium daily for three hours on four consecutive days.

Three weeks later these nodules had disappeared, and the pain was quite gone. Some fresh nodules, however, could now be felt just below the clavicle; the same apparatus was used again for three hours daily for four consecutive days in September, and again for three hours daily for seven days in October. In December she wrote saying all the nodules had disappeared, and she had no pain.

In April, 1912, some thickening appeared in the scar in two places, and a nodule was found at the posterior border of the right sterno-mastoid. Applicators containing 110 mg. were used, with a 50 mg. tube in the axilla, all being applied for six hours daily on five consecutive days. An applicator of 40 mg. was put over the nodule on the sterno-mastoid for the same period; it became much smaller, and the induration disappeared.

In September the patient came again with pain in the arm, stiffness of the shoulder, dyspnoea, and thickening in the anterior axillary fold. She was weak and very thin. A tube of 60 mg. and applicators were again used as before for six hours on four consecutive days, and a month later a similar treatment with somewhat larger apparatus was carried out. Eight weeks after this the dyspnoea had become less, the pain was gone, and the patient could move her arm freely again. She is still under treatment.

PAGET'S DISEASE.

Two patients afflicted with this condition have been treated with radium.

The first, an unmarried woman of 35, had a patent urachus, and the disease had commenced at the umbilicus. It readily yielded to radium, and an apparent cure was effected.

The second, a married woman aged 58, had the left breast affected. She came under treatment quite recently, but a very great improvement has already been brought about, though the case is not yet finished.

In both instances treatment was carried out with a quarter strength applicator, unscreened, and an exposure of one and a half hours' duration.

CASES.

Paget's Disease of Umbilicus.

The disease (Case No. 5,010, F., aged 35) was of three years' duration. It had been subjected to a variety of treatments without effect, and was slowly but steadily increasing in size.

The patient was first seen on August 21st, 1911. There was then a roughly circular patch 5.5 cm. in diameter, with its centre at the umbilicus, covered with a flaky, yellowish crust, which, when detached, left a reddish, slightly ulcerated surface underneath. There was no bleeding, no infiltration, and no rolled edge. The diagnosis of Paget's disease had been made by a leading dermatologist. The patient had a patent urachus.

A quarter strength applicator of sufficient size to cover the lesion completely was applied without screen for one and a half hours on August 21st, 1912.

She was examined on September 13th. There had been a fairly vigorous reaction. The inner portion of the ulcer nearest to the umbilicus was covered with new healthy epithelium, but the outer portion was still red and inflamed. She came again a fortnight later, when the lesion was found to be completely healed.

A slight recurrence took place early in September, 1912. The same treatment was adopted with an equally good result. The patient has since kept perfectly well.

CARCINOMA OF THYROID.

In Case No. 5,127, F., aged 35, the disease was of six months' duration. The symptoms were cough with occasional haemoptysis, dysphagia, and dyspnoea; marked stridor accompanied any exertion or excitement. She consulted a leading hospital surgeon in March, 1912, who diagnosed carcinoma of the thyroid (inoperable), and advised radium.

She was first seen on March 26th, 1912. Examination showed distinct enlargement and hardness of the thyroid, most marked inferiorly. The percussion note was impaired over the apex of the right lung, and vocal resonance and fremitus were increased in the same area. X-ray screening showed a faint shadow just below the inner end of the right clavicle.

The patient had three series of treatments with half-strength apparatus containing 120 mg. radium screened with 2 mm. lead. The first, of four days, six hours each day (March 27th to 30th); the second, of five days, six hours each day (April 29th to May 3rd); the third, of five days, six hours each day (June 3rd to 7th).

She reported herself for examination on September 23rd, 1912. The enlargement and hardness of the thyroid had disappeared. Her general condition was good, and she had gained weight. She no longer had any dysphagia and experienced only a very slight degree of dyspnoea on great exertion. There was no stridor. The physical signs at the apex of the right lung were unaltered.

The patient has returned to her work as schoolmistress, but still reports herself every two months. No further treatment has been necessary.

RODENT ULCER.

This is of all forms of malignant disease the one which is most amenable to the action of radium. Untreated rodent ulcers not exceeding 2 cm. in diameter, and not affecting mucous membrane, cartilage, or bone, almost invariably yield to one exposure of one to three hours' duration with a full-strength applicator unscreened.

If the ulcer occupy a large superficial area—say, 20 sq. cm. and upwards—an unscreened application over the whole area at the same time is inadvisable in view of the severe systemic disturbance which would follow such a procedure, and the lesion should be treated by two, three, or four applications made in rotation to different parts of its surface, at intervals of three weeks or a month.

When a mucous membrane is affected rodent ulcers prove much more refractory, though exception should perhaps be made in regard to the palpebral mucosa, as small rodent ulcers in this situation often respond well to exposures of strong unscreened apparatus of fifteen to twenty minutes' duration given consecutively for three days.

If the rodent ulcer has attacked bone or cartilage, great care must be exercised not to give too heavy an exposure, or a very acute, painful, and prolonged inflammation may be produced.

When the extent, position, or character of the ulcer precludes the possibility of strong unscreened exposures, the best results will probably be attained by prolonged exposures with heavily-screened apparatus using the "ultra-penetrating" rays only. This method is followed by little or no active inflammatory change, and, in addition, often alleviates the pain of the ulcer in a very definite manner. The action of radium in these cases can be greatly aided by judicious skin grafting as soon as the base of the ulcer has assumed a healthy appearance.

Many of those ulcers which have received treatment extending over a period of many years with x rays, zinc ionization, CO_2 , etc., respond badly to radium treatment, and it is unwise to attempt to make any pronouncement as to the probable result. Quite frequently the previously treated tissues break down to an extent which far exceeds the existing ulceration, and repair is very slow and imperfect.

More than half of the cases of rodent ulcer which applied for treatment at the Radium Institute during the past year were of this character, and the destruction of

tissue was so great that no hope of satisfactory repair could be entertained.

CASES.

Rodent Ulcer of the Back.

In Case No. 102, F., aged 53, the disease was of twenty-five years' duration. All kinds of treatment had proved ineffective, and during the last three years the ulcer had steadily grown larger.

The patient was first seen on December 12th, 1911. There was a flat, roughly oval, shallow ulcer in the right lumbar region, measuring 4.2 by 2.7 cm. The patient was given one treatment with a half-strength applicator containing 70 mg. of radium, unscreened, for one and a half hours, on December 29th, 1911.

She reported herself for examination on February 2nd, 1912, when the ulcer was found to be almost healed and to measure only 2.6 by 1.3 cm. No further treatment was given, but the patient was asked to come again in two months.

She returned on May 14th, 1912, when the ulcer was seen to be completely healed.

Rodent Ulcer.

The patient (Case No. 66), M., aged 59, had an oval ulcer measuring 1.5 by 1 cm. situated just below the inner canthus of the left eye. It had begun two and a half years before and was steadily increasing in size.

A full-strength applicator was placed in contact with the lesion, without a screen, for two hours on November 9th, 1911. On February 24th, 1912, nothing of the lesion remained. In September a nodule the size of a millet seed appeared at the site of the former lesion. This was again treated as before and after a few weeks nothing save a faint scar was left.

Rodent Ulcer.

The patient (Case No. 133), M., aged 75, had been treated during three years by zinc ionization, carbon dioxide snow and radium, with temporary success, for a small rodent ulcer on the right ala nasi. Each new treatment had brought about an apparent cure, but recurrence took place within two months. On January 24th, 1912, a full strength applicator was placed in contact with the ulcer without a screen for one and a half hours. The reaction was slow, but by April nothing remained of the lesion but a small white depressed scar. There has been no trace of recurrence.

Rodent Ulcer of Ala Nasi.

In Case No. 175, M., aged 65, the disease was of three years' duration. He had been treated with x rays, high frequency, fulguration, and thoradin, but without any good result.

He was seen and treated on March 27th, 1912. He then had an almost circular ulcer, 1.3 by 1.4 cm., on the centre of the right ala nasi. The floor of the ulcer was very thin, being composed of but little more than nasal mucous membrane. The edge of the ulcer was much infiltrated, especially at its upper part. He was given one treatment with a full-strength apparatus applied for fifty minutes to the floor, and one and a half hours to the edge of the ulcer.

He was examined on May 23rd, 1912, when the ulcer was found to have healed perfectly, and to be covered with a smooth and supple cicatrix.

The patient, who lives in Canada, wrote at the end of August saying there was no sign of recurrence.

Rodent Ulcer.

Case No. 242, male, aged 49, had had a rodent ulcer on the left side of his neck for eighteen years. It had been treated by many applications of x rays, and three times by excision, but never healed completely.

When he came to have radium applied in June there was an ulcerated area of 10 by 7 cm. on the side of the neck. The whole of the area was covered by half-strength applicators with screens of $\frac{1}{8}$ mm. of lead, for four hours on each of four consecutive days. This treatment was repeated three weeks later. The upper part of the ulcer rapidly healed, while the edges became much thinner. Two similar treatments were given at longer intervals, and the physician reported towards the end of the year that the ulcer was nearly healed, and that the patient had left England.

Rodent Ulcer.

This patient (Case No. 5,137), F., aged 69, had been treated through nine years by many methods, including the cautery, carbon dioxide snow, and x rays, but never with complete success.

When she came she had an ulcer with raised margin measuring 2 by 1 cm., situated close to the inner canthus of the right eye. A half-strength applicator was placed over the ulcer without any screen for one and a half hours on May 1st.

On June 12th the ulcer had healed, but a nodule remained close to the inner canthus. This was treated by a small full-strength applicator, applied for one and a half hours without a screen; the nodule subsequently broke down. When the wound healed in July there was a smooth, soft, healthy scar.

Rodent Ulcer.

The patient (Case No. 5,044), F., aged 50, had a circular ulcer of 1.8 cm. diameter situated high up on the left cheek. It was of four years' duration and had recently increased in size more rapidly. She had had no previous treatment excepting with ointments.

On September 16th, 1911, a half-strength apparatus was placed directly over the ulcer for one and a half hours. On October 27th following she came to show herself, and a smooth white scar occupied the site of the former ulcer.

Rodent Ulcer.

Case No. 5,227, M., aged 60, when seen had a roughly circular lesion 2 cm. in diameter on the left eyebrow. It had existed for sixteen years in spite of treatment with lotions and ionization. The base was indurated, the margin was thick and irregular, and the floor red and tender.

A full strength applicator was put on the growth for one and a half hours without any screen on July 27th, 1912. The ulcer rapidly cleared up, and the induration slowly disappeared. When seen in November there was a perfectly smooth, healthy scar.

SARCOMATA.

Whenever possible sarcomata are best treated by the insertion into their centre of a tube containing 50 to 100 mg. of radium, with a screen of 0.5 or 1 mm. of silver; it is left in position for twenty or thirty hours; the application is repeated after a month.

This frequently proves most effective; the tumour steadily shrinks in size, and becomes replaced by a dense fibrous nodule which shows little or no tendency to grow.

If this method be impracticable, prolonged exposures with flat applicators screened with 1 or 2 mm. of lead, and placed so as to cover as great an extent of the growth as possible, and to produce a "cross-fire" action of the rays, will often do much to check the growth; but this procedure is not nearly so promising as the preceding one. In either case it is essential to give as vigorous a treatment as possible, as the great vascularity of these growths, and their rapid and wide dissemination by the blood stream, are factors which militate very strongly against the chances of success.

CASES.

Sarcoma of Superior Maxilla.

The patient (Case No. 148), M., aged 72, was first seen on February 20th, 1912, when the disease was stated to be of three months' duration. The growth was rapidly increasing.

Little or no alteration in the size of the maxilla was appreciable externally, but there was marked bulging downwards of the left half of the hard palate, and the left nostril was occluded by the pushing of the antral wall over to the nasal septum. The patient had epiphora and diplopia.

On February 20th an emanation tube (initial activity 44.5 mg.) in a screen of 1 mm. of lead was inserted into the growth, and left there for twenty-four hours. A portion of the growth was removed at the time of operation and submitted to microscopic examination. It proved to be round-celled sarcoma.

The patient was examined on April 25th. The bulging on the left half of the palate was much less, and the left nostril was no longer occluded. There was no diplopia and no epiphora. Transillumination, however, showed that there was still some abnormal opacity of the left antrum, and the patient was advised to have a second treatment.

On April 26th an emanation tube (initial activity 30 mg.) in a screen of 1 mm. of lead was inserted into the antral cavity and left there for twenty-four hours.

The patient's doctor wrote on July 20th, 1912: "I have again seen our patient, and he is wonderfully well. There is nothing in the nostril now, nor is there any pain. The swelling in the mouth has gone. His general condition is excellent."

Sarcoma of Pharynx.

At the beginning of 1912 the patient (Case No. 232), M., aged 56, experienced a choking sensation at night with a sharp pain in his neck. He consulted a surgeon, who found a swelling in the posterior pharyngeal wall, and, after a biopsy which showed the growth to be a sarcoma, excised the tumour, cutting down to the bone, which was found to be roughened. After this the patient's neck remained very painful and stiff, and, though it improved with massage, it still caused great suffering and inconvenience. Shortly after the operation a mass of granulation tissue in the posterior pharyngeal wall was treated with the cautery, but the wound never healed and there was continuous suppuration.

When seen on May 29th, 1912, the posterior pharyngeal wall was bulging forward. A rectangular area of ulceration, measuring 3 by 1.5 cm., covered with granulations, was situated on the centre of the prominence, with pus exuding from its lower end. Deep palpation behind the angles of the jaw revealed a swelling, more marked on the right side. The patient was very weak, had considerable dysphagia, and suffered from constant pain in his neck. The first treatment lasted through five consecutive days. Three applicators, containing 310 mg. of radium screened with 2 mm. of lead, were fastened externally below and behind the angles of the jaw, so as to cross-fire the affected areas. This was done five hours daily for five consecutive days. The exact situation was altered slightly from day to day. A small circular applicator, containing 30 mg. of radium screened with 1 mm. of silver and arranged with a thick lead case to protect the mouth, was held by a silver wire against the ulcer for an hour each day. Before this treat-

ment had been completed the patient reported that he had been able to sleep well for the first time for many months.

On July 16th he came to be treated again. He had then no pain or dysphagia. The suppuration had ceased and the pharyngeal ulceration had completely healed. The swelling in the pharynx was reduced to an oval prominence about 3 cm. long, and no definite tumour could be detected by external palpation. The patient was back at his ordinary work and feeling well. The treatment was then repeated, and the patient returned to his home. He has not reported since.

Lympho-sarcoma of Neck.

In Case No. 50, M., aged 41, the disease commenced in December, 1910, as a growth just below the right mastoid. An operation was performed in April, 1911; the growth on microscopical examination proved to be sarcoma. It recurred in June, 1911, and a second operation was performed on August 14th, 1911. There was recurrence again in September, 1911. The patient then consulted a leading hospital surgeon, who declared the condition to be inoperable and suggested radium.

The patient was first seen on October 24th, 1911. There was an oval swelling at the level of the angle of the jaw behind and below the right ear. It measured 6.5 by 4 by 1.3 cm.; it was hard and firmly fixed to the underlying tissues. The skin over its most prominent part was glazed and hyperaemic. The growth was the seat of occasional severe lancinating pains.

He had fourteen treatments between October 24th, 1911, and January 16th, 1912, with full-strength applicators containing 260 mg. radium screened with 2 mm. of lead. The growth steadily decreased in size and all pain disappeared.

When examined on February 16th, 1912, no trace of the growth could be found, and the patient expressed himself as feeling quite well.

He was seen again on June 29th, 1912. He was then in perfect health and had gained 9 lb. in weight.

Sarcoma of Thigh.

The patient (Case No. 211), M., aged 18, had an injury to the right thigh at the junction of the middle and lower thirds in March, 1912, and shortly afterwards an increasing swelling appeared at the site of the injury. The tumour was smooth and oval, with ill-defined edges, and slightly tender on pressure. Careful examination led an eminent surgeon to pronounce it to be periosteal sarcoma, and he advised operation, but the patient refused to submit.

On May 10th, 1912, an emanation tube with initial activity equivalent to 100 mg. of radium bromide, in a screen of 1 mm. of lead, was embedded in the tumour and left for twenty-four hours. A portion of the growth was removed at the time of the operation, and microscopical examination showed it to be spindle-celled sarcoma. Seven weeks later an emanation tube of initial activity equivalent to 75 mg., in a 1 mm. lead screen, was inserted for twenty-four hours. After the first treatment the tumour ceased to enlarge, after the second it became somewhat smaller, and the patient was able to walk with comparative ease.

The surgeon reported in November that no signs of dissemination had made their appearance, and that the original tumour was not causing the patient any trouble whatsoever.

NAEVI.

FLAT SUPERFICIAL NAEVI, CAPILLARY NAEVI—"PORT-WINE" STAINS.

These are the most difficult of all naevi to treat, and much care and patience must be exercised in order to bring about a satisfactory result.

The factor of personal idiosyncrasy is always prominent, and it is exceedingly difficult to lay down any definite rules as to strength and duration of exposure. It is best to proceed with great caution, giving a short, unscreened exposure, and if necessary gradually increasing the same until a satisfactory reaction has been obtained. As a general rule, apparatus of quarter or half strength should be used, the screening should not exceed 0.02 mm. aluminium, and the exposures should range from ten to sixty minutes' duration.

The best results can be looked for when the naevus is quite superficial, and shows no tendency to infiltration. If much infiltration exist the treatment will have to be much more vigorous, and a destructive reaction of slight degree produced. A smooth, supple, and white scar will be left.

CASES.

Capillary Naevus.

In Case No. 174, F., aged 19, the naevus was congenital; it was roughly circular, dark, plum-coloured, and about 3 cm. in diameter. It was situated in the centre of the right cheek. No previous treatment had been tried. On March 27th, 1911, a half-strength applicator screened with 0.01 mm. of aluminium was placed in contact with the naevus for forty minutes. A fair reaction followed.

On May 9th a quarter-strength applicator with the same screen was used for one hour. On June 20th the first treatment

was repeated. The patient was seen in September, when the naevus was so light in colour as to be scarcely noticeable, and the overlying skin was perfectly smooth.

Capillary Naevus.

The patient (Case No. 229), F., aged 4 months, was brought on May 29th, 1912, with a raised blue circular naevus 2 cm. in diameter over the middle of the left parietal bone. A full-strength apparatus screened with 0.04 mm. aluminium was applied to cover the lesion for seventeen minutes.

When seen a month later only the posterior margin remained discoloured, and the patient was treated with a half-strength applicator, screened as before, for twenty minutes.

On September 13th the naevus had almost disappeared, the tissues felt normal, and the hair was covering the slightly red area which remained.

Capillary Naevus.

The patient (Case No. 5,040), F., aged 16, came on September 11th, 1911, for treatment of a very disfiguring purple superficial naevus occupying the upper half of the left cheek. It dated from birth, and electrolysis and other treatment had brought about very little improvement. It was treated, a portion at a time, with a large quarter-strength or smaller half-strength applicators screened with 0.01 mm. of aluminium, the exposures varying from forty minutes to one hour. An interval of a month was allowed for each reaction. The patient emigrated in September, 1912, and the colour then was reduced to a fairly uniform pale pink tint, except close to the eyelids, where it was somewhat deeper.

CAVERNOUS NAEVUS.

These lesions are frequently particularly suitable for treatment by "cross-fire," and in such cases good results can generally be expected.

Half-strength applicators should be used with screens of 0.1 mm. of lead and exposures of from twenty minutes to one hour's duration, given daily for three consecutive days, and the series repeated in a month's time. Under this method of treatment the naevus slowly and steadily shrinks, and the process is unaccompanied by any surface irritation.

CASES.

Venous Naevus of Finger.

Case No. 19, F., aged 11, presented a venous naevus of the right middle finger, which was congenital but had slowly increased in extent in spite of two operations.

When seen in September, 1911, she had a large blue, pulpy, subcutaneous mass occupying the dorsal palmar and outer surfaces of the right middle finger. Two half-strength applicators, containing 60 mg. screened with 0.04 mm. of aluminium, were used to cross-fire the naevus, the exposure being twenty minutes. A sharp reaction followed.

On November 16th the naevus was smaller, and the treatment was repeated for a thirty minutes' exposure.

In January, 1912, and again in March the same applicators were used for forty-five minutes with a screen of 0.1 mm. of lead. Finally in May this treatment was repeated for thirty minutes on two consecutive days.

When seen in September the finger was normal in colour, and though some slight thickening remained it was not sufficient to trouble the patient either by its size or appearance.

Cavernous Naevus.

In Case No. 5,021, F., aged 1 year, a small naevus was present on the tragus of the left ear at birth, and rapidly increased to the size of a large orange in spite of treatment by electrolysis and carbon dioxide snow.

When first seen, in August, 1911, the cavernous tissue involved the lower part of the ear and the side of the neck, while a scarred swelling rested on the clavicle, dragging the child's head down to the left.

Four half-strength applicators containing 30 mg. each, with a screen of 0.1 mm. of lead, were used throughout the treatment; the exposures were made at first for four, and later for three, consecutive days, beginning with sittings of fifteen minutes each, gradually and carefully increasing the time to thirty minutes. The intervals allowed for reaction were slightly over a month. When seen in November the patient had had nine treatments in all. The naevus was reduced to the size of a pigeon's egg, occupying the posterior portion of the pinna and lobe of the ear. Some bluish capillary areas were present in the soft relaxed skin, but the scarring had almost completely disappeared, and the child's head was no longer displaced by the size and weight of the tumour.

Cavernous Naevus.

Case No. 5,104, F., aged 18 months, was brought to be treated for a large hemispherical pulpy naevus of 4.5 cm. diameter occupying the upper part of the left cheek. The condition had developed from a congenital red flat birth-mark, in spite of treatment with carbonic snow and electrolysis. The child's mouth and nose were distorted, and the swelling projected upwards in front of the left eye.

The exposures for this treatment were always given on three consecutive days with two half-strength applicators of 30 mg. each screened with 0.1 mm. of lead. The time of each sitting

was twenty minutes during the first treatment in February, 1912, increased by five minutes each time up to three-quarters of an hour. The treatments were given at intervals of slightly over a month, and the child has had eight in all.

When seen in December the lesion was reduced in size sufficiently to relieve the dragging on the mouth and nose, and there was no obstruction to vision.

This patient is still under treatment.

KELOID.

The results obtained in the treatment of this condition with radium are admirable. Keloids of recent formation and occurring in young subjects are the most easily cured. Applicators of half strength should be employed with screens of 1 mm. of silver and an exposure of from fifteen to twenty hours extended over three successive days. The series should be repeated at intervals of one month.

By this method of treatment a steady and gradual return of the tissues to the normal is produced without any surface irritation.

Small elevated and rapidly growing keloids may be safely treated by a single exposure of one to one and a half hours' duration with a half-strength apparatus unscreened. The resultant scar is usually quite smooth and supple, and shows no tendency to further keloidal formation.

CASES.

Keloid of Face and Hands.

Case No. 13, F., aged 27, was severely burnt on the face and hands with petrol on March 30th, 1911. Healing was not complete until the middle of June, and shortly afterwards all the scars became keloidal and rapidly increased in size.

The patient was first seen on September 11th, 1911. At that date there was a large, very dense, bright red keloid covering the nose and both cheeks, and occupying the position usually picked out by lupus erythematosus. Both lower eyelids were drawn down, and there was epiphora. There were other keloids over the forehead (most marked on the right side) while in front of each ear there was a dense keloidal band 0.3 cm. in height and running from the level of the external canthus to the angle of the jaw. Another small keloid was present on the left side of the upper lip. The face was like a mask, rigid and expressionless. The dorsal surfaces of both hands were covered with darkly pigmented keloidal masses which also implicated the thumb and the first and second fingers of the left hand, so that the finer movements of the hands were performed stiffly and with much difficulty.

The patient was under treatment from September 12th, 1911, to May 20th, 1912, receiving six series of treatments, each series being of five days' duration, with exposures ranging from two to six hours each day. The applicators used were of half strength, and screened with 1 mm. of silver.

The improvement was steady and uninterrupted, and when seen in September, 1912, scarcely any facial blemish was appreciable, the epiphora had disappeared, and the texture of the skin over the greater part of the face was normal.

All the keloidal tissues had disappeared from the hands, though the skin was still slightly pigmented.

Keloid of Chin and Cheek.

This child (Case No. 158), F., aged 14, was severely burnt about the neck and chin on April 17th, 1911. Keloid formation was first noted in the scar in September, 1911; since that date it had steadily increased.

The patient was first seen on April 17th, 1912. There were then two extremely dense keloidal bands passing from the under surface of the chin to the right sterno-clavicular articulation, and exercising so much traction that she was unable to close her mouth. There was another dense band running along the lower border of the right jaw from its angle to the symphysis menti, and all the skin between the right jaw and the clavicle was keloidal.

The case was treated with large-size, quarter-strength applicators screened with 1 mm. of silver; the exposures were of six hours' duration, and the patient received in all twenty treatments between March 11th and October 11th, 1912.

The child is still under treatment, but great improvement has already been effected. She can close her mouth perfectly, there is no longer any traction on the chin, the keloidal tissue on the right side of the neck has disappeared, and the dense bands leading from the chin to the sternum are much smaller and softer.

Keloid of Cheek and Chin.

In Case No. 5,060, F., aged 5, there was a very dense and highly coloured keloid, following on a burn received fifteen months previously.

The patient was first seen on October 30th, 1911. There was then a wide, ribbon-shaped band of keloid running from the right temple down the descending ramus of the jaw and spreading out so as to invest completely the right half of the chin on its inferior and lateral aspects.

The patient received in all thirty-two treatments between October 3rd, 1911, and October 15th, 1912. Half-strength applicators were used with screens of 1 mm. of silver, and each exposure was of three hours' duration.

Steady and uninterrupted improvement resulted from the treatment, and when the patient was examined on December 16th, 1912, scarcely any keloidal tissue was noticeable except at the right angle of the mouth, and this, the patient's mother stated, was rapidly disappearing.

Keloid Acne.

In Case No. 5,106, M., aged 37, the duration of disease was five years and all treatment had been ineffective. The patient suffered from intense irritation at the back of his neck, and a thick keloid patch 5 by 2 cm. had slowly developed, surrounded by an area of red, roughened skin.

The first treatment consisted in applying a quarter-strength applicator over the lesion for two hours on two consecutive days. The reaction was fairly sharp, with hyperaemia and tenderness, but the patch was much softer at the end of a month.

The second treatment was by a half-strength applicator for one hour, and this was repeated every five weeks till in December only a very small nodule remained in the centre of the part treated, and the patient was free from irritation.

No screen was used in treating this patient.

PAROTID TUMOURS.

These growths appear to be peculiarly susceptible to radium, and in almost every instance distinct improvement, frequently going on to apparent cure, is observed.

The treatment must, however, be lengthy, and much patience and perseverance are needed to bring about a successful result. Applicators of half or full strength should be employed and screened with 2 mm. of lead, the tumour should, if possible, be covered over its whole extent, and the exposure should be of not less than thirty hours' duration extended over five days.

The series of exposures should be repeated at intervals of four to six weeks so long as is necessary.

CASES.

Parotid Tumour.

The patient (Case No. 183), M., aged 53, was sent by a leading surgeon who had found him to be suffering from inoperable malignant tumour of the parotid. He had a hard oval tumour measuring 6 by 3.5 cm. firmly fixed to the ascending ramus of the right jaw. It was not tender on pressure, and occasioned very little discomfort, but it was growing rapidly.

The patient was treated on four occasions at intervals of six to eight weeks, the screen used being 2 mm. of lead throughout, and the exposure being four hours daily on alternate days for six, five, or four sittings; three to five full-strength and half-strength applicators, containing each from 20 to 80 mg. of radium bromide, were employed to cover the whole surface of the tumour, cross-firing it as much as possible, about 240 mg. being used on each occasion. After each treatment the swelling grew less, till only a hard nodule, measuring 3.2 by 2.4 cm., was left behind the angle of the jaw.

He is to report again if any further activity should become evident.

Parotid Tumour (Recurrent).

In Case No. 5,105, F., aged 18, the tumour was of four years' duration. It was removed by operation, July, 1910, but recurred in December, 1910. The growth steadily though slowly increased, and had not been checked by x rays.

The patient was first seen on February 5th, 1912, when there was a definite hard, fixed growth immediately below the lobule of the right ear. It measured 4.5 by 3 cm., and was distinctly tender to the touch. The patient complained of intermittent acute lancinating pains in it.

She received in all thirteen treatments between February 8th, 1912, and May 10th, 1912, with half-strength applicators screened with 2 mm. of lead, and the growth gradually decreased in size, and became far less tender.

When the patient came for examination on June 21st, 1912, the growth had completely disappeared. She no longer had any pain, and was in excellent health.

Parotid Tumour.

The patient (Case No. 5,150), F., aged 39, had a tumour excised from behind her right jaw in September, 1909; recurrences were removed from the same area in January, 1910, and February, 1911. A further recurrence was considered inoperable, and the disease was held in check for a time by x-ray treatment.

In May, 1912, the tumour was situated below, and anterior to, the right ear, filling up the fossa behind the jaw. It was oval, firm to the touch, and quite fixed, measuring 7 by 4 cm., and causing partial closing of the external auditory meatus. There was an enlarged gland to be felt near each end of the hyoid bone.

The patient was treated with five applicators, containing 260 mg. of radium, placed so as to "cross-fire" the tumour thoroughly, screened with 2 mm. of lead, for five hours daily for five consecutive days.

Two months later the tumour was reduced to half the size, and a further similar treatment with three applicators of 30 mg. each was carried out. In September no tumour could be felt, and the glands were shot size.

In November a very small nodule could be felt at the edge of the masseter. This was treated by a 20 mg. plate, screened with 1.5 mm. of lead, the time of exposure being as before. The nodule rapidly disappeared, and the patient was in excellent health when seen late in December, 1912.

FIBROMATA.

Two cases of fibromata of the penis have been treated, and both cured. In both instances all previous treatment had proved quite ineffective.

CASES.

Fibroma of Penis.

In Case No. 74, aged 56, the disease was of seven months' duration. No cause was ascertainable. The patient was awakened every night about 4 a.m. by painful erection, which occasioned him great discomfort and annoyance. He was impotent.

He was first seen on November 16th, 1911. There was then a small oval fibroma, 1 by 0.5 cm., situate on the dorsum of the penis in the middle line immediately behind the corona.

The patient was given eighteen hours' treatment six hours a day on three successive days, with a full strength applicator screened with 2 mm. of lead.

He reported himself on January 23rd, 1912. He stated that he had had no trouble or discomfort from painful erections since November 28th, and that he was no longer impotent. Palpation revealed the presence of an extremely dense nodule about the size of a BB shot at the site of the original tumour. It occasioned the patient no pain or annoyance. He has since remained perfectly well.

Fibroma of Penis.

The patient (Case No. 5,152), aged 51, had complained of a hard lump on the dorsum of the penis for nine months. It was not painful, but it caused slight retraction and impotence.

When seen in May, 1912, the tumour was the size of a walnut, and was situated in the corpus spongiosum at the root of the penis.

The patient had four treatments at intervals of about six weeks. On each occasion two full-strength applicators of 30 mg. each, screened with 2 mm. of lead, were fixed at right angles over the tumour for six hours daily for three consecutive days. There was a steady diminution in the size of the lump till in December it was no larger than a pea, and gave rise to no symptoms whatever.

FIBROID DISEASE OF THE UTERUS.

Only four patients suffering from this condition have as yet been treated with radium, and of these two only have been under observation long enough to enable any opinion to be formed as to the benefit which may be obtained. In both instances distinct improvement has resulted, but the cases are still under treatment.

CASES.

Fibroid Disease of Uterus.

In Case No. 237, aged 26, the disease was of three years' duration. The dysmenorrhoea and menorrhagia had steadily increased in severity. In May, 1911, she consulted a leading gynaecologist, who curetted the uterus; this was followed by slight but transient benefit. In April, 1912, she again saw her surgeon, who told her she had fibroids, and advised hysterectomy. This was declined and the patient determined to try radium.

She was first seen on June 3rd, 1912. She stated that her menstrual period lasted for seven days, the flow being excessive and the pain very severe, especially during the first three days, so that she was unable to leave her bed. Per vaginam the uterus was the size of a three months pregnancy and nodular. The cervix was hypertrophied, elongated, and oedematous.

This patient had two series of treatments, each for five consecutive days, six hours each day—the first June 3rd to 7th, the second July 22nd to 26th—with a tube containing 100 mg. of radium with a screen of 2 mm. of lead.

She reported herself on September 11th. Her last period, which occurred during the first week of September, lasted but four days; pain was only experienced on the third day, and then was but trifling. She estimated that the loss of blood had been reduced to one-eighth of the former amount. Vaginal examination showed no increase in the size of the uterus. The cervix was much firmer, shorter, and not oedematous.

The case is still under treatment.

Fibroid Disease of Uterus.

The patient (Case No. 5,690), aged 43, had suffered from menorrhagia, gradually increasing in severity for six years, till the period now lasted for a fortnight at a time and was accompanied by intense pain. She had also a constant mucoid discharge from the vagina, and was very thin and pale. She had some difficulty in walking.

Examination on June 6th, 1912, revealed a large irregular tumour reaching to the umbilicus, and by its size fixing a nodular and anteverted uterus in the pelvis. The anterior lip of the cervix was enlarged and oedematous.

The first treatment in January, 1912, was conducted by inserting a very small tube containing 50 mg. of radium bromide (screened by 1.5 mm. of lead) into the patulous cervix for six hours daily for ten days. This produced sufficient

amelioration of symptoms to make the patient wish for further treatment. In March a tube of 60 mg. was used as on former occasion for five days, and in May the 50 mg. tube was used as before for five days. By the end of the year the patient had had normal menstruation without much pain, and there was no vaginal discharge. She was looking and feeling well.

LICHENIFICATION OF SKIN.

This peculiarly intractable form of skin lesion is quickly cured by short exposures to half-strength applicators unscreened, or screened with the thinnest aluminium, and the relief afforded to the intolerable irritation is often marked within twenty-four hours. Cases so treated show little or no tendency to relapse.

Lichenification of Neck.

In Case No. 236, F., aged 31, the disease was of ten years' duration and had resisted all attempts at cure. There were two lesions—one, triangular in shape, with sides of 6 cm. in length, was situated at the lower part of the left posterior cervical triangle; the other, a circular patch 3 cm. in diameter, over the anterior surface of the left axillary fold. The patient complained of a frequent and almost intolerable irritation in the spots, which was aggravated by warmth and was exceptionally severe during menstruation.

She was treated on June 3rd, 1912, receiving a ten minutes' exposure with an applicator of half strength, screened with 0.01 mm. aluminium.

She reported her elf for examination on July 15th. The lesions had completely disappeared, leaving normal and healthy skin, and she stated that she no longer experienced even the slightest irritation.

She has since kept perfectly well.

Lichenification of Skin.

Fourteen years previously the patient, M., aged 58 (Case No. 278), was attacked by eczema on which lichenification developed. For several years itching had been a very marked feature of the case. When seen there were superficially scarred red patches over each clavicle. Between the shoulders at the back was a quadrilateral patch of skin with numerous scattered red papules. Similar lesions were present on the inner side of each knee and the sock area from the ankle upwards.

Five areas on the back were treated each for ten minutes with an unscreened quarter-strength apparatus. Three months later all the treated areas had responded well and the irritation had ceased. Six more patches were treated, and all cleared up in the same manner. There was no tendency to recurrence.

PRURITUS.

Radium is undoubtedly of great use in this condition, especially if it be of long standing and associated with leucoplakia or hyperkeratosis. When no actual lesion exists and the trouble is purely nervous in character the results are not so satisfactory, and often little benefit follows the application.

No definite rules can be laid down for treatment, as the local conditions vary so greatly, but the screening and exposures must be adjusted in relation to the character of the lesion.

CASES.

Pruritus Vulvae.

In Case No. 122, aged 62, the disease was of twenty-six years' duration. She had had every possible kind of treatment with lotions, ointments, baths, and high-frequency currents without success. The irritation at times was intolerable, and she was unable to get any rest.

She was first seen on January 5th, 1912. On examination two small hyperaemic and inflamed but non-ulcerative patches were found immediately within the ostium vaginae just above the fourchette, one on each labium, the right being the larger. She also complained of great irritation immediately above the clitoris, but there was no visible lesion at that site. Between her first visit and April 26th, 1912, she received in all nine treatments, each of five minutes' duration, with a half-strength applicator unscreened.

Slight but quite definite and persistent improvement followed on each treatment, and on May 9th she came to report herself as completely cured.

She has since kept perfectly well.

Pruritus Ani.

In Case No. 236, M., aged 57, the disease was of more than thirty years' duration. The patient was operated on by the late Mr. Allingham for a condition of hyperkeratosis of the anal orifice in 1897. He had, however, never been wholly free from pruritus since that date, and during the past two years the condition of hyperkeratosis had returned, and steadily increased, while the itching had become intolerable. All remedies had proved utterly futile.

He was first seen on May 24th, 1912. The anal orifice was cone-shaped and covered with a dense pearly epithelium, which was hard to the touch and traversed by numerous radiating fissures which showed the vascular corium at their base. The condition of hyperkeratosis extended upwards towards the

spine and forwards to the perineum, and was surrounded by a zone which was hyperaemic and eczematous.

The patient had three series of treatments between May 28th, 1912, and September 26th, 1912; each series occupied four days, with exposures of three hours' duration each day. Half-strength applicators were used with screens of 1 mm. of silver.

When examined on November 14th, almost the whole of the hyperkeratosis had disappeared, except for a small circular patch close to the anal orifice. There was no longer any irritation; the itching was but slight, was of an intermittent character, and easily bearable.

Pruritus with Leucoplakia Vulvae.

In Case No. 5,197, F., aged 50, the condition was of five years' duration. She was in a bad neurasthenic condition, due to the insomnia, loss of appetite, and loss of weight, which had followed on the almost ceaseless irritation.

She was first seen on June 25th, 1912, at which date there was a condition of hyperkeratosis in the angles between the folds of the labia minora, all round the ostium vaginae, and spreading backwards towards the anus. On the inner surface of the right labium was a rectangular patch of leucoplakia 2 by 3 cm. The patient complained greatly of the irritation, which she declared to be almost intolerable.

She had seven treatments between June 25th and September 5th, with the result that all the hyperkeratosis and leucoplakia disappeared, and the intolerable irritation became reduced to a very slight, inconstant, and quite easily bearable itching. She reports that she is still improving.

CHRONIC ECZEMA: PSORIASIS.

These conditions generally yield readily to short unscreened exposures with quarter-strength apparatus applied for two to three minutes on three successive days, the exposure being repeated after a week or fortnight if necessary.

With chronic eczema the cure may be permanent, but in psoriasis the patches tend to recur sooner or later, and require further treatment.

CASES.

Chronic Eczema.

Case No. 4, F., aged 52. This patient had been treated by routine methods for eighteen months for a widespread chronic eczema, but a number of intractable patches on the abdomen remained. Four of these were treated by an unscreened half-strength applicator applied to each spot for three minutes on three successive days.

In a month no sign whatever of the rash remained on the areas treated. Several other patches were treated in a similar manner, and all cleared up in the same remarkable way. Eight months later no recurrence had taken place.

Psoriasis.

In Case No. 5,148, F., aged 12, four small scaly patches of psoriasis were present eighteen months before the radium treatment was undertaken, one on each knee and on each elbow. The spots on the elbows had yielded to ichthyol, but no treatment had availed to clear the knees.

Quarter-strength plates were applied unscreened to the knees for periods of three minutes on three successive days. One month later the left knee showed only slight signs of the rash. The treatment was repeated to the left knee, and to a fresh patch that had arisen on the left elbow. In two months the elbow was free of disease, but the left knee still showed a small scaly area.

One month following the above date the knees and elbows were quite free from psoriasis, but two months later slight recurrences had taken place on each knee. The same treatment was repeated. The patient has not yet returned for examination.

LUPUS VULGARIS.

Treatment with Finsen light is to be preferred to radium in cases of this disease, and whenever possible it should always be adopted.

If radium be used, however, half-strength or full-strength applicators should be employed without screen, and a destructive reaction produced.

LUPUS ERYTHEMATOSUS.

This very intractable condition, which so often defies all treatment, is usually greatly improved by radium. Care must be taken not to give too strong a dose, and the best results usually follow the use of a quarter or half strength applicator sufficiently large to reach well beyond the borders of the lesion unscreened or screened with 0.01 mm. aluminium, and an exposure of forty to sixty minutes' duration.

CASES.

Lupus Erythematosus.

In Case No. 177, F., aged 31, the disease was of six years' duration, and began as a small spot just outside the outer

canthus of the right eye, whence it rapidly extended to the left cheek, nose, right cheek, and right upper eyelid. She had been treated with arsenic, quinine, iron, and mercury internally and salicylic acid, resorcin, and carbon dioxide snow locally, without benefit. Hyperaemia was a marked feature of the condition.

The treatment adopted was the application of unscreened quarter strength plates for an hour over various portions of the lesion. This was continued at intervals of a month for four months. The disease steadily retrogressed from the beginning. In October, 1912, the left wing of the lesion was hardly noticeable. Two small active patches were present, one on the left side of the nose, and one near the inner canthus of the left eye. Most of the right wing of the affected area was healthy, the lower edge alone remaining somewhat scaly.

The patient is coming at long intervals for treatment, and there is little doubt that her condition will eventually be cured.

Lupus Erythematosus.

In Case No. 5,129, M., aged 24, the condition began as a small whitish patch on the left cheek. It grew steadily, and a few months later a similar lesion arose on the right cheek. No vasomotor phenomena were present, except that both ears were scarred and somewhat purple in colour. Just before treatment there were three slightly raised red patches, one on the right cheek (2.5 by 3.5 cm.) and two on the left (2.5 by 1.3 cm. and 1.7 by 1.7 cm.). There was no rash on the nose. The red areas itched and smarted.

Treatment consisted of the application of a quarter-strength plate without metal screen for one hour over each patch. The reaction was smart, and the disease became less marked. All subjective symptoms ceased, and a month later the same treatment was repeated. This apparently cured the disease. Examination six months later showed the patches to be covered by smooth, supple, healthy scars, and no sign of activity had manifested itself.

TUBERCULOUS ADENITIS.

Prolonged exposures of from twenty to thirty hours' duration in all, with heavily screened radium apparatus emitting only the ultra-penetrating rays will generally bring about a steady diminution in size of the infected glands without causing supuration or surface irritation.

CASES.

Tuberculous Adenitis.

The patient (Case No. 34), F., aged 24, came in October, 1911, to be treated for two enlarged tuberculous glands below the left jaw. She had had several operations previously for the removal of similar glands.

Two applicators of 20 and 30 mg., screened with 2 mm. of lead, were placed so as to cross-fire the glands, and applied for four hours daily for three consecutive days. This led to a considerable diminution in size, and the treatment was repeated in November. The glands shrank to small hard nodules and caused no further trouble.

Tuberculous Adenitis.

The patient (Case No. 103), F., aged 16, came in December, 1911, to have treatment for an enlarged tuberculous gland fixed to the skin by scar tissue, the remains of an old sinus. Two full-strength applicators, containing 30 mg. each, were applied, with screens of 2 mm. of lead, for three consecutive days, that over the scar remaining for three and a half hours and that over the gland for seven hours each day. When seen four months later the gland had shrunk to the size of a BB shot, and was movable under the skin; the scar was scarcely noticeable.

ARTHRITIS DEFORMANS.

This extremely obstinate, progressive, and crippling malady is not infrequently strikingly benefited by the daily drinking of 250 c.cm. of radium emanation solution of a strength of 1 to 2 millicuries per litre. The treatment must, however, be persisted in for quite a long time, and at least six weeks are likely to elapse before any change is noted.

In a favourable case the articular and muscular pains are lessened or disappear, the movements of the affected joints become much freer and are accompanied by less grating, the muscles controlling the joints regain much of their lost tone, and the general health of the patient is greatly improved.

With the majority of the patients the emanation solution produces a definite diuresis, and with a few it acts as a slight laxative, though free purgation has never been noted.

Up to the present time only twenty-one patients have been treated, but the results obtained are sufficient to warrant the hope that radium emanation solution will prove a most valuable addition to the routine medical treatment.

CASES.

Arthritis Deformans.

In Case No. 197, M., aged 39, the disease was of twenty-five years' duration, the joints chiefly affected were the wrists, elbows, ankles, and knees.

The patient was first seen on April 25th, 1912. He complained of great pain, especially in his knees, elbows, and shoulders. He was unable to stand upright without sticks. He walked very slowly and with extreme difficulty, and could not cross his knees. The movements of his upper extremities were greatly restricted so that he was unable to brush his hair or shave himself.

The patient was put on a course of radium water, and took 250 c.cm. of radium emanation solution daily, except on Sundays, for eighteen consecutive weeks.

He was seen and examined on September 3rd, 1912, and very general improvement was noted. Pain in the affected joints was so slight as to be practically negligible, and he slept well. He was able to flex his knees and cross them one over the other. He could stand and put on his overcoat without supporting himself with a stick, and he stated that he felt much more secure when walking. The movements of his upper extremities were much freer and more exact, and he could now brush his hair and shave himself. Appetite was good, and the general health excellent.

The patient is still under treatment, and is steadily improving.

Arthritis Deformans.

In Case No. 220, M., aged 56, the disease was of four years' duration and commenced with synovitis of the right knee. The attack lasted for eighteen months, and was accompanied by much swelling and grating of the joint on movement. In January, 1912, the left knee-joint became affected and painful so that the patient was unable to bear his weight on his left leg.

He was first seen on May 17th, 1912. The left knee-joint was slightly swollen, and a little free fluid was present. Movement of the patella over the articular surface of the femur with the quadriceps tendon relaxed elicited slight grating, principally on the external aspect. The patient complained chiefly of a feeling of weakness and insecurity in the joint. The pain was not very severe and was most acute when he walked upstairs.

He received a six weeks' course of radium emanation water—from May 26th to June 29th. He was examined on July 11th, when he expressed himself as feeling much better, and said that the feeling of weakness in the knee-joint had disappeared, and that he was able to run a little. Examination of the joint showed a considerable diminution of the swelling, no free fluid was present, and passive movement no longer elicited grating. In October the improvement was still maintained.

Arthritis Deformans.

In Case No. 222, M., aged 35, the disease was of nine years' duration. It commenced in May, 1903, with synovitis of the right knee following an injury. The knee was kept in splints for two years under the assumption that the disease was tuberculous. At the end of that period the joint was firmly ankylosed. The right elbow and right wrist became affected in June, 1904, complete ankylosis of these joints was noted in June, 1909. The left hip and ankle were attacked in September 1908, the hip becoming almost completely ankylosed at the end of 1910. The disease made its appearance in the right hip in the year 1908, but this never became so severely affected as the left one. The patient had been treated with hot air, peat, pine, and electric baths, high frequency, massage, etc., and had had 5 gr. of guaiacol three times a day for three years; nothing had served to arrest the progress of the disease.

He was given two courses of treatment with radium emanation solution. Each course lasted for six weeks and the patient drank 250 c.cm. of radium emanation solution every day except Sundays. The first course was from May 20th to June 10th, the second from October 14th to November 25th.

He was examined on December 12th. Very great improvement had taken place. All his movements were freer. He could walk much better, and no longer had pain in any of the affected joints. He stated that he could now dress himself completely without any help, except putting on his shoes, a thing which he had not been able to do for more than four years. His general health was excellent.

The improvement is still being maintained.

Arthritis Deformans.

The disease in Case No. 5,084, F., aged 52, was of twelve years' duration. The first symptoms were limitation of flexion at the hip-joint and pain under the gluteus maximus of an intermittent character. These symptoms gradually increased in severity for ten years; but in November, 1910, the patient had an acute exacerbation, and all movements at the hip-joint became restricted, and were attended with intense pain. In September, 1911, this pain was so severe and constant that she was unable to sleep for more than half an hour at a time, and became extremely worn and emaciated. Every possible form of treatment—dietetic and medicinal—had been tried without effect.

The patient commenced to take radium emanation solution on October 9th, 1911, and continued until December 21st, 1911. Slight improvement was noticed about six weeks after the treatment commenced, and from that time progress was both steady and rapid. The patient was examined on December 28th, 1911. The pain at the hip-joint had disappeared and all

the movements could be accomplished with ease. She stated that she was able to button her boots, which had been impossible for the last ten years. She slept well every night, and was able to lie in any position without discomfort. The patient was seen again in November, 1912, and was quite well.

Arthritis Deformans.

In Case No. 5,194, M., aged 54, the disease was of eighteen months' duration; it had commenced in January, 1911, with severe synovitis of the left knee which left the joint swollen. All movements of the knee became painful and were accompanied by coarse grating. Wasting of the left thigh muscles was very marked. The left hip became affected in February, 1912. The patient had tried all forms of medicinal treatment, electric and hot air baths, but without much effect.

Treatment was commenced on May 14th, 1912, and the patient drank 250 c.c.m. of radium emanation solution of a strength of 6 millicuries per litre daily, Sundays excepted, until July 26th, 1912.

He was examined on September 3rd. There was then scarcely any restriction of movement at the left knee and hip, and all movements could be accomplished without pain. The wasting of the thigh muscles was no longer so pronounced, and the muscular tone was greatly improved. The patient stated that he was able to walk for three or four miles at a time without experiencing any discomfort.

This improvement has been steadily maintained.

GRANULOMATA.

Granuloma of Bridge of Nose.

The patient (Case No. 185), M., aged 16, struck his nose against a lamp-post on January 21st, 1912, splitting his skin in a vertical direction. The wound was sutured, but did not heal, and pus formed. It was then treated by fomentations, etc., and the split closed, but left a very marked thickening, which resisted all attempts to bring about its absorption. The thickening was confined entirely to the epidermis and subjacent connective tissue, and did not involve the periosteum. It was not tender, and only slightly painful on pressure, but occasioned the patient much annoyance by its unsightliness, as it gave him a Roman nose of an extremely pronounced type.

He was first seen on April 3rd, 1912, and received two treatments, each of six hours' duration, on April 4th and April 11th, with applicators of half strength, screened with 2 mm. of lead.

The mother of the patient wrote on June 3rd, 1912, saying that he had returned to school, that his nose was perfectly well, and there was no longer any distortion of its shape.

PAPILLOMATA.

Warty Growth.

The patient (Case No. 240), F., aged 30, was first seen on June 5th, 1912. A small, flat, warty growth was found on the

dorsal surface of the metatarso-phalangeal joint of the left great toe, 1 cm. in diameter, surrounded by a zone of marked hyperaemia.

It was of six months' duration, and had steadily grown in spite of all kinds of treatment. It was very tender on pressure and acutely painful. The patient could not wear a boot, walked with great difficulty, and was taking morphine in order to get sleep at night.

She was given one treatment with a full-strength applicator unscreened for one hour on June 5th, 1912. She reported herself on July 8th, when the growth was found to have completely disappeared. The patient was wearing a boot, and could walk perfectly well. All pain had gone.

PROPHYLACTIC TREATMENT.

During the period between September, 1911, and December, 1912, thirty-nine patients who had recently undergone operation for malignant disease received post-operative prophylactic irradiation. Only seven recurrences had been reported at date January 1st, 1913.

In the treatment of these cases full and half-strength applicators with screens of 2 mm. of lead and containing from 50 to 500 mg. of radium were used. The length of exposure varied between twenty and sixty hours spread over a period of three to ten days, according to the nature of the disease.

It would be utterly futile at so early a date to make any statement as to the precise value of radium treatment in preventing or minimizing the danger of recurrence, but as the majority of these patients had suffered from extensive, severe, and rapidly progressive malignant disease, and the operators had expressed grave doubts as to the probability of their remaining free from the disease for more than a few months, the relatively slight percentage of recurrences so far noted does much to justify the routine adoption of post-operative irradiation. It should prove of especial service in those cases of malignant growth in which it has been found impossible to operate well beyond the appreciable area of the disease.

In the compilation of this report much valuable assistance has been rendered by my assistants, Dr. J. E. A. Lynham and Dr. A. Burrows, who have been associated with me in the treatment of the majority of the cases described.

APPENDIX.

REPORT OF THE CHEMICO-PHYSICAL LABORATORY.

By W. L. S. ALTON,

FELLOW OF INSTITUTE OF CHEMISTRY; DIRECTOR.

THE Laboratory has been concerned since the foundation of the Institute with measurements in connexion with the purchase of the radium salts acquired. Not only have the available amounts of radio-active material been excessively uncertain, but until the recent preparation of International Radium Standards, the use of various methods of determining the activity proved that the real value of the term "radium bromide" differed as much as the methods themselves.

The laboratory has prepared, with a few exceptions, all the applicators now in use, and in fact was engaged in this work during the building and equipment of the Institute; so that at the time of opening, there were twenty-four pieces of apparatus ready for use. Since then, with the acquisition of more radium salts, eleven applicators have been added, which, with their maintenance and the additional applicators still to be made, will keep the staff constantly employed.

In addition, work and experiments with radium emanation have developed steadily; the increasing utility of this form of treatment, both by means of applicators and by means of radio-active solutions, has necessitated the setting aside of a very large amount of radium salts to provide the emanation required. The Laboratory is solely responsible for the preparation of radio-active applicators and screens in accordance with the prescriptions of the medical staff for work within and without the Institute.

The total activity of the emanation produced for this purpose, and for radio-active solutions, exceeds that of 6,900 mg. of radium bromide.

The preparation of a continual supply of radio-active water has now gone beyond the experimental stage, and has resulted in the construction of a new type of apparatus which appears to be highly efficient. The amount of radio-active water prepared since the opening of the Institute exceeds 400 litres.

Finally, the Laboratory is called upon to perform all the determinations of the activity of the apparatus employed, and, in the case of all emanation applicators, the dosage during the period of application.