Eczematous Reactions

We can now pass under review certain paradoxical reactions observed in the more extensive forms of eczema. We are all familiar with the type which, beginning symmetrically on the legs, subsides or even clears up notwithstanding an extension in an acute form to other regions—the arms, for example. In these cases a process of autosensitization may be presumed whereby the skin has become sensitized to the products of its own damaged cells set free because the original eruption has been scratched or otherwise irritated. To satisfy the facts, this and other hypotheses must in such cases concede the presence of a circulating agent which is carried to the skin and there provokes the eczema eruption. But under these circumstances all the skin areas should react in the same way at the same time, which does not happen. Therefore as certain portions of the skin recover as the result of treatment or spontaneously, while elsewhere the eruption extends or develops, we are entitled to infer that the skin is in a sense self-governing and can restore its integrity despite the continued action of the internal or humoral factor. Exogenous dermatitis, now to be considered, is that form of eczema in which the eruption is brought out by contact with one or several skin hazards—that is to say, certain external agents which are known to be capable of provoking an eczematous reaction by contact. The distribution will therefore usually be on the backs of the hands, fingers, and forearms. To this rule there are necessarily many exceptions, depending upon the kind of occupation and the nature of the skin hazard, of which a formidable list could easily be prepared from those in common use in the various industrial processes to-day. Nor do the circumstances of home life confer freedom from exogenous dermatitis, as witnessed by the housewife's hands, chapped and excoriated by contact with soap and water or other agents used for cleansing and similar purposes; or from the use of chemical fertilizers in the garden. In these cases there is some degree of the internal factor, otherwise all workmen and all housewives would become similarly affected. Nevertheless, as in this class of eruption the cause is clearly external, it is properly described as an exogenous or contact eczema.

Sometimes the skin is specifically sensitized to one agent, as in primula dermatitis. In such cases, because of an idiosyncrasy, the individual is permanently sensitized to the skin hazard.

Treatment of Eczema

From this it follows that the topical treatment of eczema is in all cases essential, and will usually take precedence over the general—which is logical, because we can see and treat the faulty skin and can directly observe its reactions. While there is no standard treatment for eczema as such, there are certain guiding principles, which may be summarized as follows. The eruption presents itself in an acute, subacute, or chronic phase, each calling for a different kind of local application. Thus in the acute phase decongestion of the inflamed skin by an evaporating lotion is required, whereas an ointment is usually contraindicated by reason of the heating effect of an occlusive dressing. In the middle or subacute period a paste is suitable, the powder incorporated in this paste rendering it permeable and allowing the passage through it of exudate. Finally, a stimulating ointment or small doses of x rays are employed in the chronic phase. From this it follows that where eczema is widely distributed, different regions may require different forms of topical treatment to accord with the various forms of local reaction. This design of treatment can be represented in the following framework.

The formula for the lead-glycerin lotion is as follows: glycerin of subacetate of lead, 1 oz.; glycerin, 1 oz.; and water to the pint. It is unfortunate that glycerin is in short supply, because we are thereby deprived of an invaluable remedy for which

there is no real substitute. Lead-glycerin lotion is applied as a moist dressing on white lint, which must be kept constantly wet. A word may be added concerning the form of superficial x-ray therapy prescribed for chronic rebellious eczema. This should be reserved for localized patches of refractory eruption, and especially for occupational dermatitis affecting the backs of the hands. One-half of a full dose—that is, one-half of the amount required to cause the hair to fall out—is given, and is repeated if necessary in four weeks' time. This treatment should, nevertheless, be entrusted only to those experienced in this very highly specialized branch of radiotherapy.

This is the positive approach to topical therapy. There is also the equally important negative—that is, the avoidance of those things which delay recovery or provoke a relapse. Scratching, the injudicious use of soap and water, the effects of sun and wind, which includes therapeutic ultra-violet irradiation, are all to be reduced or excluded so far as possible. In some cases small doses of a sedative may be called for to reduce the over-sensitive reaction to simple external stimuli. Rehabilitation has now become an integral part of modern treatment: the re-education of the skin is an essential to recovery, and this applies in particular to exogenous dermatitis. To resume work before all traces of the eruption have disappeared is to court further trouble; a period of convalescence adds considerably to the prospect of permanent recovery except where there is an idiosyncrasy which precludes any future contact with the specific injurious agent. This is no more than the application of those general principles of treatment which are fundamentally the same throughout all the branches of medicine.

VISUAL PHYSIOLOGY OF THE CINEMA*

BY

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The moving picture has in the past been used to a certain extent for educational purposes both in schools and in universities, and when photographic materials become available once more it is certain that there will be a very great exploitation of this teaching medium. The fighting Services and propaganda authorities have no doubt of the value of this dynamic method of illustration. It is axiomatic that the best way to learn about a thing is to study the thing itself; the next best is to study a motion picture, particularly a slow-motion picture, of it. The other available methods—hearing and reading, which have been so long our only alternatives—are certainly inferior. Since the cinema is likely to play an even larger part in our general environment than it does at present, it is important that medical people should have some elementary knowledge of the physiological problems of moving pictures.

Design of the Cinema

The student comes to the class-room to learn, and no unnecessary difficulties or distractions should be put in his way. The quality of the projection should therefore be better, if possible, than that attained in the commercial cinema. Fortunately a committee of the Society of Motion Picture Engineers (1941) has issued a series of recommendations regarding the proper use of 16-mm. equipment, as this size has been generally accepted as the standard for educational purposes. These recommendations are the basis of the present account of the technical design of the cinema.

The details of the picture can be clearly seen if the observer is seated not more than six screen-widths from the screen. A position too near the screen is not to be recommended, because, as a result of the great magnification of the photographic image, the picture on the screen—even when properly focused—lacks sharpness. It has been stated that efforts of accommodation made in attempts to improve the definition may fatigue the ciliary muscles. Flicker also tends to be prominent when too near the screen, but disappears when the observer moves back (Masterton and Kellog, 1942). At the front of the class-room, where the screen appears largest, the roving movements of the eyes necessary to follow the action may

* Abstract of a lecture delivered in the Tennent Institute of Ophthalmology, Western Infirmary, Glasgow.

be excessive and are apt to produce fatigue. These excessive movements may, moreover, reveal flicker not seen when the gaze is steadily maintained. Flicker may be manifest on entering a theatre, but as a rule in a few minutes the sensation diminishes or disappears.

The screen should be filled by moving about the projector, which, with the usual 2-in. lens, will be $5\frac{1}{2}$ screen-widths from the screen. There will be one position in the room where the perspective of the projected picture is correct: since most 16-mm. pictures are taken with a 1-in. lens (or are reduced from 35 mm., which amounts to the same thing) this position is half-way between the projector and the screen. Other positions may give rise to error in the estimation of relative sizes of objects, but this does not seem to be important; the camera-man may use lenses of different focal lengths, and obviously the observer cannot be in the correct position for every one. It is important, however, not to sit too much to the side; at 40 degrees from the line at right angles to the screen the screen appears square, and this is not a tolerable amount of distortion (Tuttle, 1933). For school projection the viewing angle should not be more than 30 degrees.

The committee therefore recommends (a) that a picture-width equal to one-sixth of the distance from the farthest row of seats to the screen position should be adopted for class-room projection; (b) that no pupils should be seated closer to the screen than twice the picture-width; and (c) that no row of seats should be longer than its distance from the screen (Fig. 1).

FIG. 1

FIG. 1.—Diagram of seating arrangement of class-room with mat screen of width W . The projector is situated at P . The thick line indicates the limit of the seating area.

FIG. 2

FIG. 2.—Diagram of seating arrangement for a narrow room with a beaded screen.

(Modified from diagrams in the *Journal of the Society of Motion Picture Engineers*.)

The screen has an important influence on the seating arrangements. A screen with a mat surface—e.g., flat white paint—is 90% as bright at 30 degrees from the perpendicular as at 0 degree; no modification of the recommendations is necessary. Some screens have their surfaces coated with small glass beads. In this case most of the light is thrown back towards the projector even when it is at an angle to the screen. An observer on the centre line of the class-room sees a picture about four times as bright as that obtained with a mat screen, but the brightness falls off rapidly as he moves to the side: the maximum viewing angle should be 20 degrees. When an evenly illuminated beaded screen is observed from the front of the room one part of the screen may be very much brighter than the other parts; to reduce the variation of brightness to a tolerable degree no seat should be less than $2\frac{1}{2}$ screen-widths from such a screen (Fig. 2). Screens coated with fine particles of aluminium, with either a smooth or a rough finish, should never be used for class-room projection as they show a pronounced bright area, and, being colour-selective, they are not suitable for colour films.

In a square room (Fig. 1) the mat screen is undoubtedly the best, and is certainly the kind to use. The beaded type may be used in a long room, with the precautions mentioned (Fig. 2). It is necessary to point out what is so often forgotten—screens need to be kept clean. A screen which has deteriorated may waste up to half the light falling on it, as well as cause distraction when the image appears to move across mottled areas (Falge, 1931). Wandering of the attention of the spectators is diminished if the area around the screen is dull and featureless; the border of the screen is probably better grey than black.

It remains to decide the brightness of the projected picture which will allow the eyes to work at full efficiency (Projection Screen Brightness Committee, 1936). If the light is too weak, picture quality suffers, contrast diminishes, high lights are weak, and detail cannot be seen from the back row of seats. If there is too much light, graininess may become evident, high lights dazzle, and flicker become apparent. It has been found by trial that the desirable brightness corresponds to 10 foot-lamberts* with the projector running but with no film in the machine. Under these conditions, at a speed of 24 frames per second with a two-bladed shutter there will be an objectionable 48-cycle flicker. Under normal conditions, however, flicker is not noticeable, because the brightness-range of the picture is usually from 8 to 28% of that of the blank screen. The brightness may be increased by using a two-bladed shutter in place of the three-bladed one often supplied; whether flicker becomes obvious depends partly on the illumination and partly on the projector design. Flicker and also film wear would be greatly reduced if a continuous instead of the present intermittent projection method were available; the optical difficulties are, however, considerable.

The required light output in lumens equals—

$$\frac{\text{Desired brightness (foot-lamberts)} \times \text{Area of screen (sq. ft.)}}{\text{Screen reflection coefficient (as decimal)}}$$

For example, a mat screen 3 ft. by 4 ft. with a reflection coefficient of 0.75 needs a projector output of $\frac{10 \times 12}{0.75} = 160$ lumens. It is expected that manufacturers will soon give values for their projectors. For ordinary class-rooms there will be no difficulty in obtaining adequate brightness with incandescent lamps, but where the screen size exceeds 8 or 9 ft. arc lighting may have to be used.

The quality of the picture suffers if the projection-room is not adequately darkened, but complete blackness is neither necessary nor advisable; a general room-light of 1/10 foot-candle (with which it is just possible to read newsprint) is not harmful, and may be appreciated for reasons of safety or of discipline.

The Illusion of Reality

Having dealt with some of the features in the design of the cinema, I should like to describe a few of the reactions on the spectators of what is presented to them on the screen. It is fairly true to say that most of the advances in film technique have been introduced to give the audience a greater feeling of reality. Mechanical improvements in cameras and projectors have made movement less jerky and have eliminated shake and flicker; development of radio technique has given us a sound accompaniment; photographic advances have improved tonal quality and have recently given us colour—surely a great step towards reality. We might well ask what will be missing from the complete illusion when stereoscopy is added, as it must be before very long.

The answer is that many things will be missing, the absence of which is not appreciated because of the accommodating and uncritical qualities of the human mind. The silent films seem very strange to us now and would not stir our emotions to any degree, though many of us can still recall how we were shocked when the films began to talk. We are accustomed to seeing pictures in black-and-white and we accept without question the absence of colour. To avoid undue mental shock colour has to be introduced gradually in the middle of a monochrome film. Disney's *Fantasia* was surely a riot of colour, but it began with rather severe shots of the orchestra in black and orange. Stranger still, when we see coloured films of natural scenery we are apt to describe them as unnatural when in fact the colour rendering is extremely good. The book *Film*, by Rudolf Arnheim (1933), is a most interesting example of this conservative attitude. Arnheim actually welcomes the photographic and physiological restrictions of the medium: the film cannot represent Nature accurately, and the more it attempts to do so the less likely is it to be artistic; and, further, colour and stereoscopy are considered to be dangers to artistic presentations because they make the moving picture too natural.

* A lumen is the amount of light falling in one second on a unit area placed at right angles to the direction of the light at unit distance from an international candle. The foot-candle is the unit of illumination equivalent to one lumen per square foot. A foot-lambert is the brightness of a surface emitting or reflecting one lumen per square foot.

The camera is single-eyed and therefore true vision of depth is impossible, but the image projected on the flat screen gives us a feeling of depth by variations in size and intensity, by perspective and parallax: a man walking away from the camera becomes smaller, less well-defined, and moves across the background. Occasionally I have noticed that viewing the screen with two eyes gives a smaller feeling of depth than does monocular vision—perhaps because both retinal images are the same. In the absence of stereoscopy perspectival excisions are sometimes rather obvious—the corner of a newspaper in front of a man's face may cut a piece out. There is no doubt that stereoscopy is the most important factor in perception of depth (Washburn and Wright, 1938) and that if it were added to cinematography a great step towards the complete illusion of reality would have been achieved. There is no short cut to stereoscopic vision: each eye must be given a slightly different view. A few stereoscopic moving pictures have been made and shown publicly. A number of methods are possible (Norling, 1941; Langlands, 1943), some of which do not even require the spectators to wear special apparatus over the eyes—surely an amazing example of human ingenuity.

Although the eye and the camera are constructed on similar principles, and although the images on the retina and on the film are, so far as we know, very much the same, yet we do not see exactly what is projected on the retina. If I stretch out my hand it does not seem to grow bigger, in spite of the increase in the size of your retinal image. This peculiarity of vision which gives us constancy of size and form has been called by Thouless (1931a, 1931b, 1932) phenomenal regression to the real object. A square card lying on a table in front of us is always seen as a compromise (the phenomenal shape) between the shape calculated from the laws of perspective (the stimulus shape) and the actual square (the real shape). The camera images and the projected images are faithful renderings of the stimulus shape, and may thus give rise to distortion. In cartoons it may be important to draw the shapes not according to formal perspective but so that the resulting sensation is the same as that evoked by the actual objects. Regression depends on clues of depth; if, therefore, the illusion of depth is complete, as in stereoscopic cinematography, the image thrown on the screen should obey the laws of perspective. Since at present the illusion is not complete a compromise between the phenomenal and stimulus shapes would probably give the best results.

The eye readily rejects images that are obviously inappropriate—e.g., the image of a squinting eye. The eye, like the camera, can be focused accurately for only a small range (depth of focus) at any one time. Out-of-focus images are not normally seen; continuous adjustment of accommodation ensures that each plane is examined while in focus, so that the subjective impression is that the whole depth of the scene is in accurate focus. The disadvantage of camera vision has been overcome by multiplane photography in which successive planes are focused in turn and recorded without blurring of detail.

It is curious how soon after entering a cinema we forget the severe restriction of the visual field—at two screen-widths distant it is 28 degrees, at six widths only about 9 degrees. Attempts have been made to increase the size of the film and of the screen, but these have not been successful. The small field of vision makes it difficult to replace clues normally provided by the proprioceptive nerve endings. In a street scene we may be shown barrows being pushed uphill with obvious effort to give us a second-hand notion of the appropriate muscular sensation denied to us lounging in our seats. Sometimes the camera is made to look round (pan) so that we may be given a wider view; when the picture is projected we get the impression that the scenery is floating past. If the eye is fixed, movement of an external object from right to left causes movement of the retinal image from left to right, and we are aware that the object has moved. When the eye glances from left to right the retinal image again moves from left to right, but the external object does not appear to move and may not even be seen. The failure of reciprocity can be clearly seen if a neon lamp on a.c. mains is used as the test object (Bell, 1943, unpublished). It seems reasonable to deduce that proprioceptive impulses arising in the external eye muscles are responsible for the reduction of visual sensation during eye movements. Normally we take in a scene in a series of glances, but if the camera made glancing movements the projected picture would be very unsatisfactory, since our proprioceptors would be unaffected. In the present state of physiology it is hardly possible to imagine how artificial but

appropriate proprioceptive stimulation could be supplied to an audience.

We are thus a considerable distance on the road to the complete illusion of reality, but there are many problems yet to be solved. It seems to me that a great bar to improvement of film presentation lies in the multiplicity and complexity of the techniques employed in one moving picture. It may even be that if the technique for the perfect illusion were available it would be an impossible medium. The main difficulty would be to find a superhuman creative worker who would be first an artist and then a technical expert in matters tactile, olfactory, proprioceptive, and auditory, as well as in three-dimensional colour.

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ENCEPHALOMYELITIS FOLLOWING VACCINATION IN FIFE

BY

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The three outbreaks of smallpox which occurred in Scotland during 1942—in Glasgow in May (32 cases), Methilhill, Fife, in August (29 cases), and in Edinburgh in October (36 cases)—were each followed in Fife by a public demand for vaccination. The vaccinal state of the public was low. It was estimated that in Methilhill only 20 to 30% of the population had been previously vaccinated; while at Cowdenbeath, a town in which one case of smallpox occurred at a late stage in the outbreak, between 40 and 50% had been vaccinated. The percentage of vaccinated infants in the county as a whole is normally 30.7. The number of people at all ages who received primary vaccination following upon the outbreaks was therefore in excess.

During the Glasgow outbreak free vaccination was offered in Fife through general medical practitioners, and no specific instructions were issued as to any method of insertion; but when cases at Methilhill were found to be suffering from an infection of high potency, and when one of them who had been vaccinated by the single-stroke method sickened with smallpox ten days later, instructions were given that three insertions be made 3/8 in. long and 1/8 in. apart. For the most part this method was followed, but it is known that some practitioners continued to employ the single-stroke method or undertook multiple scarification. It was not possible to collect accurate information regarding the sequelae of the methods used, but it was ascertained that severe local reactions and prostration more often followed the three-stroke method. This method was largely employed in the affected area, and absenteeism at the local coal-mines, which continued for an average of two days, rose from a normal level of 5% to 15%, and at a local emporium employing about 200 people from 0.5% to 6%.

In all, 54,698 doses of lymph were issued by the county public health department to private practitioners and to public clinics. Of these, 7,151 were obtained from a private firm immediately the presence of smallpox became known. The remainder came from the Government lymph establishment. Orders for lymph were placed daily, so that fresh material was always in use. Stocks were kept in refrigerators overnight.