their compounds with chinoline. Then follows a determination of the vapour density of chinoline, and an examination of the action of the iodides of the alcohol radicals on the base, and some of the products of the decomposition of the hydriodates of the ammonium bases so formed.

He also examines the chinoline series as it is obtained from coal-tar, and proves the presence, in addition to chinoline, of lepidine, and a new base, "cryptidine."

In the course of the investigation, the following compounds were analysed :—

Platinum salt, chinoline,	$C^{18} H^7 N, HCl, + Pt Cl^2$
Gold,	$C^{18} H^7 N, HCl, + Au Cl^3$
Palladium,	$C^{18} H^7 N, HCl, + Pd Cl$
Cadmium,	$C^{18} H^7 N, HCl, + 2 Cd Cl$
Uranium,	$C^{18} H^7 N, HCl, + (U^2 O^2) Cl$
Nitrate of chinoline,	$C^{18} H^7 N, + NO^5 HO$
Bichromate,	$C^{18} H^7 N, + 2 (Cr O^3) HO$
Binoxalate,	$C^{18} H^7 N, + 2 (C^2 O^3 HO)$
Platinum salt, methyl-chinoline,	$C^{20} H^9 N, HCl, + Pt Cl^2$
Hydriodate ethyl-chinoline,	$C^{22} H^{11} N, + HI$
Platinum salt, ethyl-chinoline,	$C^{22} H^{11} N, HCl + Pt Cl^2$
Hydriodate amyl-chinoline,	$C^{28} H^{17} N, HI$
Platinum salt, amyl-chinoline,	$C^{28} H^{17} N, HCl + Pt Cl^2$
Platinum salt, lepidine, from coal-tar,	$C^{20} H^9 N, HCl + Pt Cl^2$
Hydriodate ethyl-lepidine,	$C^{24} H^{13} N, HI$
Platinum salt, ethyl-lepidine,	$C^{24} H^{13} N, HCl + Pt Cl^2$
Platinum salt, cryptidine,	$C^{22} H^{11} N, HCl + Pt Cl^2$

3. On Fermat's Theorem. By H. Fox Talbot, Esq., F.R.S.

The author gave a simple demonstration of the proposition, that $a^n = b^n + c^n$ is impossible, when $n > 2$, and either of the numbers, a, b, c , a prime number.

4. On the Transmission of the Actinic Rays of Light through the Eye, and their relation to the Yellow Spot of the Retina. By George Wilson, M.D.

In 1849 the learned Swiss philosopher Wartmann stated, in his "Deuxième Mémoire sur le Daltonisme," p. 40, that "the eye

arrests the chemical radiations which accompany the more refrangible rays." He founded this conclusion on experiments made with guaiac resin; but as this substance is by no means very sensitive to actinic influence, it seemed desirable to test the question whether the eye can transmit the chemical rays of light, by an appeal to those highly impressible *actinolytes* (as they may be called) which the recent progress of photography has revealed to us.

The necessary trials were kindly made for me by Messrs Dick and Spiller of London, and their results, which are opposed to those of Wartmann, were published last autumn in the Appendix (p. 166) to my *Researches on Colour-Blindness*.

I now lay upon the Society's table photographs of small objects, on glass and paper, produced by rays which, before reaching the sensitive surfaces, had traversed the transparent humours of an ox's eye. These photographs were obtained by the gentlemen I have named in the following way:—

"An ox-eye was prepared by cutting away the sclerotic until the choroid came into view; a circular aperture of one-eighth of an inch in diameter was then made through this membrane and the retina, which laid bare the vitreous humour at a point opposite to that where the light enters. The eye was then supported in the brass mounting of a photographic lens (*i.e.*, a brass tube adapted to the front of a camera), resting at the posterior end on a ring of cork which fitted tightly into the tube, and retained in front by a diaphragm, so as to permit the cornea to protrude. From the arrangement of the fittings, we are quite satisfied that no light excepting that which passed through the eye could enter the camera.

"Within the dark box, a strip of black paper, with a diamond-shaped or rhombic aperture occupying the greater part of its breadth, was extended across in front of the prepared collodion glass plate, so as to throw its image on the latter, in the event of any chemical rays finding their way to it. The camera was then pointed to the sky (the morning being bright and the sun shining), and the plate exposed for fifteen seconds. On developing with solution of sulphate of iron, a very decided picture appeared. The glass plate which accompanies this paper was the result of twenty seconds' exposure.

"The conclusion derived from this experiment, although perfectly

satisfactory to those who arranged the apparatus, is open to the objection, on the part of others, that the picture does not present any *prima facie* evidence of its being the result of rays which passed through the eye. We therefore endeavoured to copy photographically the actual image which is depicted on the retina. To do so, another bullock's eye was carefully dissected, so as to open a circular space of about three-eighths of an inch in diameter at the back of the eye, the retina was removed, and a very thin film of glass, in shape like a watch-glass, substituted for it; this supported the vitreous humour in its original position, and served also to prevent its contact with the photographic paper placed behind to receive the impression. In another trial, the retina was left untouched, without altering the ultimate result.

“ Iodide of silver paper was then made sensitive to light by a wash of gallo-nitrate of silver, and used as in the Talbotype process, small squares of the wet paper being successively applied to the back of the thin glass film, and exposed for varying periods (one minute on an average) to the different objects to which the bullock's eye was presented. On developing the latent images with strong gallo-nitrate of silver, very distinct pictures were obtained *of a key* and *of a spotted window curtain*. These negative pictures are inclosed. It is thus beyond a doubt that the chemical rays penetrate the humours of the eye, and impinge upon the retina.

“ ALLAN B. DICK.

“ JOHN SPILLER.”

It thus appears that the actinic or chemical rays are not arrested in their passage across the chamber of the eye; and it becomes an important question how they will affect the general surface of the retina on which they impinge, and what share they have in producing vision. Into this problem, as a whole, however, I do not purpose to enter: the question I alone consider is the change which the actinic rays will undergo when they fall upon that peculiarly organized portion of the human retina which anatomists distinguish as the “yellow spot.” This “spot,” almost peculiar to man, presents a diameter of about $\frac{1}{12}$ th inch, and occupies the bottom of the eye, in the exact axis of its transparent humours. It is more transparent than the rest of the retina, and has long been recognized as the seat of most perfect vision in the eye of man. I have elsewhere drawn

attention to the effect which it must have as a coloured medium on the light which reaches it,* and on the actinic rays which traverse it. I wish now to carry these views a step further, in connection with the reflection of light from the choroid through the retina, which was discussed before the Society last session, in a paper "*On the Eye as a Camera Obscura*," and which, before and since, has been largely made the subject of independent inquiry by foreign and British observers. In particular, Professor Goodsir has shown, in a lecture delivered in the University of Edinburgh last June, and since published,† that it is not merely the case that light traverses the retina to the choroid, and is then reflected so as to return through the retina, but that *it is only the rays thus returned which produce a luminous sensation*. The light, therefore, which traverses the yellow spot, and is then reflected forwards on the choroidal extremities of the optically sensific constituents of the retina, must have been deprived, to a greater or less extent, of its actinic rays, before it determines a luminous sensation, unless the portion of the retina under notice differ from all other yellow transparent media known to us, in not arresting the chemical rays. If it be not in this respect exceptional, then the theory of perfect human vision may be simplified by the exclusion from consideration of the actinic rays; and one use of the yellow spot, for which it has hitherto baffled physiologists to find a use, may be to extinguish these radiations. I offer this only as a suggestion, the value of which must be determined by testing the chemical power of light after it has traversed the yellow spot,—an experiment which only those few anatomists can try who have the opportunity of examining the human eye soon after death.

I will only, therefore, remark further, in reference to the absorption of the actinic rays by the yellow spot (with which this paper is chiefly concerned), that the views of those who have described visual impressions on the retina, as phenomena of the same kind as photographic impressions on surfaces charged with salts of silver, or other actinolytes, must fall to the ground if the actinic rays of light are stopped before reaching the optically sensific constituents of the retina. The similar opinion, also, that "spectral vision," and other abnormal peculiarities of sight, are phenomena of the same kind as

* Researches on Colour Blindness, p. 83.

† Edinburgh Medical Journal, October 1855.

the development (as it is technically called) of latent photographic images, must, for the reason mentioned, be abandoned. It will still, of course, be competent to compare normal and abnormal vision with photographic effects, as phenomena displaying analogy, though not affinity.

To one other relation of the retina to light, I make the briefest reference. If only those rays which are reflected from the choroid produce, by their impact on the retina, the objective perception of light, and if the depth of tint of the yellow spot be considerable, and its colour at all homogeneous, then perfect vision must be exercised by yellow, not white light. But if this be the case, we should be unconscious of red and blue when seeing best, or at least should receive from them an impression very different from that which they occasion when they affect the general surface of the retina. I forbear, however, to speculate on this, seeking rather to direct the attention of the few anatomists who have the opportunity of investigating the subject to an examination of the chromatic as well as the actinic relations of the yellow spot, than desiring to dogmatize on either.*

P.S.—I take this opportunity of expressing my regret, that in a postscript, added after it was read, to the paper in the Transactions of the Society for last session, “*On the Eye as a Camera Obscura*,” I inadvertently misstated the views of Professor Goodsir on the retina referred to in this communication, and had not an opportunity of amending the statement before the Transactions were published. I have, therefore, to request those who wish to do justice to Mr Goodsir, to consult his lecture on the Retina, published in the “*Edinburgh Medical Journal*,” for October 1855.

The following Donations to the Library were announced:—

The Assurance Magazine, and Journal of the Institute of Actuaries,
Vol. vi., Part 3. 8vo.—*From the Institute.*
Proceedings of the Ashmolean Society, 1855. 8vo.—*From the Society.*

* According to some eminent authorities, there is an aperture in the centre of the yellow spot. If such be the case, light may pass and repass by it without being coloured; but as such light will in both journeys fail to impress the retina, it cannot contribute to the production of a luminous sensation.

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- The Journal of Agriculture, and the Transactions of the Highland and Agricultural Society of Scotland. N. S., No. 52. 8vo.
—*From the Society.*
- Journal of the Asiatic Society of Bengal. N. S., Nos. 5 & 6. 1855. 8vo.—*From the Society.*
- Bulletin de la Société de Géographie. 4^{me} Série. Tome x. 8vo.
—*From the Society.*
- Verhandlungen der Kaiserlichen Leopoldinisch-Carolinischen Akademie der Naturforscher. Bd xxiv., Supp. Bd xxv., Heft 1. 4to.—*From the Academy.*
- Smithsonian Contributions to Knowledge. Vol. vii. 4to.—*From the Smithsonian Institution.*
- Abhandlungen der Kaiserlich-Königlichen Geologischen Reichsanstalt. Band 2, 1855. Fol.
- Jahrbuch der Kaiserlich-Königlichen Geologischen Reichsanstalt, 1855. No. 1. 8vo.—*From the Institute.*
- Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe. Bd xvii., Heft 3. 8vo.—*From the Academy.*
- Coup d'œil Géologique sur les Mines de la Monarchie Autrichienne. Par Fr. de Hauer & Fr. de Fœtterle. 8vo.—*From the Authors.*

Monday, 21st April 1856.

SIR DAVID BREWSTER, K.H., V.P., in the Chair.

The following Communications were read :—

1. On the Prismatic Spectra of the Flames of Compounds of Carbon and Hydrogen. By William Swan, Esq.

While the prismatic spectra of the blue portions of an oil-lamp or coal-gas flame, exhibit a number of bright lines, separated by dark intervals, the spectra derived from the bright light of these flames are perfectly continuous. Apparently inconsistent results are in like manner obtained when the flames of different compounds of carbon and hydrogen are compared. Thus, lines are easily seen in the