II. "On the Acceleration of Oxidation by the Least Refrangible End of the Spectrum." Note II. By Captain Abney, R.E., F.R.S.  Received June 8, 1878.

In my first note on this subject it was stated that further experiments would be undertaken, in which sensitive films would be exposed to the action of the spectrum in atmospheres free from oxygen. These have been carried out by means of apparatus specially designed for the purpose, hydrogen and nitrogen being the atmospheres employed, and in some cases hydrogen vacua. In every case the experiments were confirmatory of what was previously surmised, the image showing no signs of oxidation, and there is evidence to show that the limit of sensibility of the compounds used is lowered towards the least refrangible end of the spectrum.

Exposure of films in solutions which readily combine with oxygen, and at the same time with the halogens, have given most remarkable results. For instance, silver bromide which by its colour should have proved sensitive to the red end, yet when exposed in the usual manner was insensitive below B in the spectrum, proved sensitive when exposed in sodium sulphite \( \text{Na}_2\text{SO}_3 \), and arrived at M the lowest limit (about W.L. 12,000) which I have as yet photographed. In the same solution, to quote another experiment, silver iodide proved sensitive to a point between a and A. The experiments were carried out in duplicate. In one the plate was immersed in the solution, and in another the salt was dissolved when possible in glycerine and applied to the film. Both methods answered equally well, but for some purposes the latter is more convenient.

My experiments also prove, that what is technically known as solarization is due to the oxidation of the image, accelerated by light generally, be it the more or less refrangible end of the spectrum. This oxidation causes the formation of a compound which is undevelopable, as already has been pointed out. It has thus been found impossible to produce solarization in solutions which have oxygen absorbents. We may therefore conclude that the whole spectrum exercises a reducing action on the sensitive salt, and that this reduced compound is again capable of being oxidized by it.

The relative power of the two actions seems to vary according to the part of the spectrum. This subject is still under consideration.

In my first note I also mentioned that photography in natural colours probably depended on the same action. My surmise is confirmed to a great extent. If silver sub-chloride or silver sub-bromide be produced chemically, we have a dark compound formed which, if exposed to the action of the spectrum whilst in an oxidizing solution (such as hydrogen peroxide), rapidly takes the colour of the rays acting upon it,
the yellow being the least marked. The red, green, and blue are however particularly well rendered by reflected light, and the plate shows the colours as seen when a dull light is thrown on the slit of the spectroscope, a simile which was suggested to me by Mr. Norman Lockyer.

From the evidence obtained by these experiments it appears that two or three molecular groupings are sufficient to give the necessary colours, a subject which I only allude to, since the more general question of molecular groupings is being considered by others.

III. “A Tenth Memoir on Quantics.” By A. Cayley, Sadlerian Professor of Pure Mathematics in the University of Cambridge. Received June 12, 1878.

(Abstract.)

The present memoir, which relates to the binary quintic \((x, y)^5\), has been in hand for a considerable time; the chief subject-matter was intended to be the theory of a canonical form discovered by myself, and which is briefly noticed in “Salmon’s Higher Algebra,” 3rd Ed (1876), pp. 217, 218; writing \(a, b, c, d, e, f, g, \ldots u, v, w\), to denote the 23 covariants of the quintic, then \(a, b, c, d, f\) are connected by the relation \(f^2 = -a^2d + a^2bc - 4c^3\); and the form contains these covariants thus connected together, and also \(e\); it in fact is \(1, 0, c, f, a^2b - 3c^2, a^2e - 2cf)^5(x, y)^5\).

But the whole plan of the memoir was changed by Sylvester’s discovery of what I term the Numerical Generating Function (N.G.F.) of the covariants of the quintic, and my own subsequent establishment of the Real Generating Function (R.G.F.) of the same covariants. The effect of this was to enable me to establish for any given degree in the coefficients and order in the variables, or, as it is convenient to express it, for any given deg-order whatever, a selected system of powers and products of the covariants, say a system of “segregates;” these are asyzygetic, that is, not connected together by any linear equation with numerical coefficients; and they are also such that every other combination of covariants of the same deg-order, say, every “congregate” of the same deg-order, can be expressed (and that, obviously, in one way only) as a linear function, with numerical coefficients, of the segregates of that deg-order. The number of congregates of a given deg-order is precisely equal to the number of the independent syzygies of the same deg-order, so that these syzygies give in effect the congregates in terms of the segregates: and the proper form in which to exhibit the syzygies is then to make each of them give a single congregate in terms of the segregates, viz., the left hand side can always be taken to be a monomial congregate \(a^n b^\beta \ldots\), or, to avoid fractions, a numerical multiple of such form, and the right hand