not true that Hübner used "binomials" during the period mentioned by Mr. Forbes, and it can only be by sophistry, which flies in the face of Hübner's own usage and explicit and oft-repeated statements, that it can be made to even seem that he used "binomials" in the period indicated. He came to use binomials at a later date, and finally toward the end of his life adopted the "binomial system of nomenclature," as we know it to-day. The legends of the plates in Vol. I of the *Sammlung exotischer Schmetterlinge* are *not* binomial, they are *absolutely* trinomial. I squarely take issue with Mr. Forbes on this point.

My motive for writing the foregoing lines is to simply let any reader of SCIENCE, who may have read my article of July 1 and Mr. Forbes's reply, understand that I am in thorough disagreement with him. I do not wish silence on my part in these columns to be construed as assent.

W. J. HOLLAND

CARNEGIE MUSEUM

VISIBLE RADIATION FROM EXCITED NERVE FIBER AGAIN

THE phenomenon of the "Reddish Blue Arcs and the Reddish Blue Glow of the Retina" is a very remarkable one—especially when it is exhibited (as I exhibit it) in a dark room before a whole audience at once. All are agreed that one is seeing entoptically certain optic nerve fibers on the surface of the retina —but why are they visible? I have given reasons for believing that they are emitting physical light—and this has required no "violent efforts of the imagination," as Dr. Davis[1] supposes that it has done—one has only to remember that nerve, when excited, gives out heat, and that heat is, objectively, the same thing as light. It happens that a physicist has just stated this explicitly: "The experimental evidence for thinking that light is a form of energy and *that radiant heat is of exactly the same nature as light* is overwhelming."[2] (Italics mine.) But may the cause be (Gertz) a secondary stimulation of some organ-fibers, ganglia, bipolar cells, or rods and cones—by means of action currents? There is a residual image, so nothing but rods or cones can be concerned—they alone contain the highly specific light-sensitive substance which furnishes a residual image. An electric current sent in from the outside gives visual sensations but with no residual image; "this does not prove, however," says Dr. Davis, "that an electrical disturbance *localized in the retina* (italics his) might not stimulate the photosensory mechanism directly." Now a current from the outside might conceivably have attacked the optic nerve only after it has left the eyeball, but that it actually runs along the fibers on the surface of the retina is proved by the fact that structural details of the retina are marked out by it—for instance, at certain intensities the blind spot will be seen to be of a different color from the rest of the field. Since this is the case, it is inconceivable that an action current generated *within* the nerve fiber should play any different rôle from one that comes into it from a battery on the outside. It follows that nothing but physical light attacks the photosensory mechanism.

My theory has now been beautifully confirmed by Deane B. Judd, of the Bureau of Standards (*American Journal of Psychology,* October, 1927).

CHRISTINE LADD-FRANKLIN

[1] SCIENCE, 1928, LXVII, 69.

[2] Crew, Henry, 1927, "General Physics," 319–320.

QUOTATIONS

GENESIS AND EVOLUTION

THERE will be no more monkeying in the public schools with the Mosaic account of creation as recorded in the book of Genesis, if Representative Hobbs's bill to prohibit it finds favor with his fellow members of the General Assembly and is approved by the Governor. Mr. Hobbs, who is the accredited representative of the sovereign legislative district composed of Wolf and Powell Counties, has introduced a bill to prohibit the teaching in the public schools of the state any theory of evolution that conflicts with his understanding of the sacred texts of Holy Writ.

Statesman Hobbs has eight children, whose simple faith in the Hebraic account of creation he would protect with the strong arm of the law. Many earnest, honest sticklers for the letter of the law will approve and applaud this zealous guarding by the Wolf-Powell statesman of the faith once delivered to the saints. Why should the great Commonwealth of Kentucky trail behind progressive states like Tennessee and Texas in this matter of protecting its youth against this threatening heresy? Was not the Grecian Socrates put to death for corrupting the faith of the youth in his time, respecting the virtues of the gods? Was not Galileo severely punished by the Hobbs law of his age for contradicting the Biblical teaching about the solar system?

Representative Hobbs serves well his state in seeking to call a halt on these venturesome modern school teachers. They have already poisoned the minds of a mighty multitude with the false doctrines that the earth is round, that the planets revolve around the sun, that this earth instead of being the sum and center of the universe is but a sand grain on the limitless shores of creation and, instead of being only six thousand years old, has been revolving through space for

untold ages. What about these idle fellows who spend their nights, not in honest sleep, but in peering through great telescopes into the starry heavens, or instead of reading the story of creation, so beautifully told in the book of Genesis, go reading the riddle of the rocks in a vain effort to controvert Moses' account of the beginning of things?

This revolutionary evolution theory is gaining alarming headway, and unless something is done about it right away there is no telling what may happen. And popular education is doing it. Woodrow Wilson, the greatest educator of his time, when asked his opinion of evolution said: "I take it no educated man questions the established fact of organic evolution." The schools and universities are to blame for the spread of this dangerous doctrine, and if statesman Hobbs would insure the rising generation against this corrupting teaching he should introduce a bill abolishing all public and private schools. The uneducated man accepts what he has been told by mother and the preacher; asking no questions. But as soon as the child appears in school, he begins to ask a reason for things. Oh, for a return of the simple faith in witches and ghosts and horse shoes and rabbit feet, a flat earth and a revolving sun, etc., and no questions asked. Lawmaker Hobbs is Kentucky's hope for this happy return of the good old days, but, alas! it is to be feared that he is casting his pearl before swine in that sceptic bunch at Frankfort.—*Kentucky Republican.*

SEPARATIONS BY THE IONIC MIGRATION METHOD

THE development of the ionic migration method for effecting difficult separations has been described in a number of articles appearing in the *Proceedings of the National Academy of Sciences*[1] and in the *Journal of the American Chemical Society*.[2] This series of investigations, carried out at Columbia University between 1920 and 1926 and continued at New York University since the latter date, has now given results of interest in several quite diverse fields. The presentation of an informal summary and the correlation of the results obtained are the purposes of this paper.

The work was started as an attempt to devise a practicable method for the separation of isotopes. Other investigators had succeeded in obtaining, at best, only a very slight degree of separation of isotopic elements into their various atomic species after heroic expenditures of time and labor by other methods, and it appeared that there did exist the possibility here of obtaining a quick and decisive result. The situation with regard to ionic mobility may be explained very briefly. A long-standing controversy has been waged on this property; one school insisting that ionic mobility is fundamentally dependent upon ionic volume, another being equally confident that it is fundamentally dependent upon ionic mass. The results available in the literature for homologous series of organic anions and cations have been utilized by both parties to give their respective points; but, since we have no definite knowledge as to what amount of solvent accompanies any ion in its journey towards an electrode and since it is the *total mass* or *total volume* of the ion and of its accompanying solvent envelope which must be taken into account, such data obviously offer us no means for definitely determining the problem.

The discovery that isotopes possess *equal atomic volumes,* made by Soddy and Richards in 1914,[3] first put us in a position to impose a crucial test, for isotopic ions necessarily *differ in mass.* If mass is influential, therefore, it should be possible to obtain a separation of isotopes by taking advantage of the fact that the lighter ion will migrate more rapidly than the heavier. This idea of an "isotopic race," however, can not be carried out experimentally as simply as it might seem at first sight. Ions do not compete under the influence of the electric current in the manner of a track meet, unless we extend our experiences to include a continuous relay race. We can not start all of our ions at one point and obtain a separation by noting when those of a certain species have passed a given goal, for there must be maintained a steady supply all the way from one electrode to another in order for the current to pass, and it will not help us much if a faster ion hurries ahead of its slower neighbor, since it will merely find itself in the company of other slower ions which happened to start a little in advance. By a modification of the experimental procedure, nevertheless, our "isotopic race" may be converted into a "parade" which can be suitably regulated.

The apparatus used is shown in the accompanying diagram, and its applicability may be illustrated by a condensed description of the technique employed in the case of chlorine.

An agar-agar gel A containing sodium chloride is inserted as a short middle section in a long horizontal tube of pyrex glass, one and a half inches in internal diameter. On one side of the chloride gel is added a gel B containing sodium hydroxide; on the other side a gel C containing sodium acetate. The ends of the tube

[1] *Proc. Nat. Acad. Sci.*, 9, 75, 1923; 10, 458, 1924; 11, 393, 1925.

[2] *Jour. Amer. Chem. Soc.*, 48, 2619 and 3114, 1926.

[3] Aston, "Isotopes," 17, 1922 (Arnold and Co.).