male, and Strong found three such dark females.

If in the female the sex-differentiating factor and the factor for plumage color are placed close enough together in the same chromosome to be linked, but not so close that the linkage is complete, "crossing-over" would cause the two factors which entered in the same member of the homologous pair of chromosomes to lie in different members and hence to segregate to different gametes.

If the sex-differentiating factor be *M*, then the formula for the male is *MM* and for the female *Mm*. Let the gene carried by the recessive white pigeon be *w* and the dominant form of that gene carried by the dark bird be *W*. The dark female would ordinarily form gametes of the types *MW* and *mw*, but would occasionally form gametes *Mw* and *mW* by crossing-over.

The gametes and their possible combinations would be as follows:

P_1	White ♂	*Mw*—*Mw*
	Dark ♀	*Mw*—*MW*—*mw*—*mW*
F_1	$\frac{Mw}{Mw}$	— white ♂ (exceptional)
	$\frac{Mw}{Mw}$	— dark ♂
	$\frac{MW}{mw}$	— white ♀
	$\frac{Mw}{mW}$	— dark ♀ (exceptional)

A measure of the linkage between the sex-differentiating factor and the factor for plumage color would be the ratio of crossovers to the total number of individuals which might show crossing-over, viz., 4:59 or 7 per cent.

It should be pointed out that "partial-sex-linkage" signifies the linkage between the sex-differentiating factor and any other factor in the sex chromosome. In the case of *Drosophila* "sex-linked" means only that the factor is carried by the sex chromosome, and as yet no evidence has been obtained bearing on the degree of linkage of the sex-differentiating factor and any of the other factors thus far found in the same chromosome.

An explanation similar to the one here adopted for the pigeon may be given to Bateson and Punnett's[4] results with the silky fowl where partial-sex-linkage in the pigmentation is found. Three other cases of the same sort have been reviewed by Sturtevant,[5] viz., pink versus black eye in canaries, *Aglia tau* and its variety *lugens*, and *Pygœra anachoreta* and *P. curtula*.

Two cases of partial-sex-linkage in which the male is heterozygous for sex are reported. At least Sturtevant[6] so interprets the case of the dwarf guinea-pigs of Miss Sollas, and quite recently Doncaster[7] finds in cats that certain exceptions in the inheritance of coat-color may be due to partial-sex-linkage.

CALVIN B. BRIDGES
COLUMBIA UNIVERSITY

EXPERIMENTS SHOWING THAT COMPLETE RELATIVITY DOES NOT EXIST IN ELECTROMAGNETIC INDUCTION

IN the *Physical Review* for November, 1912, I described in detail some experiments which, taken together with earlier experiments by Faraday and others, establish the fact that complete relativity does not exist in electromagnetic induction. As a number of enquiries with reference to these experiments have been made, and as the subject of relativity is one in which great interest is taken by others as well as physicists, it seems desirable to give a brief account of the experiments in SCIENCE.

Two series of experiments were made, one without iron and the other with iron. In the first series a cylindrical condenser was mounted symmetrically in the approximately uniform magnetic field within a cylindrical electric coil coaxial with the condenser's armatures. The condenser, maintained at rest, was short-circuited, and the coil, tra-

[4] W. Bateson and R. C. Punnett, *Jour. Genetics*, August, 1912.

[5] A. H. Sturtevant, *Jour. of Exp. Zool.*, May, 1912.

[6] A. H. Sturtevant, *Am. Nat.*, September, 1912.

[7] L. Doncaster, SCIENCE, August 2, 1912.

versed by an electric current, was rotated about its axis at uniform speed. The inner armature of the condenser was then insulated from the outer, after which the magnetic field was annulled and the rotation stopped. The inner armature was then tested for electric charge.

The second series of experiments was similar to the first except that the magnetic field was produced by two symmetrical electromagnets mounted coaxially with the condenser and rotated together at the same speed.

In neither series of experiments was there detected upon the condenser any charge as great as the experimental error (see below).

Now it is an immediate consequence of the classical experiments of Faraday and others upon the electromotive force developed in a metal disc rotating in a magnetic field produced by a *fixed* electric coil or magnet, together with experiments of Blondlot,[1] H. A. Wilson,[2] and myself[3] upon the electric charges developed on adjacent conductors by the motion of insulators in magnetic fields produced by fixed coils or magnets, that, if the complete condenser and its short-circuiting wire had been rotated while the coil or magnets remained fixed, the armature tested would have received a charge equal to the continued product of the capacity of the condenser as it would be with air or free ether as dielectric, the magnetic flux through the space between the armatures, and the number of revolutions of the condenser per second. Moreover, it follows from the above mentioned experiments on insulators that if the condenser's dielectric is air, as in my own experiments, it is of no consequence whether the air rotates with the armatures or not.

It was thus easy to calculate the charge which would have been developed upon the condenser in each of my experiments for the same relative motion between it and the complete field-producing agent, but with this agent at rest and the condenser in motion.

The investigation proved conclusively that the condenser system, when it remained at rest and the agent producing the field rotated, received not more than a minute fraction of the charge it would have received for the same relative motion if the agent producing the field had been the part to remain at rest. Within the limits of error of the experiments —about 1.4 per cent. in the experiments with the electric coil, and about 1 per cent. in the experiments with the electromagnets—this fraction was zero.

The experiments appear to be *experimenta crucis*, in complete accord with the theory of Lorentz, but inconsistent with any theory based on complete relativity.

S. J. Barnett
The Ohio State University

[1] *Journal de Physique*, 1902.
[2] *Phil. Trans.*, 1904.
[3] *Physical Review*, 1908.

THE AMERICAN SOCIETY OF NATURALISTS

The thirtieth annual meeting of the American Society of Naturalists was held at Case School of Applied Science, Cleveland, Ohio, on January 2, in connection with the meetings of the American Society of Zoologists, the American Association of Anatomists, the Botanical Society of America, the American Society of Physiologists, the American Society of Biological Chemists, the American Phytopathological Society, and the various sections of the American Association for the Advancement of Science.

The morning session was devoted to a symposium on Adaptation, with the following speakers:

M. M. Metcalf (Oberlin College): "The Origin of Adaptations through Selection and Orthogenesis."

Burton E. Livingston (Johns Hopkins University): "Adaptation in the Living and Non-living."

George H. Parker (Harvard University): "Adaptation in Animal Reactions."

Henry T. Cowles (University of Chicago): "The Adaptation Viewpoint in Ecology."

Alfred G. Mayer (Carnegie Institution of Washington): "Adaptation of Tropical Animals to Temperature."

Albert P. Mathews (University of Chicago): "Adaptation from the Standpoint of the Physiologist."

Lawrence J. Henderson (Harvard University): "The Fitness of the Environment; an Inquiry