

When using quaternions we have to be very careful to distinguish results which are intrinsically geometric from results which are relative to the direction of reals. This may be illustrated from the theory of complex numbers. The transformation $z' = az + b$, where a, b, z, z' are vectors in a plane (which become complex numbers after the choice of a real axis), is a transformation of similitude, no matter what direction be chosen as the axis of reals, but the transformation is not independent of that choice.

In relativity the time axis is accidental to a particular observer or group of observers and should be chosen *after* the fundamental work is done, not before. The analysis which is really appropriate to the theory of relativity as conceived by Minkowski is Grassmann's. Even a vector analysis (such as that used by Lewis and me, loc. cit.) assumes an origin, which is theoretically "de trop," though practically not much in the way. Is it not unfortunate that Minkowski should have followed the English Cayley, referred to the Scotch Hamilton, and ignored the German Grassmann? Should not some Geheimer Regierungsrat among his colleagues have given him secret directions to avoid such an unpatriotic scientific *mésalliance*?

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SHORTER NOTICES.

Histoire des Mathématiques. Par CH. BIOCHE. Paris, Belin Frères, 1914. vi+93 pp. Price, 1 fr. 75 c.

It is one of the strange anomalies in the making of books that France, where the best work in the history of mathematics was done in the eighteenth and early nineteenth centuries, should have done so little in this line in recent years. Montucla, who wrote the first interesting general history of the subject; Delambre and De la Lande who were his worthy successors; Bossut, whose style maintained well the earlier traditions; Libri, writing in France although Italian by birth, and writing with the style of a novelist; Chasles, putting more mathematics into his work than his predecessors,—all these men contributed very notably to the appreciation of the historical development of the science, and set a high standard of style if not always of scholarship. But of late France has produced no general histories of mathematics worthy the name.