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Quaternion Baseball DOUGLAS SWEETSER, Quaternions.com of Acton — Spring training has begun. Physicists are prone to think of America's past time in terms of number theory. The trajectory of a hit to right-field is the position R as a function of time t, or $R(t)$. A complete description would keep both values available, namely $(t, R(t))$. This requires four numbers, perfect for quaternions. Time is the real number, while 3D space has three different imaginary numbers. Our language shifts to respect space-time. The hit goes from home plate-now to right field-future. A spatial reflection of the hit using a huge mirror would have the ball travel to left field-future. This requires the same amount of time but twice the distance is covered. A reflection in time takes the ball from right field-past to home plate-now before traveling back, needing the same amount of space but twice the time. Reflect both space and time, and the ball starts in left field-past, goes through home plate-now, and continues to right field-future. For the complex plane, the reflection around the real axis is visual indistinguishable from one around the imaginary axis. To a space-time physicist, the two are easy to tell apart: mirrors have 2 items while one must use memory to spot time reflections. One can draw in space but can only animate in time.

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