

# Biplots: Taking Stock

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It may be argued that biplots have been with us for at least 350 years but it is only since Ruben Gabriel's 1971 paper, and the pervasive availability of the VDU screen, that they have entered the modern era. In the past year two books have been published on biplots.

The basic idea is very simple: simultaneously to display graphically two kinds of entity, in such a way that gives a good visual impression of data presented in a matrix  $X$ . However, there are many questions that need investigation and whose current status will be discussed. These include:

What kinds of data are permitted in  $X$  and how do these affect their representation?

Does  $X$  require some initial transformation?

How are the two kinds of entity presented: as lines and/or points?

Usually approximation is involved: how is the quality of the display assessed and presented?

How are the diagrams to be interpreted: using inner-products, distances, angles, areas, projections?

What freedom is there in the relative scaling of the two sets of entities?

What freedom is there in the placement and orientation of lines and points?

What special considerations pertain to large data-sets and how may they be addressed?

Different answers to these questions often convey precisely the same information but presented in different graphical forms. There is no "correct" choice, making it essential for proper interpretation that users are fully aware of what choices have been made.