

Note on the conversion of microscope stage coordinates

ABSTRACT

A method is presented for easily converting microscope stage coordinates from one microscope to another, when the numerical scales of one or both stage axes increase in opposite directions on the two microscopes.

INTRODUCTION

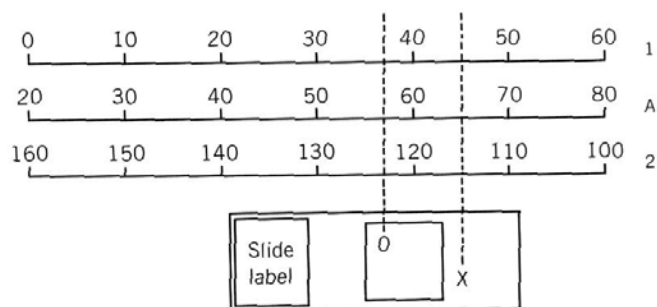
One of the problems in micropaleontological practice is the relocation of particular specimens on permanently mounted strewn slides viewed in transmitted light, using different microscopes within the same or different laboratories. The most common method of recording the location of specimens is to list the coordinates of specimens according to the millimeter X- and Y-scales of the microscope stage. Traverse (1958) and Pierce (1959) discussed the conversion of coordinates from one microscope to another and pointed out that conversion is simple if the scale of each stage axis runs in the same direction on the two microscopes. However, conversion of coordinates from one microscope to another has been difficult if the scales run in opposite directions—if, for instance, the millimeter numbers increase to the right on the X-scale of one microscope and increase to the left on the second scope. This problem has been solved by means of a simple conversion factor.

In the following examples, the microscope used by the original investigator to locate his specimens is designated microscope A; the scopes of two other persons trying to relocate the same specimens are designated microscopes 1 and 2. The conversion procedure is described only in terms of the X-axis for simplicity, but the method is the same for converting coordinates on the Y-axis.

Text-figure 1 shows a microscope slide with a reference mark (x) and a particular specimen of interest (o). Also indicated are the X-axis scales for the three microscopes, A, 1, and 2.

In the first example of conversion (table 1 and text-figure 1), microscopes A and 1 both have stage scales running in the same direction, with the scale numbers increasing to the right. The location of the reference mark on the slide according to microscope A is 65.0, and according to microscope 1 it is 45.0. Therefore, the conversion factor is -20.0 , meaning that for any point on any slide, the X-coordinate will be 20.0 less on microscope 1 than it is on microscope A. In the example in table 1, specimen o has an X-coordinate of 56.0 on microscope A; for microscope 1 it is $56.0 - 20.0 = 37.0$. This is shown diagrammatically on text-figure 1.

The second example shown in table 1 and text-figure 1 is conversion from microscope A to microscope 2. In this example, the two-stage X-axis scales run in opposite directions; the scale of microscope A increases to the right, whereas that of microscope 2 increases to the left. On microscope A the X-coordinate of the reference mark on the slide is 65.0 as before. The X-coordinate of the reference mark according to



TEXT-FIGURE 1

Microscope stage X-axis scales for three microscopes. The x on the slide is the reference mark; o is a specimen. The vertical dashed lines show the X-coordinates for the reference mark and the specimen on each microscope.

microscope 2 is 115.0. Adding the X-coordinates of the reference point for the two microscopes together ($65.0 + 115.0$) we obtain a sum of 180.0, which is the conversion factor of the X-coordinates for the two microscopes for this or any other slide. On microscope 2 the X-coordinate of specimen o will be found by simple subtraction: (conversion factor) - (X-coordinate of specimen o on microscope A) = (X-coordinate for the specimen on microscope 2). In terms of our example, $180.0 - 57.0 = 123.0$.

It is logical that this subtraction of the X-coordinate on microscope A from the conversion factor would locate the specimen on microscope 2, because as the stage is moved a certain number of millimeters from the reference point to the specimen—in our example 8.0 mm. (from 65.0 to 57.0) on microscope A—the change in scale reading on microscope 2 is exactly the same, only in the opposite direction. Thus, the increase in the numerical coordinate reading on the one microscope is exactly balanced by the decrease of the numerical coordinate on the second microscope, so that the sum of the coordinates for the two scopes at any one point on the slide must remain constant, and this constant is the conversion factor.

In order for this method of conversion to work, several items of information must be provided by the original investigator:

1. Time and trouble are saved by stating in which direction the scales increase on the original microscope (left or right, toward or away from the front of the slide). X-scales of two microscopes may of course run in the same direction whereas the Y-scales may run in opposite directions, or vice versa.
2. The coordinates of a reference point on the original investigator's microscope must be specified. The reference point might be a mark scratched on the lower surface of the slide, below the cover slip (Traverse, 1958), or somewhere on the upper surface of the slide (Wodehouse, 1933; Pierce, 1959). Alternatively, the mid-

TABLE 1

Examples of conversion of coordinates from microscope A to microscopes 1 and 2.

Microscope	X-coordinate of reference point	X-coordinate conversion factor	X-coordinate of specimen o
A	65.0	—	57.0
1	45.0	-20.0	37.0
2	115.0	180.0	123.0

point of a standard 1 × 3-inch microscope slide may serve as the reference point (Tschudy, 1966, p. D78).

3. In giving the coordinates for the reference point and for the specimens, the investigator must state which number represents the X-coordinate and which the Y-coordinate.

4. The investigator should also specify whether the slide was placed on the stage so that the label was on the left or the right, unless this is obvious from the orientation of the lettering on the slide label. If the slide is not viewed the same way on the stages of the two microscopes (for instance, with the label to the left on microscope A and to the right on microscope 1 or 2), then the method of conversion is the opposite of what it would be if the slide had been oriented the same way on both microscopes. For instance, take the problem of converting coordinates from microscope A to microscope 2 in the example in table 1 and text-figure 1. If we assume that the label was to the left on one microscope and to the right on the other, then the conversion of the X-scale coordinates would be done as though the stage X-axis scales ran in the same direction rather than in opposite directions.

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