

Understanding the Micrometer

By Jack Smith

IN physical measurements, two systems are used, i.e., the English and the metric systems. The English system is signified by *fps*, meaning *foot pound second*. The metric system is denoted as *mks* (*meter kilogram second*) but the *cgs* is the one adopted by most scientists. It stands for *centimeter gram second*. For the two systems, the linear measurement is a necessity. That is why, science students, especially when doing laboratory work or experiments should be well versed with the two common systems of linear measurement: that of the English foot and the European meter.

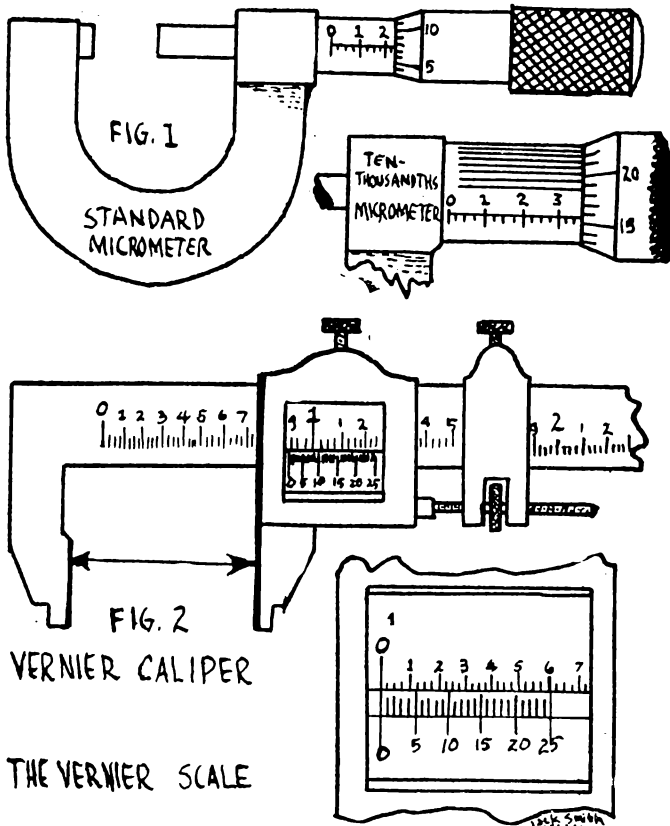
clip the stock to be measured at the jaws or the flat ends of the anvil and the spindle. The rotary handle is called the thimble and its circumference is divided into 25 parts, usually with graduations scored in multiple of one which is actually representing 0.001 of an inch. The body or barrel (also called *hub*), whereon the thimble rotates, is graduated in numbers from 1 to whatever maximum distance the micrometer can measure. The lengthwise calibration is the reference or datum line. Number 1 of the barrel, as shown, represents 0.100" or 100/1000ths of an inch; similarly, number 2 is 0.200". Every graduation between numbers represents 0.025" so that number 2 with one mark after it, is read 0.225". As shown in the above figure, the reading is 0.2278" or approximately 0.228". It is the conventional practice to take the nearest mark of the beveled edge of the thimble in case the gage line happens not to coincide with a mark.

When the edge of the thimble is between the 0.975" and the 1.000" lines of the barrel and the 24-line on the beveled edge of the thimble coincides with the barrel line, the reading is computed to be $0.975 + 0.024$ or 0.999". If the thimble is between 0.050" and 0.075" and the gage line is between the 13- and 14-thimble lines, but nearer the 14-line, the reading is $0.050 + 0.014$ or 0.064".

Try practising with a piece of plate or rod and measure its thickness or diameter as the case may be. Secure a feeler gage from an auto-mechanic and verify the thickness of the assorted feelers. This will afford a good practice for the fledgling in scientific measurement inasmuch as the thickness of the feeler gage is marked in every leaf.

The clockwise rotation of the thimble drives the spindle towards the anvil. The piece to be measured should be pressed lightly in between the anvil and the spindle of the "mike" or micrometer. Remember that it is considered a wrong method to clamp tightly the metal to be measured.

Another kind of a micrometer which can give a reading as fine as ten-thousandths of an inch is available. However, the ten-thousandths micrometer is used seldomly. The minute reading is made through the vernier scale which shows the difference between dimensions correct to 0.0001". For example, if the



The metric system has long been adapted in the Philippines because of the Spanish influence. The English system is popular in school work because of the influence of American textbooks. An average Filipino student knows the two systems of linear measurement.

Because of the peculiarity of the inch or foot, it is quite difficult to make a fine measurement; hence, the necessity of having a micrometer. See Fig. 1. The knurled handle at the right can be rotated so as to

thimble is between 0.075 and 0.100, the gage line on the barrel is between 19 and 20 on the thimble; the line 8 of the vernier coincide with a line on the thimble, the reading is computed to be $0.075 + 0.019 + 0.0008$ or $0.0948''$.

The Vernier Caliper

The vernier principle is incorporated in another kind of measuring tool called vernier caliper. (See Fig. 2.)

The vernier caliper, as commonly known, is made almost similar to the micrometer. The stock to be measured is clipped between two jaws. One of these jaws is fixed while the other is sliding. There is attached with the sliding jaw a vernier scale. The main scale which is etched on the body of the caliper shows the major dimension in inches. Each inch division is sub-divided into 40 parts, so that each graduation is read as $0.025''$. Numbers 1, 2, 3, etc., in between the inch division represent the readings of $0.100''$, $0.200''$, $0.300''$, etc. Three marks after number 4 within an inch division is read as $0.475''$.

When the zero mark of the movable jaw falls between two graduations on the main scale, the dimension made will be between the smaller and the bigger reading. This reading is approximated in the case of a caliper made without the vernier. If there is one,

the vernier scale in the movable jaw will take care of the difference.

The vernier scale is graduated from 0 to 25. Actually, each mark is read in multiple of 0.001. That whole distance of the vernier scale is equivalent to 24 graduations on the inch division or $0.600''$ on the main scale. Since there are 25 marks on the vernier scale, each mark is equal to $1/25$ of 0.600 or 0.024 . A main scale division (which is 0.025) and a vernier division (which is 0.024) will make a difference of 0.001, the reading for every mark on the vernier.

The technique of locating the excess in reading as indicated on the vernier scale is an easy matter. Along the 25 marks on the vernier scale, one of these marks is in line with a mark on the main scale. The additional reading will be based on that mark of the vernier scale falling in line with a mark on the main scale. For example, when the index is between $0.275''$ and $0.300''$ on the scale, and line 23 on the vernier coincides with a scale line, the reading is $0.275 + 0.023$ or $0.298''$. If the caliper is set for $0.139''$, the movable jaw is moved to 0.125 mark, i.e., one mark after number 1 on the main scale, and the vernier scale will be slowly manipulated such that the 14th graduation will coincide with a mark on the main scale.

The Teacher's Methodology

By Juan V. Baquiran

Character Education

SINCE the implementation of the Revised Philippine Educational Program at the beginning of the school year 1957-1958, the development of ethical character became the pervading element in all classroom instructions. In the past, Character Education was merged with Social Studies. Under the present plan, however, although it remains to be a part and parcel of Social Studies, it is being recognized as a separate Subject-Area in itself under Moral Character and Citizenship. It is the consensus among educators, that Character Education be treated as a separate subject in order to place moral character at the head of the civic virtues that must be inculcated and developed in our youth.

How to acquire character:

Character is the sum total of an individual's inner traits as represented by his conduct. It may be acquired by:

1. heredity
2. home training
3. school training
4. associations
5. observation
6. studying the lives of great men

General Objectives of Character Education:

Mckown gives us the following objectives of Character Education:

1. To develop an intelligent respect for the convention of society.
2. To develop an increasing ability to discern causes and to relate effects.
3. To develop a recognition, and acceptance of one's responsible membership in society and an increasing success and satisfaction in discharging that membership effectively.
4. The harmonious development adjustment, and integration, of one's personality.
5. To develop the desirable traits of character.