

This revision is taken from the abstract of an MPhil dissertation by a Chinese-speaking student of Electronic Engineering.

Original	Revisions
The properties of superconducting transmission lines are studied by a TEM mode analysis.	The properties of superconducting transmission lines are <b>given</b> by a TEM mode analysis.
	The properties of superconducting transmission lines are studied <b>using</b> a TEM mode analysis,

Intuition suggested two possible re-writes for *studied by* in the student's draft: *given by* and *studied using*. We studied concordances from 'Nature' and 'New Scientist' to see if they confirmed these suggested revisions. When we looked at the pattern *Past participle + using + method/technique/model etc.* the results seemed to be clear and consistent, the verbs before *using* being those where the method etc. could not be made the subject of the active verb. Thus a method cannot analyse a spectrum, a model cannot calculate values - and microscopy (or an analysis) cannot study anything at all. Here are a few examples of the citations that we found:

1 d spectrometry, with the spectrum analysed using a mathematical method known as Fourier tra  
2 combination. These values were calculated using the arithmetic mean model developed by Hry  
3 ect crystal. The distance can be estimated using the value of the threshold voltage. Willia  
4 xes become available. The results obtained using this technique should be of adequate accur  
5 ure-series spectrum in Fig. 2b is produced using 11 Slepian sequences with  $2B = 0.11$  cycle  
6 embrittlement are too small to be studied using conventional electron microscopy, which ha

Subsequent examination of the data has shown similar results for alternative expressions in place of *using* such as *by means of* and *by the use of*.

When we looked at the patterning of *Past participle + by + method/technique/model etc.* the results seemed to be equally clear, since now the verbs that appeared were those where, by grammatical metaphor, the method etc. could be made the subject of the active verb. Thus a statistic may demonstrate a change, a dashed curve may give a variation in axis ratio, sequence comparison analysis may identify a pairing, etc. In these citations, therefore, *by* may be regarded as introducing the agent of the Passive:

7 a small change which was not demonstrated by the effect size statistic, which is a measure  
8 indrops. The variation in axis ratio given by the dashed curve in Fig. 1 was devised to rec  
9 ublished). The P9.0 pairing was identified by sequence comparison analysis, and is widespre  
10 o the extent or for the duration indicated by previous isotope studies. The magnitude of th  
11 es. An alternative explanation is provided by string theory, which views matter as made up  
12 cated adjacent to the epithelium, as shown by electron microscopy. Additionally, the caver

This rapid survey thus supported the two revisions suggested for the student's original, without giving any clear indication as to whether one should be preferred over the other. In the event, the student chose *given by*.

As a postscript, it should be mentioned that after the consultation I looked in greater detail at cases where the Past participles in 1-6 are followed by *by*. In most, the structure was followed - as might be expected - by a human agent. For *studied*, for example, I found citations such as:

13 the hedgehog, whose cortex has been studied by Jon Kaas and his colleagues at Vanderbilt Un  
14 he ground." One of these, now being studied by Japan's Ministry of Post and Telecommunicati  
15 f 36 hospital incinerators in Wales studied by the House of Commons Select Committee on Wel  
16 re of the brain. One chemical being studied by the researchers is 1,3 dinitrobenzene (DNB),

There were, however, a few citations where the structure was followed by a non-human Noun Phrase, usually one which named a specific technique, as in the following:

17 il cell. The quenched products were studied by analytical transmission electron microscopy;  
18 the DBM. This branching rate can be studied by finger counting or by Fourier analysis. Figu

Citations 17 & 18 may stand as a warning against over-hasty examination of data. Nevertheless, I believe that they do not invalidate the revision: what we discovered in the course of the consultation remains valid as a **general** difference between the use of *by* and *using*, *by means of*, *by the use of* etc. in contexts such as this. Language teaching has always relied on over-simplifications: at least, if we are basing what we do on evidence of authentic usage, we should be better placed to realise what those over-simplifications are, and to judge whether they should be allowed to stand.

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5th June 1996

[Back to Kibbitzers](#)

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