

## Thermometers with separate scales: Mann's Magic Mountain and its Silent Sisters

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In 1924 Thomas MANN's monumental novel, *Der Zauberberg*, (*The Magic Mountain*) appeared and began a vigorous literary life.<sup>1</sup> This essay deals with one important facet of *Magic Mountain*, the measurement of temperature levels of the tuberculosis patients at the Swiss sanitarium where MANN's novel is laid. There are remarks about more general aspects of measurement error structures.

The silent sisters were ordinary fever thermometers but without scales. Separate scales permitted reading by doctor or nurse, but precluded – or made difficult – reading by a patient. The doctor or nurse would bring together the thermometer-without-scale and the separate scale and thus a proper reading might be taken, but the reading would not in general be known to the patient. MANN's name for the device was "stumme Schwester", i. e., "silent sister".

There seems to have been two basic roles for the wish to keep the temperature readings secret from the patient: first to avoid upsetting the patient and thus perhaps heightening the illness; second by making it more difficult to feign illness (Munchausen behavior) by cunningly introducing a bias of measurement – perhaps holding the thermometer near a light bulb or in hot water or by rubbing the thermometer on the sheet.<sup>2</sup>

*The Mörgeli discovery.* It has been asked whether the silent sisters truly existed during the periods in which MANN's wife was a patient in Swiss TB sanatoria. After all, MANN's fertile imagination was surely able to invent the unusual thermometer. Be that as it may, the question was essentially settled by Christoph MÖRGELI, Curator of the Medical History Museum of the University of Zürich. MÖRGELI, in an excellent 1988 statement, tells of finding a medical equipment catalog for the year 1896. It described exactly the silent sister, although it used the term "silent thermometer". Its inventor was given as Aimé MERCIER, Dr. Med.; the medical supply firm was HAUSMANN of St. Gallen. MÖRGELI makes a persuasive case that MANN observed use of the silent sisters at times when the MANNS were at a Swiss sanitarium. The evidence is largely drawn from documents like MANN's diaries and correspondence.<sup>3</sup>

\* I wish to express appreciation of Professor K.-R. BIERMANN's scholarly help and interchange over the years (including the present paper). He has been a beacon for the highest mathematical and historical standards.

<sup>1</sup> MANN, Thomas: *The Magic Mountain*. New York: Knopf, 1927. Translated by H. T. LOWE-PORTER. Originally published as: *Der Zauberberg*. Berlin: S. Fischer, 1924. A second English publication was a translation by John E. WOODS. New York: Knopf, 1995.

<sup>2</sup> I shall return briefly to Munchausen, with citations.

<sup>3</sup> MÖRGELI, Christoph: Die „stumme Schwester“. Ein Fieberthermometer in der Weltliteratur. *Swiss Medicine* 10 (1988) No. 3. There is brief mention of MERCIER's suggestion in DAVIS,

*Another firm.* A competitive firm entered the silent sister market. The medical equipment company in Berlin, F. & M. LAUTENSCHLÄGER, published its 1906 (or later) catalogue that includes a "Fieberthermometer nach Hildebrand". There is a picture and a description of what clearly is a variant of the silent sister. I see no reference to MERCIER; in the other direction I see nothing in MÖRGELI about the HILDEBRAND instrument.

I warmly thank Prof. Dr. Dr. Christa HABRICH, Director of the German medical history museum at Ingolstadt, for discovery of this second marketing initiative. In the same vein, I heartily thank Professor BIERMANN and Dr. Manfred STÜRZBECHER (Berlin) for their participation in the resulting discussions. One terminological reminder before we move ahead. The MERCIER description called the instrument the silent thermometer. It was MANN – apparently – who called it the silent sister, while the Berlin catalog used the terminology of an "isolated scale".

It appears that both initiatives (not surprisingly) failed commercially, thus providing an example of a supposed technological advance that really was not. Indeed my picture of Swiss medicine of the time is that a doctor or nurse would generally find it easy not to tell the patient what the measured temperature was. On the other hand it might well be simple for most patients to stroll down to a local village – MANN describes such a stroll – and buy a thermometer at a store. Or again, as MANN also describes, members of the housekeeping staff might be delighted to sell thermometers to patients. Yet again, a patient might ask a relative or friend to mail or bring a thermometer.

To repeat, the fundamental motivation was to keep the patient ignorant of the measured temperature. Two basic scenarios are suggested: first, knowledge of the temperature might have a traumatic effect and might push the temperature still higher. Second, keeping the patient outside the loop of measurement knowledge might help to deal with exaggerated reports by the patient – the so-called Munchausen effect.<sup>4</sup> Blindness in medical research circumstances is ordinarily taken to relate to (i) assignment of treatment to patient and (ii) taking care that the evaluation of outcome for each patient is in ignorance of treatment. Randomization is essential. So the magic mountain silence is somewhat different than conventional blindness although they are similar, and both can rest in a metaphor for human physiology and psychology.

Of the three sources (MANN, HAUSMANN, LAUTENSCHLÄGER) HAUSMANN mentioned only the danger of inducing neurotic reactions, LAUTENSCHLÄGER gives that plus the Munchausen problem, and MANN – as far as I can see – gives only a version of Munchausen: the oft quoted passage on p. 85 about unhappy Fräulein Ottilie KNEIFER who tried to make herself ill so that she would not be sent away from the magic mountain as cured.

It appears then that MANN saw the silent sisters in use, yet it is not wholly clear who invented the charming name "silent sister". My impression is that the name had been "stumme Thermometer" or "Thermometer with isolated scale", but then perhaps MANN

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Audrey B.: *Medicine and its Technology*. Westport, Ct.: Greenwood Press, 1981, p. 69. Davis's book has wide relevance to medical technology.

<sup>4</sup> We might compare the silence of the thermometer with the blindness typically achieved by a randomization that symmetrizes covariance structure. In both cases we are exposed to an increase in error magnitude in exchange for an improved understanding of error magnitude and structure. In a fuller treatment the distinction between constant and random error is important. Of course there are more complex examples.

introduced for his novel the more piquant sisterly term. It is of course possible that others used the silent sister idea before MERCIER, or after LAUTENSCHLÄGER. For example, there is the mysterious HILDEBRAND. Let me insert a quotation from an 1876 book by E. SEGUIN, *Medical Thermometry and Human Temperature*, New York, William Wood:

"[...] once in a while we must keep secret certain dangerous temperatures. I think every physician must possess a Walferdin's thermometer (alcoholic), which could be set to work in a range of five degrees at any point of its immense scale of 400°, and will mark accurately the 10th and even 50th of degrees known from the physician alone who has prepared the instrument." (p. 261.)

I think the argument is that a Walferdin is so large that the patient cannot possibly read both of the two marks whose difference is the desired temperature estimate.

Another loose end is the possibility of connections between the two medical equipment firms, HAUSMANN and LAUTENSCHLÄGER. One can readily imagine various connections; for example, a HAUSMANN instrument maker might want to move to Berlin and might initiate something at LAUTENSCHLÄGER.

Another weakness of the silent sister approach is that a patient might learn to approximate the temperature reading by a rapid glance at the mercury column as the thermometer is moved about. MÖRGELI makes this point.

*Other measurements.* I note that temperature is not the only measurement of interest. For example the measurement of blood pressure is sometimes made by introducing a small, haphazard amount of mercury into the mercury reservoir and noting it after the pressure scale has been read. Then a simple subtraction provides the estimated pressure. This, along with a related proposal by P. C. MAHALANOBIS, are discussed in my 1988 presidential address to the American Statistical Association. There must be many other examples, e. g., measurements related to height and weight.<sup>5</sup>

Of course any approach to measurement error should take account of artifacts special to the circumstances. In the thermometer case, one such artifact (already noted) appears when patients feign a high temperature by holding the thermometer near [DuBois, 1948, p. 10] a light bulb or in hot water or even by vigorously rubbing the thermometer against the bed sheet.

For blood pressure one might be concerned with biases and effects of second moment structure; the mechanisms might well include last digit preferences, use of the same instrument by different patients or by the same patient at different times. Another possibility to worry over is growth of distrust between patient and physician.

Thus we have generalized our discussion to cover a great many measurements – including non-medical ones, e. g., a tax authority estimates a taxpayer's income or wealth. To be sure there are bound to be costs associated with introducing new ele-

<sup>5</sup> KRUSKAL, William: Miracles and statistics: the casual assumption of independence. *J. Amer. Stat. Assoc.* 83 (1988), 929–940. – WRIGHT, B. M.; DORE, C. F.: A random zero sphygmometer. *The Lancet* 1 (1970) Feb. 14, 337–338. – MAHALANOBIS, P. C. (reported by J. TUCKER, Jr.): Summary of Lecture on the Combination of Data from Tests Conducted at Different Laboratories. *ASTM Bulletin*, No. 144 (1947), 63–65. – KLOTZ, Irving M.: Munchausen Syndrome and Hoaxes, Parodies, and Tall Tales in Science and Medicine. *Perspectives in Biology and Medicine* 36 (1992), 140–154. – ROUECHÉ, Burton: *Annals of Medicine; the dinosaur collection*. The New Yorker, 1986, 2 May, 102–111. – DuBois, Eugene F.: *Fever*. Springfield, Illinois: Thomas, 1948.



ments. For example in the clinical trial case, randomization brings in fresh random error but one gains a heightened ability to understand the resulting error structure.

Let us return to the medical context in which the patient wants to know the measurement results and perhaps the physician wants to keep the results secret. That is a classical ethical scenario that has motivated much discussion and strong feelings. The literature of ethical issues in medicine is large and the problem I have just sketched is an important part.<sup>6</sup> Caution: vocabularies differ.

*German-speaking physicians.* There arose a correspondence between contemporary physicians and MANN, a correspondence that seems to deal more with economic interests than with basic study of tuberculosis. I noticed nothing about silent sisters in my exploration of this literature. Two especially notable papers are SAUERESSIG (1974) and JUSTIN (1988). The first of these reprints conveniently a letter from MANN to critical physicians. The second is a lucid analysis of economic and conflict of interest issues.<sup>7</sup>

*Further generalizations.* In another generalizing sequence, the silent sister story might be considered special case of the importance to science of openness and of sharing for data, description, analysis and publication. The importance of sharing in statistical contexts is interestingly presented by FIENBERG, MARTIN, and STRAF.<sup>8</sup>

There are always to be sure, arguments in the opposite direction against openness and sharing; for example, anonymity of subjects, or simple justice that allows the producer of experimental data some reasonable time and opportunity to work on analysis.

There is also a variety of iconoclastic viewpoints. For example, there are views that regard customary attitudes toward scientific method as naive and that have a hard nose attitude that focuses on what scientists do rather than what they say they do. The issues are complex and in flux. For a cautionary discussion of one current and bitter area see KEVLES 1996.<sup>9</sup>

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<sup>6</sup> JONSEN, Albert R.; SIEGLER, Mark; WINSLADE, William J.: *Clinical Ethics*. New York: McGraw-Hill, 1993.

<sup>7</sup> SAUERESSIG, H.: *Literatur und Medizin zu Thomas Mann's Roman „der Zauberberg“*. Deutsche Medizinische Wochenschrift 99 (1974) 1780–1786. Includes reprint of MANN's letter 11 (1925), 1205. – JUSTIN, Renate G.: *Medicine as business and patient welfare: Thomas Mann dissects the conflict of interest*. In: BROCK, D. Heyward; RATZAN, Richard M. (Eds.): *Literature and Bioethics*. Vol. 7 of *Literature and Medicine*. Baltimore: Hopkins, 1988. Pp. 138–147.

<sup>8</sup> FIENBERG, Stephen E.; MARTIN, Margaret E.; STRAF, Miron L. (Eds.): *Sharing Research Data*. National Academy of Sciences, Committee on National Statistics 1985.

<sup>9</sup> KEVLES, Daniel J.: *Annals of Science*. "The assault on David Baltimore." *The New Yorker*, 1996, 27 May, 95–109.