

50 years of Pierre Gy's "Theory of Sampling"—WCSB1: a tribute

Abstract

This Special Issue is dedicated to one man's distinguished achievements in science and technology: 50 years of Pierre Gy's "Theory of Sampling" (TOS); the First World Conference on Sampling and Blending (WCSB1) was dedicated to this same purpose. This tribute covers a summary of Gy's professional career with a natural focus on TOS and its relationships to fundamental as well as applied sciences and technology, and why it is timely and fitting to present Pierre Gy with the tribute of WCSB1.

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1. Perspective

To put this tribute in perspective, I suggest a view of the situation in one "representative" discipline, which discovered the Theory of Sampling (TOS) only a relatively short time ago—and which is currently getting to grips with the reality that much of its "data" may in fact have been generated by processes which are more or less in neglect of TOS. For heterogeneous materials, this is far from a trivial matter: from TOS' 50 years of extensive experience in the largest industry sectors of the world which routinely have to deal with reliable sampling/analysis, it has been amply demonstrated that non-representative sampling always is a very costly affair, economically as well as scientifically.

2. Struggling chemometrics

Chemometrics is barely 30 years old, but already there are many stories, if not legends, of how difficult it originally was breaking new ground within the various sciences in which chemometrics went to work: analytical chemistry, process technology, industrial manufacturing, engineering, geology and medicine to name but a few. Difficult, because this new holistic type of data analysis apparently competed with the traditional and well-established discipline of statistics, which was not taken lightly, but frankly also because chemometrics rocked the boat too much in many complacent fields. Many scientists, also from other sciences than chemometrics, have experienced a similar struggle for recognition in their

own career. Some have struggled much longer than others, perhaps up to a decade before a breakthrough occurred. A select few of the founding fathers and the first circles of pioneers within chemometrics have consistently contributed to the struggle for this "new discipline" for the last 25 years, more or less in a constant battle mode, when addressing ever new disciplines. Oftentimes, what kept us going was (only) the essential esprit de corps within the homeland of chemometrics. One can respectfully look to the present state of chemometrics with pride for all the efforts put in. At the end of the day when all these stories have been told, chemometricians have every reason to be very proud of what we have achieved. We can demonstrably point to the current healthy status and remarkable drive within our discipline.

3. TOS

Consider now a parallel story, only substitute chemometrics by sampling, the Theory of Sampling—and double the length of this period—not 25 years, but 50 years. Also, consider that you would have to do this work mainly on your own for most of this extended time...

Unusual?—To say the least.

Below are the story behind the man behind TOS and the story of the tribute to this remarkable scientist. Pierre Gy tells his own scientific story behind TOS in part IV of his five-part series of contributions to the proceedings part of this Special Issue.

4. Biography: Pierre Maurice Gy

Family: b. Paris, July 25, 1924; s. Felix and Clemence (Gourdain) Gy; m. Sylvia Duchesne, 1946; children: Genevieve, Anne, Caroline.

Education: Degree in Chem. Eng. Paris Sch. Physics and Chemistry, 1946; PhD Physics, U. Nancy, 1960; PhD Math., U. Nancy, 1975.

Memberships: Mem. AAAS; Am. Inst. Mining Engrs. (hon.); Can. Inst. Mining and Metallurgy; N.Y. Acad. Sciences.

Honours: Medal, Mining and Metall. Inst. Japan, 1958; two gold medals Soc. de L'industrie Minerale, 1963, 1976, Lavoisier medal French Soc. Chemistry, 1995.

Publications: 9 books; 175 papers; innumerable lectures, courses.

Professional career: Chem. Engr. CMCF, Congo, 1946–1949; Research Engr. Minerais and Metaux., Paris, 1949–1952; from Head Mineral Processing Labs to Tech. Mgr., 1952–1962; Industrial Sampling and Blending Consultant, Cannes, 1963–present.

Founder: Internat. Sampling Inst., France.

Avocations: Photography, mountain climbing.

5. From SSC6 to WCSB1

Pierre Gy was originally invited as a special guest lecturer to SSC6 (the Sixth Scandinavian Symposium on Chemometrics) in August 1999. While a contribution on the "Theory of Sampling" was planned for the SSC6 proceedings, it quickly transpired that it would not be possible to do anything even remotely close to the justice this science deserve with an average-length proceeding contribution (10–12 pages or so). Thus, the idea of a more fundamental introduction to TOS in chemometrics and related data analysis sciences was born. The lack of knowledge of TOS in this and related scientific areas was simply too great. It was decided that now was the time to present a more comprehensive introduction. The First World Conference on Sampling and Blending, WCSB1 was the result.

6. 50 years anniversary introduction to TOS

A special situation now opened up. It was too much of a coincidence that TOS originated in 1950, and that the first presentation and published article appeared in 1951 and 1953, respectively. Soon, one idea followed the other, while the 50 years anniversary of TOS loomed large and suddenly very close. Knowing full well the intense workload involved, I nevertheless summoned up the courage to ask Pierre to write a new, updated introduction to the entire Theory of Sampling, complete with a comprehensive bibliography. The then 75-year young

gentleman initially balked somewhat at this suggestion, quite understandably, but after reconsidering the issue several times he came back with a scholarly opus in the form of a tutorial series which, instead of being published in the above 1999 SSC6 proceedings, you will find occupying the leading place in this proceedings issue of WCSB1 (2003). We owe Pierre a very great thank you for his willingness to undertake this hard work.

7. The "autobiography" of TOS

But what originally appeared flat out impossible was to have Pierre write his own personal scientific history. Those who know him well also know that Pierre is a most generous and gracious man—he is willing to do almost anything to grant the wish of a fellow scientist or a friend. But ask him to talk of himself as a scientist and of his scientific achievements—this is where the "almost" comes in; this is where the story usually ends. He simply is extremely disinclined towards anything that even remotely perhaps could be viewed as "self-agrandissement". Nevertheless, there was no end to the sweat and toil that went into trying to convince Pierre why Science (capital S) also needed such a biography of the originator of TOS... Suffice to say that in the end the wish of the science community at large prevailed, and success for the editor came in the form of: "50 years of Sampling Theory—a personal history". This is where Pierre tells his own scientific history of TOS within the convoluted industrial, academic, professional and personal web of his life. Fascinating is but a poor qualifier. Not many scientific disciplines have had the opportunity of a similar personal introduction to an oeuvre as monumental as that of Pierre Gy's—and TOS'—contribution to the field of science and technology. You will hopefully be greatly pleased also to read this contribution in this issue.

8. The significance of TOS

TOS is of the highest significance for all sciences, for technology and industry where proper sampling is on the agenda. Sadly, it has for most of its existence been largely overlooked in academia, if not totally neglected. This in no way has anything to do with the scientific content and/or the merit of TOS however, perhaps rather the opposite: For some, the mathematical language of TOS may appear somewhat difficult at first sight, while others only gradually will appreciate the full depth of the (very) practical sides of TOS, since it necessarily first must start out delineating the universal principles of correct, i.e. representative sampling. Apparently, for a select few, it may even be viewed almost as a personal affront that "data quality" (never much in focus since

this usually is considered the responsibility of “other disciplines”) may in fact justifiably be subject to a fundamental TOS-questioning coupled with a call for greater sharing of the practical sampling responsibilities between analytical chemistry, process technology, data analysis, statistics and indeed also chemometrics.

However, in the last 10 years or so, some improvement in this state of affairs has been noticeable. Pierre's own 1998 Wiley book: “Sampling for Analytical Purposes”, as well as the many current didactic efforts by an entire younger generation in this field (papers, books), have well begun to eliminate these stock objections to proper scientific attention to TOS. Today, there are relatively many types of courses taught on TOS, mostly by professional consultants and experts, but also in academia the situation now finally shows significant signs of change, even though there is much work to be done.

Primary recognition for the important work of teaching sampling, TOS, within academia in general, within chemometrics and process technology in particular goes to the spearhead efforts of Pentti Minkkinen of Lappeenranta University of Technology, Finland. He has almost completely single-handedly lifted the burden of starting teaching TOS at the university level for about 20 years now, for a long part of this time also in splendid isolation within chemometrics.

9. WCSB1 proceedings—also to be used outside chemometrics

WCSB1 and these proceedings can only be a relatively brief introduction to some of the most important reasons why the scientific community is finally presenting a fitting tribute to a singularly inspiring scientist's contributions—in the form of a conference dedicated exclusively to sampling. The proceedings from WCSB1 will also be used as a general introduction to the role of proper sampling within a much broader range of sciences and technological professions outside the comparatively narrow niche of chemometrics: analytical chemistry, mineral processing, process technology, engineering and technology, pharmaceutical—food, feedstock manufacturing, geology, geochemistry, clinical chemistry, medicine... These proceedings are meant to transgress traditional borders!

10. The man behind TOS

Before focusing on the scientific achievements of WCSB1 in the rest of this Special Issue, this tribute also presents a few of Pierre's more personal attributes, some of which perhaps could be considered to fall outside the strict scope of science and TOS, but which are never-the-less important in giving a more comprehensive picture of the man behind TOS.

11. The scientist



The bread-and-butter of scientific interaction: meetings, symposia, conferences ...

Pierre Gy, extreme left, was 30 years old when this picture was taken in 1954. OECC Mission (North America).

At the extreme right of picture: the Norwegian representative Prof. Magne Mortenson, Technical University of Trondheim.

For a man who has published 9 books, 175 papers, given more than 200 lectures, workshops and courses, it bears noting that Pierre Gy has never held an academic position at a university (sic), but has deliberately chosen to work mainly without the daily personal interaction of the scientific and social interaction at the workplace. There is little need to emphasise how this runs contrary to the gamut of every day conditions for the overwhelming part of most scientists. Unusual?—Indeed!

12. The sportsman



1975, Suisse-Italie.
Au pied du Monte-Rosa
4600 m.

Pierre Gy in 1975, Suisse-Italie (just turned 50).

It is only some 10 years ago that Pierre, very reluctantly, stopped taking his regular (weekly) long distance swims (10-km laps or more...) in the Mediterranean, and he last scaled the Alps in the summer of the year of 1999—as indeed he has done in almost every year of his adult life when vacationing with his wife Sylvia and family in the northern Alps.

13. Concluding remarks

This author considers it a privilege and a great honor to have been able to perform the academic public service of organizing, hosting and chairing WCSB1. I thank Dominique Francois-Bongarcon for our many ultra-short airport encounters and his spirited personal encouragement in this task and I especially thank Pentti Minkkinen for his role as facilitator for this Special Issue, without which we could not honor Pierre Gy for his life's work in this most appropriate manner.

14. The future of TOS

Pierre Gy ends his personal account in this Special Issue with the statement: "The relay is now beginning to be handed over to a younger generation of professors, engineers and other proper samplers".

To this the three of us say, most profoundly:

"May this beginning last very long indeed, Pierre—mentor and scientist extraordinaire!"



Pierre Gy with wife Sylvia at the WCSB1 banquet, August 2003.

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