SERGE CORDIER

and the PURE FIFTH EQUAL TEMPERAMENT

1972 saw the discovery by Serge Cordier of a new way of tuning pianos and keyboards. As opposed to current practice at the time, which required the fifths to be “tempered”, what he evolved was an Equal Temperament based on pure fifths.

Serge Cordier was already an established musician, and resolved to acquire on additional qualification as a piano tuner. Furthermore, he possessed an outstanding grounding in science which enabled him to apply acoustic scales in the analysis of the recommendations of his Master in Tuning. He recorded certain correspondences between beats which deviated from accepted theory, and this led him to make his astonishing theory. To his surprise, he very soon noted something which was to be confirmed later, namely that certain highly regarded tuners do in fact tune in perfect fifths – but **without knowing it**! Among these was Simon Debonne, who for many years was the top tuner for a great Parisian piano-maker - and Serge Cordier’s teacher : when his pupil made him listen to his newly finalized technique, the master found the sound quite extraordinary and totally in harmony with what he himself had taken “10 years to discover”. Yet when the experienced old piano tuner (who was non-sighted) was told this piano had been tuned in pure fifths, he peremptorily exclaimed “in pure fifths? – Impossible!” Later, however, he accepted that his intuitive approach should be expressed in these theoretical terms and became a close friend of his genius pupil – going so far as to speak of “our” discovery.

Both the retired Master-tuner and his disciple were living in the town of Alès which was soon due to host a concert by widely-acclaimed violinist: Yehudi Menuhin, accompanied by his sister Hephzibah. Although Simon Debonne was the tuner for the concert, he nevertheless asked Serge Cordier to tune the piano used for the rehearsal and apply his new temperament. At once, Menuhin noticed the sound of this tuned piano, stating that he had "never heard a piano sound so freely and with such a rich tone!" Thus, this discovery was immediately recognised at its true value by a very great musician who continued to support Serge Cordier's work, and invited him – to present his new approach to tuning in England and in the USA…

The solid theoretical basis of the new temperament was immediately confirmed by the great acoustician Emile Leipp, and this initial recognition marks the beginning of a long series of demonstrations in which Serge Cordier demonstrated his tuning method to many of the most eminent musicians, performers, composers and musicologists.

The unexpectedly rich sound gained quasi-unanimous recognition, received the highest acclaim and attracted enthusiastic responses. Newspaper articles – "Le Monde" in particular – wrote up the discovery and launched the inventor on a series of lectures including invitations by Dominique Merlet to the Conservatoire de Paris, by Paul Badura-Skoda to Vienna, by Serge Gut to the Sorbonne. In the course of these lectures which opened with a piece of piano music, Serge Cordier would explain the acoustic structure of the new tuning approach, setting it in the historic context of the temperament and of the diverse solutions adopted till then. After a reminder of simple notions of acoustics such as the definition of "harmonics", "commas" and so forth, the audience of musicians – often put off by all this science- could at least get a good grasp of the phenomenon of "trueness" thanks to the clear and coherent explanations of a theoretician who was also practitioner serving the cause of "Truth in music".

Unlike so many obscure and contradictory theories, the new temperament reveals a very simple structure. The "circle of fifths" – a representation of the "cycle of fifths" inherited from Pythagoras is a graphic way of presenting the temperament; the difficultly lies in inscribing, over the entire range of a piano, 12 fifths (giving rise to the 12 chromatic notes) into 7 octaves, knowing that it is impossible at one and the same time to retain the fifths together with all the true octaves. The Perfect Fifths Equal Temperament quite simply presents a slightly **open** circle, the extension required (i.e. 1/7 comma per octave) to allow 12 true fifths to correspond to 7 "tempered" octaves. This expansion constitutes a major difference from the usual Equal Temperament which requires a shortening of the 12 fifths. Nonetheless, numerous experiments have demonstrated that a musician's ear adjusts far more easily by expanding than by contracting, when confronted with a limited alteration of a naturally true interval. Cordier's tuning includes a crucial notion of "cultural trueness" and converges with the intuitive practice common to players of "free" instruments: they slightly expand certain intervals – especially octaves mainly in the higher treble ranges.

This then is vital characteristic of the new tuning approach, which at last reconciles the keyboard's fixed tuning with the "free" trueness of most orchestral instruments.

Here Serge Cordier's discovery reveals us full importance ; like that of an existant continent, it is the discovery of a hitherto unheard trueness, known only in theory, intuitively explored by the best tuners **and even put into practice by instrument-players in orchestras**. We know that those instruments which are free to set their pitch make use of "expressive trueness" to modify the pitch of particular notes according to their melodic context, - something which, by nature, fixed keyboards cannot do. And yet, several highly renowned musicologists both state and demonstrate that an

orchestra's trueness is inscribed within a scale of reference, and that this "backbone" cannot be other than the scale of the Equal Temperament.

Because Western musical language since J.S. Bach's time has evolved and delves so deep into the modulations between the 24 major and minor tonalities as to actually "dissolve" the tonality, it becomes impossible to play a (#) sharp higher than a (*b*) flat where the modulation is far away. Yet musicologists go on to identify this Equal Scale of reference as being the only equal scale apparently in use : the scale of the Tempered fifths. Still remained one contradiction : how, indeed, to recognize the basic way of tuning strings in fifths with this scale of reference having shortened fifths, knowing that instruments-players whose ears can hardly bear it, simply refuse to shorten their fifths. As these fifths are in fact truly in tune, the Equal Temperament referred to in which by definition the intervals are equal, can only be the one discovered by Serge Cordier : the Pure Fifth Equal Temperament. Though this demonstration may seem abstract and theoretical, its acoustic reality has been confirmed by several orchestra conductors who claim that on a piano tuned to pure Fifths they rediscover the very same sound, with the "colours" of the chords which they ask to the orchestra

« Piano bien tempéré et justesse orchestrale *[1]» (The well-tempered piano and trueness in the orchestra) is the title of Serge Cordier's book published in 1982, which expounds on this primordial aspect of his discovery. In this work, the author sets out in detail both the theory and practice of the new temperament, also providing a complete historical analysis of the phenomenon of trueness. But this unequalled researcher did not stop at that: in the 1980's he could use electronic instruments and computers to analyse sound-frequencies. Their precision enabled him to study a very complex yet crucial phenomenon in the exact application of Temperament: "inharmonicity". As they are not exact multiples of the fundamental frequency, the harmonics given out by piano strings do not coincide with their theoretical frequencies: it is the resulting gaps, variable according to pitch and piano, which are responsible for the difference from theoretical frequencies. The piano-tuner must necessarily take these differences into account with each type of piano; like any good piano-tuner, Serge Cordier of course knew this and taught it to his students.

With the new techniques now at his disposal, he went on year after year (it's a forbiddingly complex subject!) studying the effects of inharmonicity in order to arrive at a precise description of the New Temperament, systematically checking the frequency readings against his own tuner's ear.Serge Cordier was fully absorbed by his research and determined to spell out a theory to support his discovery irrefutably, this meant he had not pursued the work of publishing it after the first cycle of demonstrations and lectures although he was aware that it would be long, arduous task : it's a well-known fact that a new notion of this importance would need time to be accepted. Naturally, he was anxious to train new pupils, and taught both tuning and acoustics the Montpellier Conservatoire from 1986 to 1993. Very few of his pupils however are still carrying on this exacting profession, yet training piano-tuners in the new method is of course the most vital way to transmit it. The surprising fact is that, especially in France, where Serge Cordier is so well known in the profession, there are so few piano-tuners today applying a tuning method that musicians really love. Some indeed, no doubt resisting the idea of having to revise their specialty, have come out with criticism of the perfect Fifths (contradicting the dogma) where generally speaking they haven't actually heard such a "partition" (the initial tuning which sets up the distribution of the 12 semi-tones) - though sometimes they claim to know it. Now, the precision of the tuning in perfect Fifths, such as the inventor defined it and taught

1 *Footnote : 'Piano bien temperé et justesse musicale'. Editions Buchet-Chastel 1982. Out of print. Re-publishing this work raises a thorny problem: the author was a scrupulous researcher, opposed to such a measure In the belief that some of the theoretical calculations were no longer valid because they did not take into account his later research into inharmonicity. This might mislead a person actually tuning a piano. Yet this book is surely very valuable for anyone concerned by perfect tuning.

it to his students is dependent on inharmonicity and can thus only be transmitted “directly”, taking Into account the specific “ inharmonicity” characteristic of each type of piano. That is one of the challenges of this training, where we rediscover the merits of oral and acoustic tradition. Serge Cordier was not seeking to jealously guard his discovery – quite on the contrary, but he did always insist that those tuning approaches claiming to derive from his invention (which has been protected) should be tested and verified to avoid accusation of being inexact. It is paramount that we continue to preserve this authenticity.

Outstanding inventions always do win the day in the end, and this will certainly apply to the Cordier temperament. Let us wager that the choice of the musicians will lead to for wider use of this tuning approach. Those who succeed this brilliant researcher will have the role of continuing the work of broadcasting, demonstrating and expounding it, and of highlighting the favorable comments that continue to flow in today as before. The specialists in this area will no doubt be interested in these findings published on internet, providing an opportunity for more and more musicians to hear and appreciate this true tuning. Here lies the key to fame – well deserved. The name of Serge Cordier will then be carved in its rightful place in the history of Trueness in Music.

Serge Cordier, Yehudi Menuhin and Jean-Jacques Meynard, 1997

(photo : Emmanuel Meynard)