

The Sorcerer as Apprentice: his Notes (The computer in/and teaching the craft of composition)
Relevés d'apprenti sorcier (L'ordinateur dans/et l'enseignement de l'art de composer)

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Volume 18, Number 1, 2008

La fabrique des oeuvres

URI: <https://id.erudit.org/iderudit/017910ar>

DOI: <https://doi.org/10.7202/017910ar>

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Publisher(s)

Les Presses de l'Université de Montréal

ISSN

1183-1693 (print)

1488-9692 (digital)

[Explore this journal](#)

Cite this article

Rea, J. (2008). The Sorcerer as Apprentice: his Notes (The computer in/and teaching the craft of composition). *Circuit*, 18(1), 72–91.

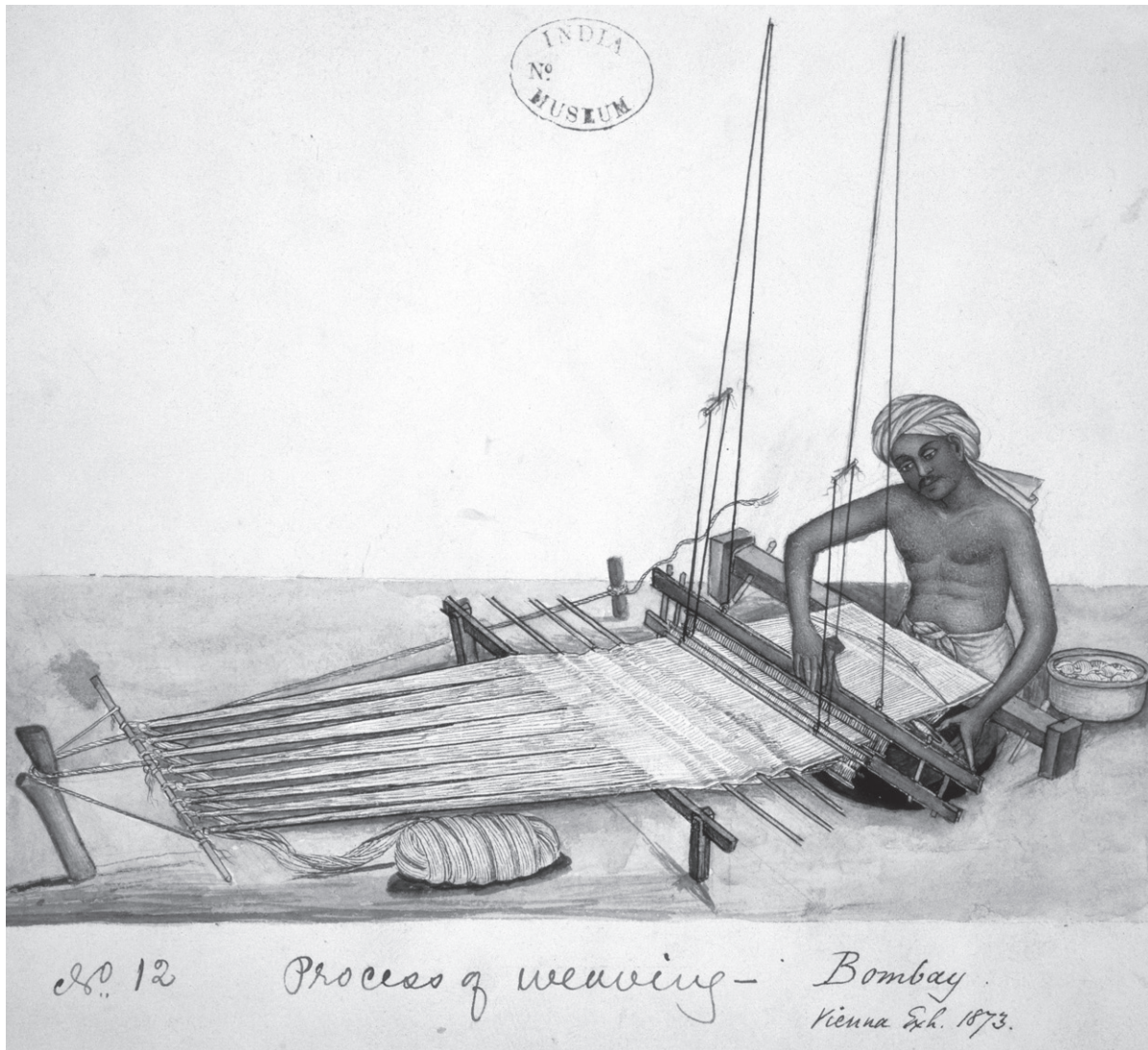
<https://doi.org/10.7202/017910ar>

Article abstract

In order to highlight some of the transformations in the practice of composition that occur due to the introduction of computing, the author provides two texts in a special typographical format which he calls 'parallel processing'.

An allegorical story entitled *Wolf-URL* together with ensuing texts that deal with interpretations of the allegory, particularly in a section entitled *Updaters, Update Now!*, attempt to put forward a critical apparatus for dealing with documentation (and underlying ideologies) related to an enquiry, with its non-exhaustive findings, that the author conducted during the spring of 2007 into the transformation of the craft of musical composition since the 1970s. They include musings about the relationship between professor and student composer where the computer plays or does not play a role in the teaching process. The outlines of this enquiry are located in a section entitled *Setup Wizard*; an assessment model is found in the *Assessment Wizard*.

By means of this new print format, the reader will be able not only to speed up the reading experience and exchange valuable information between the multiple fragments, but will also be able to draw whatever implications seem fitting from the ongoing juxtaposition.



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Its woof, warp and heddle, its fibres, knotted ties, loops and intertwinings... what is the ancient subtle art of weaving if not the silent precursor (pre-cursor) of software configurations for the handling of sound (LogicPro, AppleLoops, Patchwork, and so forth)? (J.R.)

Enquête II : fenêtre sur cours

The Sorcerer as Apprentice: his Notes

(The computer in/and teaching the craft of composition)

JOHN REA

*The computer is a moron.*¹

Peter Ferdinand Drucker (2001),
founding father of the study of management

*Living with Creative Machines*²

George Lewis (2007),
Edwin H. Case Professor of Music,
Columbia University

Getting Started

This text is a quick start guide to getting the most out of your reading experience; it is not a *Readme.txt* where one first encounters an update-history.³ This quick start guide precedes an allegorical story entitled *Wolf-URL*, illustrating an ideal tutorial, i.e., a session of intensive tuition given by a tutor to an individual or to a small number of students. As the tutelage, i.e., a process of being under the guidance of a tutor, progresses – here, a lesson in composition and on how to handle keyboards – a tutor learns to work with a tutee. In truth, tutors learn better than tutees do. They have to, to stay ahead.

Ensuing texts deal with interpretations of the allegory, particularly in a section entitled *Updaters, Update Now!*, which attempt to provide a critical apparatus for

dealing with the documentation (and underlying ideologies) relating to an enquiry, with its non-exhaustive findings, that I conducted during the spring of 2007 into the transformation of the craft of musical composition since the 1970s (!) together with musings about the relationship between professor and student composer where the computer plays or does not play a role in the teaching process. The outlines of this enquiry are located in the section entitled *Setup Wizard*; an assessment, in the *Assessment Wizard*.

Both the allegorical story *Wolf-URL* and the section *Updaters, Update Now!* are presented simultaneously with the *Setup Wizard* and *Assessment Wizard* in a special typographical format we will call ‘parallel processing’. It will require you to rotate the ‘screen shot’ of your paper issue of *Circuit* ninety degrees. In this way, it is hoped, you will be able not only to speed up the reading experience and exchange for yourself valuable information between the multiple fragments but you will also be able to draw whatever implications seem fitting from the ongoing juxtaposition. (Full text commentaries with other reactions by the various participants can be found online at URL: <http://www.revuecircuit.ca/web>).

Teaching is the only major occupation of man for which we have not yet developed tools that make an average person capable of competence and performance. In teaching we rely on the “naturals,” the ones who somehow know how to teach.⁴

Peter Ferdinand Drucker (1994)

Wolf-URL < <http://www.gnagflow.trazom5> >

For as long as I can remember now, I have always marveled at a charming minuscule collection of music that I own and leaf through from time to time entitled *Notenbuch für Nannerl Mozart*. Its author was Leopold Mozart and he had compiled it at the end of the 18th century for his daughter, Maria Anna, a young and aspiring keyboard player. Consisting of various mini compositions – *nota bene* I did not say MIDI compositions – mostly by celebrity musicians of the day including Leopold himself, this *cahier* earned its acclaim later on due to the fact that it was also known to have served as an exercise book for Nannerl’s younger brother, Wolferl, up until around 1763. Abbreviated yet structurally coherent minuets, marches, scherzos and allegros written by those now forgotten composers precede a goodly number of “new” mini compositions of the same ilk (essentially Köchel numbers and sub-numbers 1 - 5) knocked-off by the little boy genius – like so many effortless sweeps of a broom – during what I presume was a bit of downtime in the course of Punkitititi’s⁶ first mega tour of Europe between 1763 and 1766.

Setup Wizard³⁵

This and the following sections guide you through the options I provided my interlocutors in order for them to participate in my enquiry whose questions/premises – the Setup Wizard itself – arrived to them unsolicited in early March 2007 within the body of an e-mail message; it did not however disclose its magical title. See SETUP WIZARD.

What it does

The Setup Wizard helped me in setting up the elements for the later documentation and the subject matter for this very reflection of mine here in the pages of *Circuit*. It appears directly below in both English and French. See also WIZARD de CONFIGURATION. Although I gave no suggestive title to my enquiry, as I have mentioned above, the Setup Wizard nonetheless seems to display a discernable hypothesis and a hidden bias with respect to the issues raised. See also ASSESSMENT WIZARD.

I submitted the Setup Wizard to thirty-two potential respondents: two music copyists and thirty composers. Ten were English-speaking and twenty, French-speaking, mostly living in Canada but also in Argentina, Brazil, France and the United States. The average age of the respondents, of whom there were 23, is about 35 years. The age distribution was equally spaced between the youngest, 23 years, and the oldest, 64. The Setup Wizard was sent to 29 men, 3 women.

SETUP WIZARD

Dear

Would you have a moment to help me?

I am currently preparing an article for the journal *Circuit* on the relationship between professor and student of composition where the computer plays or does not play a role in the teaching process, an non-exhaustive enquiry into the transformation of the craft of composition since the 1970s (!). And I’m writing many people, professors and students alike, in order to get some feedback. (*Nota bene*: a professor was once a student!)

Would you be able to take a look at the following three questions/premises and let me have your first reactions/impressions of these matters? They can be in the form of anecdote or in-depth reflection

The *Notenbuch*, found in its complete form at the *Neue Mozart-Ausgabe Online*,⁷ also reveals that, from the very beginning of his tutelage, the father taught simultaneously both music theory *and* composition to his children by way of a given bass line, followed then by melodies to be varied and spun out, all infused with structural modeling, and the study of intervals and so on. In addition to notational quirks such as staccato marks in the form of cute tiny drops, there were other delightful annotations inscribed by the father which appear directly below particularly noteworthy opus-cules: “These eight Menuets Wolgangerl learnt at the age of four” and “Wolgangerl learnt this piece [a *Scherzo* by Wagenseil] on January 24, 1761, three days before his fifth year, between 9:00 and 9:30 in the evening” and “Wolgangerl learnt this Menuet and Trio [of forty bars] in half an hour, at 9:30 in the evening, on January 26, 1761 one day before his fifth birthday.” And there are also the ascriptions “di Wolfgango Mozart d. 14^t Octob. 1763 in Bruxelles” as well as, six weeks into the magical mystery tour, “di Wolfgango Mozart d. 30^t Novb. 1763 à Paris.”⁸

I often think – when playing at the piano those model compositions however hackneyed they seem, contemplating Wolferl’s apparently instantaneous simulation of them, but also visualizing how (I say to myself) such ‘replications of nature’ point to a future gigantic

but I would appreciate precise comments and, if possible, rapid ones – before the end of March thus in about twenty-one days.

Two last things:

- It is not necessary moreover to respond to all three subjects
- If you wish that your comments not be attributable to you in my text, would you kindly indicate this to me.
 - 1) the commonplace or clichéd effects already observed in the organization of work that result with the use of musical text/notation processors (*Finale*, *Sibelius*, etc.) – through the exploitation of ‘copy-paste’ and other manipulations ... but also in the change of relationship between copyists and publishers (should the case arise) – effects which, as a consequence, act upon compositional styles (due to the restrictions placed on graphic and notational innovation)
 - 2) the commonplace or clichéd effects of sequencer use on the training of composers and their vocations: their relationship with electroacoustics, with notation, with the reality of interpretation-performance/performers, and with various forms of dissemination of their music, etc.
 - 3) the influence (real or not) upon composers of the myth of musical research together with the appropriation (or the failure of appropriation or, indeed, its refusal) by certain composers of the latest or most advanced application software (as used, say, at IRCAM or Stanford, etc.), the prestige associated with the mastery of technology, and the capacity of developing one’s own patches, etc.

WIZARD de CONFIGURATION

[*nota bene*: *Le vouvoiement servait aussi le cas échéant.*]

Cher/Chère

Si tu as un moment, peux-tu m’aider?

Je prépare un article actuellement pour *Circuit* sur le rapport entre professeur et étudiant(e) de composition où l’ordinateur joue ou ne joue pas un rôle dans l’enseignement, une enquête non exhaustive sur les mutations de l’artisanat des compositeurs depuis les années 70 (!). Et j’écris à plusieurs personnes, professeurs comme élèves, afin d’avoir un retour d’information. (*Nota bene*: un professeur était jadis un élève!)

metamorphosis that will produce some of the greatest music ever known to man, and then again seeing in my mind's eye those little children in the course of an evening's recreation (re-creation, *indeed*) amusing themselves in the wintry quiet of an unheated Salt City⁹ flat or, later in a gilt-edged hotel room driving away the blues of an autumnal gloom in *Paris pluvieux*, whose silence is only broken by the tinkling of an unadorned keyboard – what is it here exactly in this portrait of solitary yet sonorous domesticity that seems to go missing?

Electricity, for one thing. Even so I suppose that, despite the chilly surroundings and the candle-lit ambiance, the wizened father warmed things up a bit for his kids before obliging them to go to bed by recounting a mysterious tale or two, let's say, about the “white gold”¹⁰ that since medieval times had assured Salt City's wealth and self-reliance. Now, in structurally transmuting that colourful expression – similar to the way he had so magically demonstrated early on in the evening by modeling celebrity minuets, marches and scherzi, etc. – Leopold promptly points to the family's discoloured keyboard with its faded and lowly *Tasten* of ‘white’ and ‘gold’ and sweepingly foretells how, one day soon, those wooden keys may turn into an assured source of wealth if not autonomy for the family – but he doesn't use words quite like those needless to say. It is, he tells his tutees, *ein Talisman*,¹¹ *ein Glücksbringer* – the latter

Peux-tu jeter un coup d'œil sur les trois questions/prémisses suivantes et me faire parvenir tes premières réactions/réflexions à ces questions? Elles peuvent être en forme d'anecdotes ou réflexions approfondies, mais j'apprécierai des commentaires précis et, si possible, rapides – avant la fin de mars donc dans vingt-et-un jours.

Dernières choses :

- Il n'est pas nécessaire non plus de répondre aux trois sujets.
- Si tu veux que tes commentaires ne te soient pas attribuables dans mon texte, veuillez aimablement me l'indiquer.

- 1/ les effets de la banalisation des traitements de texte (*Finale*, *Sibelius* etc.) déjà sur l'organisation du travail – possibilité de « copier-coller » et autres manipulations ... mais aussi la mutation du rapport avec le copiste et l'éditeur (le cas échéant) et en conséquence, sur le style des compositeurs (restriction de l'innovation graphique et notationnelle, etc.)
- 2/ les effets de la banalisation des séquenceurs sur la formation des compositeurs et de leur vocation : leur relation à l'électroacoustique ; à la notation ; à la réalité d'interprétation et le travail avec des interprètes ; aux formes de diffusion de leur musique, etc.
- 3/ l'influence (réelle ou non) sur les compositeurs du mythe de la recherche musicale, et l'appropriation (ou l'échec de l'appropriation ou, en effet, le refus) par certains compositeurs des logiciels de pointe (du type logiciels ircamiens), le prestige lié à la maîtrise de la technologie, à la capacité à développer ses propres patches, etc.

Exercise Wizard

This section guides you through the process of reading responses, i.e., those ‘exercises’ of imagination and reflection undertaken to handle the questions/premisses that comprise the *Setup Wizard*. See EXERCISE WIZARD.

What it does

The Exercise Wizard helps you setup a path for your own reading based on Exercises you choose. The Exercise Wizard includes a large

utterance is not to be confused with the father's rival then, C. W. Gluck¹² – at which point, and just as the ancient directives of sorcery advise, he cocks an eye, looks straight away at his unwitting apprentice son, WAM, and whispers: “It will do your bidding!”

Even in our day and age, thanks to the social realism imparted to us by ceaseless advertisements and subliminal publicity, passing the time away at night at a keyboard (whatever its variety: Dvorak, azerty, qwerty or MIDI, etc.), seems to certainly set off inside of people's minds, tutors and tutees alike, the very same sequence of delusory fantasies.

Toys, for another. The presence of toys goes missing in my portrait. At times I also ask myself how the world of great music might have been altered had WAM been every evening, instead of toying around with his smudgy little keyboard, actually occupying himself with a WHAM-O, or other plaything routinely given by parents today to their very young children. WAM received no *GI Joe*, *Mutant Ninja Turtle*, *Mega-kill Transformator* nor for that matter any *Wii*, *PlayStation 3* or *Xbox 360 Elite*. And since he possessed no ‘starter’ computer the way kids do nowadays (giving them the opportunity to use the devices “on their own terms”; see below particularly footnotes 20 and 23), he could not benefit from the

selection of comments to choose from. Mix and match the exercises to create your own understanding. Only a few exercises are included here as excerpts, one from each respondent. You can even share the full-text versions of the exercises with other tutees and/or tutors by simply going to URL: <http://www.revuecircuit.ca/web>.

EXERCISE WIZARD

1) commonplace or clichéd effects of musical text/notation processors, <i>copy-paste</i> , limits on notational innovation TOOLS, SET of TOOLS	1/ effets de la banalisation des traitements de texte, <i>copier-coller</i> , restriction de l'innovation notationnelle OUTILS, OUTILLAGE
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Le rapport du compositeur face à l'*outillage technologique*: quel est notre degré d'appropriation de la technologie, notre degré de référence à celle-ci en matière de composition ou, ultimement, nous nous devons de répondre à la nécessité de la *mise en jeu* d'une idée (de sa matérialisation)? S'approprier ou référer à l'outillage technologique suppose que celui-ci soit appréhendé comme tel, un moyen à la disposition de la pensée (selon le but visé) et, à un certain degré élevé d'appropriation, un moyen modelé par l'imagination créatrice. Toute appropriation est toutefois affaire d'apprentissage. Après l'éveil à la séduction et les jeux d'*apprenti-sorciers* [mon emphase], toute investigation réelle et subtile de la technologie se situera, par maturation, bien au-delà de la manipulation (...). Si nous faisons, d'une part, référence aux programmes d'écriture (de copie de type *Finale*, *Sibelius*), « traiter » une idée en matière de composition musicale n'est pas de l'ordre du traitement de texte. La composition répond à des impératifs d'un tout autre ordre. L'éventail des possibilités de manipulations tirées des programmes de ces logiciels n'offrent en eux-mêmes, à toute fin pratique, que des manipulations. On appréciera certainement le produit mais pour ce qu'il est réellement, c'est-à-dire un produit. Là est sa valeur, combien utile pour la copie, mais d'une valeur restreinte et restrictive pour la composition proprement dite.

André Villeneuve (né en 1956)

creative potential and ‘limitless’ modeling capabilities inherent, say, to *GarageBand 3*.¹³ Thus he avoided the co-dependent and obsessive (addictive?¹⁴) behaviour, so widespread in our time, that makes of the omnipresent laptop portable computer and/or palmar device the inevitable security blanket-talisman that it is, like the faded flannel rag so closely clenched by an open-faced Linux Van Belt in the comic strip *Be-nots*. Tutoring, tutorials and tutelage are not what they used to be. And maybe that’s a bad thing, a bad bad thing. And tutors and tutees have changed too.

Le siècle des avions a droit à sa musique.

Claude Debussy (1913)¹⁵

*La plus belle définition de tout ce que nous faisons à l’IRCAM se trouve dans Monsieur Teste de Paul Valéry: « le démon des possibles ordonné ». Nous voyons par exemple qu’avec un logiciel comme Modalys il est possible de faire sonner une percussion comme si sa surface s’étendait sur des kilomètres.*¹⁶

Frank Madlener (2006)

Director of IRCAM

Updaters, Update Now!

There are critical distinctions to be drawn from this tale of tutor and tutee, distinctions that are subject, too, to updating and upgrading. For example, it has often

When teaching introductory level composition courses I insist that my students notate their ideas by hand (...) Also, it forces them to hear their ideas with their ear and imagination. That being said, I find it somewhat ironic, frustrating, absurd and amusing when students come to their tutorial sessions with computer-generated scores and they tell me that they will recopy it by hand when they submit the project to me at the end of term. They clearly miss the point of the whole exercise. They obviously want to hear their music and the computer enables them to do so in a truly effortless manner

Paul Frehner (b. 1970)

Il est évident que dans certain cas, les logiciels de notation sont mal adaptés, mais ces cas sont plutôt rares. Évidemment, mes collègues compositeurs pourraient être accusés de manque de rigueur, mais ce manque de rigueur me semble aussi à l’image des institutions qui forment ces compositeurs et qui oublient totalement l’enseignement approfondi de ces outils de travail.

David Adamcyk (né en 1978)

[L]a tentation est grande de bénir les dieux pour l’invention de la fonction *copier-coller* (...) Il faut, bien entendu, beaucoup moins de conviction pour *copier-coller* un passage musical qu’il n’en faut pour le recopier à la main (...) Le réel défi n’est donc pas tant de revenir l’âge pré-informatique, mais plutôt de réadapter notre méthode de travail au monde actuel pour que nous ne perdions rien de la vigilance créatrice que notre métier exige. Autrement dit, un *copier-coller* bien *sent* est une très bonne chose, à la limite, bien mieux qu’un laborieux et embêtant travail de recopie automatique et ennuyeux. Mais pour le *sent*, il faut du temps et du recul. Il faut pouvoir et vouloir prendre ce temps et ce recul. À mon avis, il faut davantage viser l’utilisateur que l’outil...

Jimmie LeBlanc (né en 1977)

(...) je travaille autant avec mes outils de départ qu’avec *Finale* que je tente de “dresser” pour formater un document qui répondra à mes besoins de notation (...) En retardant ainsi l’utilisation de *Finale* dans mon processus de création je limite son rôle à celui d’aide à la copie plutôt que comme aide à la composition.

Michel Frigon (né en 1967)

been noted that anyone, WAM included, manipulating a keyboard or musical instrument is, in reality, manipulating a technology simply by the fact of being situated in front of a technological object¹⁷ whose capabilities are fixed within historical time: a *Stradivarius* violin,¹⁸ a *Broadwood* piano, a *Böhm system* clarinet, a *Yamaha DX-7* synthesizer, and so forth. WAM's first 'toy' was a starter clavichord (that traveled with him too and was utilized for nocturnal effusions). His first 'tool', a harpsichord and, later, his 'machine', a five-octave *Walter* piano from the mid-1780s onward; an *Andreas Stein* fortepiano was also of interest to him in the late 1770s especially for its action (escapement mechanism) which he appreciated. In his short life, the composer and keyboardist WAM whizzed through technological changes with assurance and poise. He did so, I believe, because his tutelage had begun with a toy-like object, not a tool, and definitely not with a machine.

• **TOY to TOOL (Paradigm shift)**

It goes without saying then that “[t]oys and play in general are an important part of the process of learning about the world and growing up. The young use toys and play to discover their identity, help their bodies grow strong, learn cause and effect, explore relationships, and practice skills they will need as adults. Adults use toys and play to form and strengthen social

Des étudiants que j'ai eus depuis que j'enseigne la compo [au niveau collégial], très peu utilisent l'ordi et ceux qui l'utilisent, ne l'utilisent essentiellement que pour retranscrire au propre le travail qu'ils font préalablement à la mitaine. Je crois que je n'ai eu droit qu'une fois ou deux à des simulations MIDI (...) Ce qu'il faut comprendre, c'est qu'à ce niveau, ils n'en sont encore qu'aux premiers balbutiements, et pas plus d'un étudiant sur quatre ou cinq ne possède un logiciel d'écriture.

André Hamel (né en 1955)

La répétition est une opération de base et facile à comprendre. Son importance et sa pertinence sont sans doute relativisées et mises en contexte lors d'un enseignement "classique", mais je suis d'accord qu'on pourrait s'y perdre sans de bonnes (ou simplement d'autres) références. S'il y a une "tendance" à utiliser cette ressource de manière simpliste (et ceci vaut également pour les séquenceurs), c'est à mon avis dû plutôt à une mauvaise orientation, ou à son manque. On voit cependant aussi des autodidactes qui explorent profondément les possibilités de ces outils logiciels: ceux-ci rendent également facile l'exploration de la variété (...) Dans le cas des cours de musicalisation que je donne, je vois clairement la facilité qu'ont les enfants de trouver à la fois les utilisations "cliché" des logiciels qu'ils utilisent (une voix transposée dans l'aigu et accélérée fait toujours rire, et tous feront cet essai spontanément sur un patch de transposition et étirement) et celles qui mènent à des questions musicales plus riches (ils voient par exemple que la présence des sons "de fond" change avec la transposition).

Guilherme Carvalho (né en 1974)

2) commonplace or clichéd effects of sequencer use on composer training ... MACHINE	2/ effets de la banalisation des séquenceurs sur la formation des compositeurs MACHINE
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The "old-fashioned" composing paradigm generally consists of sitting at a piano with paper and pencil, sketching some notes, playing them, erasing, revising, playing again, etc. (...) I can imagine this literally hands-on involvement to be beneficial in some situations and a hindrance in others. Either way, computer play-back has not

bonds, teach the young, remember and reinforce lessons from their own youth, exercise their minds and bodies, practice skills they may not use every day, and [even] decorate their living spaces. Toys are more than simple amusement, and they and the way they are used profoundly influence most aspects of life.”¹⁹ To be sure, any tutor-sorcerer would understand this conception of the toy and grasp its implications when dealing with tutee-apprentices. This is normative behaviour. However in our time, things have shifted a bit, or a lot, depending upon where one’s point of view lies: that of a tutor or that of a tutee.

No one can deny, for instance, that there have been significant occasions when toys ‘morph’ into tools, and that many of these shifts have occurred quickly.²⁰ One need only remember the rapid transfer of e-mail and instant messaging from teenage playthings to essential services in business and industry. As recent as 2004, Duke University (North Carolina) offered its entering undergraduate class of freshmen free Apple *iPods*. “Yes, it seems that the popular MP3 recorder has been reclassified from *toy to tool* [my emphasis] by Duke’s professors. The university received a \$500,000 grant to equip new students with “minicomputers for educational uses.”²¹ Remember: *iPods* were introduced to the world as a commercial product only in October 2001.

eliminated the possibility of this “tactile composing,” just the necessity for it. However, I think in many cases composers have stopped composing with their hands because they no longer need to.

Niklas Kambeitz (b. 1977)

Si on privilégie certaines décisions parce qu’elles sont plus faciles avec la machine, il me paraît souhaitable d’avoir la lucidité de s’en apercevoir et d’user de prudence. (...) les simulations MIDI peuvent être un bon outil de travail, mais peuvent aussi abrutir le compositeur dans sa conscience du « faire » musical, creusant ainsi l’écart entre les mondes de l’intention et de la réalité pratique. Enfin, je crois que cette leçon de la science-fiction qui valait pour [copier-coller] vaut aussi pour ce dont nous discutons ici : c’est aux humains à former les machines, non l’inverse.

Maxime McKinley (né en 1979)

I believe that a composer must maintain as close a connection to his/her creation as is physically and spiritually possible. This does not mean that one must play all instruments well in order to compose for them, however we must be able to play at least one, really two or three is more like it, more if possible. This does mean that we must not - at any cost - disengage ourselves (as if an innocent observer) from what we are writing. If you can’t sufficiently hear what you have written with your eyes and inner ear, then you are not truly a composer - you are a bricklayer who follows someone else’s plan having neither the connection to the plan nor the creative spark to consider its details. In short, one cannot truly be inside the music if you need a grotesque machine to show you what you have done!

Robert Baker (b. 1970)

Je vois surtout l’avantage d’avoir une simulation du travail en cours. Au moins pour entendre l’harmonie et la polyphonie et comprendre la forme. C’est déjà pas mal ! Je me rends compte que l’impulsion première de création demeure. L’étudiant avec une approche traditionnelle restera comme ça et celui qui est plus aventurier se compliquera la vie un peu plus. D’ailleurs, la notation non-conventionnelle est en régression.

José Evangelista (né en 1943)

In Kansas City, “one elementary-school district recently gave all its students PDAs [Personal Digital Assistants], complete with wireless interconnection capability. The reasoning was that the technology would allow teachers to walk among [grade-school] students and wirelessly distribute class assignments, tutorials and other teaching aids. Students are supposed to ‘sync’ their PDAs nightly to get the latest assignments.”²²

What goes on here? Don’t tutors tutor any longer?²³ Such pedagogical procedures (akin to ‘distant learning’) surely give new meaning to the ethical principle of ‘at arm’s length,’ i.e., the distance a person needs to maintain from another in order to avoid offensive or harmful contact, even a crime if one person goes too close to another without consent.

“Technology remains a toy when it is used merely because it is attractive and exciting, but its real potential is unexplored. Technology is often introduced into education to attract and excite, without any more than an assumption that it might be useful. But, if applied without deliberative study of its use in context and without evaluation of the technology’s impact on this use, ‘educational’ *remains* a toy... Indeed, a technology ‘toy’ can quickly become a tool if it is used for directed

The “Hybrid Sequencer Paradigm” [i.e., integrating MIDI and audio tools] has the effect of blurring the boundaries between the professional and the amateur (knowledge of music – in its traditional sense – is no prerequisite to be able to operate inside this paradigm). On quantitative terms, this entails that a larger number of persons seem to be trying their hands at composing music (...) More and more, I see people who are able to use computer-based word-processing applications, but are not able to *write*. More and more, I see people who are able to use computer-based music notation software, but are not able to *write* music.

Osvaldo Budón (b. 1965)

It is not a substitute for listening with an imaginative ear, where you try to accurately hear what the aural result would be if played by real performers. The risk I suppose is that we lose or never develop this skill if we completely depend on the computer (which fails in many places, especially if we don’t invest time into building a computer system that provides the fullest capabilities of sound simulation). But as long as there is a good understanding of the areas where the computer falls short, then it can only be helpful – like any other tool.

Emily Hall (b. 1978)

In the last seven years I have known a number of composers who have ignored their imaginations and musical instincts and instead entirely relied upon sequencers to provide feedback about the sound of their compositions. For example in the last nine years I witnessed and was in a number of unfortunate performance situations where the composer used MIDI sequencers as his or her primary auditory guide and, as a result, had written a type of clichéd and unrealistic music (...) [Nevertheless,] in the last few years I’ve begun to use the application OpenMusic to construct complex harmonic, rhythmic, and microtonal materials that I would not have been able to previously imagine and, in these instances, have found that MIDI sequencers have been invaluable in helping me judge and achieve musical ideas I would not have been able to previously.

Jacob Sudol (b. 1980)

exploration. In general, a technology becomes a tool when its use is principled and applied for a purpose.”²⁴

For someone of my generation, the personal computer of the 1970s seemed very much like a toy when it first appeared, gawky as it was and unattractive if not ugly. Strange how the PC made a rapid trajectory: from useful toy-to-tool (essentially for word-processing, once called typewriting,²⁵ as well as accounting aid), to a machine to be junked and, lastly, turning itself into a collector’s item.²⁶ University mainframe mega computers employed for composing music in the ‘60s and ‘70s were business/administrative machines with imposing card-punching units, reams of perforated paper all surrounded by mosquito-humming printers. For the then computer music tutor and tutee (I explored the medium a bit as a graduate student at Princeton University), only nocturnal discharges were authorized since diurnal operations were reserved for university priorities, which in those years in America included work for the U.S. Department of Defense. Such “compositional instruments” seemed utterly impersonal to me being neither convivial tool – one says ‘friendly’ now – nor toy to be played with.²⁷

• TOOL to MACHINE to MEGAMACHINE

Further critical distinctions can be articulated. Consider Lewis Mumford (1895-1990), U.S. philosopher of the

3) myth of musical research, latest software, prestige of personal patch ... MEGAMACHINE, AUTOMATON	3/ mythe de la recherche musicale, logiciels de pointe, prestige du propre patch MÉGA-MACHINE, AUTOMATE
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Training in both musical fields and scientific fields (...) must be balanced but seldom is (...) scientists and researchers [in music] are fully up to date on concerns in their own domain, but are completely naive in the other (...) In terms of application software, patches are like the *power tools* [my emphasis] of the composer’s toolkit. They can be used throughout a composer’s development just as any other traditional tools that the composer has either collected or crafted for him or herself. Since software application develops at such a rapid rate, these “power tools” are likely to become obsolete far sooner than more traditional varieties.

Trevor Grahl (b. 1984)

The politics of musical research, touted as a *sine qua non* by some, reviled as an infernal machine by others, is by no means different from the politics of traditional compositional craft. How many times have we seen a composer’s orchestration held up as a sign of superiority? (...) [F]rom the Enlightenment onwards, the increasingly democratic access to expertise has sometimes led to a counter-reaction from the “expert” who demotes the amateur to the status of an incompetent (...) Of course there is often an economic barrier involved in purchasing [software applications], if one ever does; perhaps for younger composers this is a source of tension, a sense of being a technological have- or have-not, more than being on either side of the research/composition divide.

Inouk Demers (b. 1970)

Les logiciels de pointe ne peuvent donner des choses intéressantes que si l’imagination, la folie, le besoin d’expression, la réflexion sur le résultat, le GOÛT sont mis en jeu. Même en s’en tenant à certains “patches” simples, on peut obtenir des résultats expressivement, poétiquement, intellectuellement riches. Le prestige lié à la maîtrise

history of science and technology, and the contrast made by him during the early 1930s, in the time of Depression: a “tool lends itself to manipulation” (today, ‘hands-on’) while a “machine lends itself to automatic action.”²⁸ A megamachine, he would write some thirty-five years later in his *magnum opus*, *The Myth of the Machine*, comprises what it takes to build the Pyramids, the Roman Empire, to conduct the two World Wars, or to run the Soviet or American military-industrial complex. Such organizations are facilitated by the bringing together of huge quantities of men, creating a “human” machine of immense accuracy. In general, a megamachine acts as a social structure but not one arranged with respect to human requirements. Rather, megamachines revolve around the “needs” of the very machines (computers?) themselves which now typify and manipulate our own lives.²⁹

In this regard, I cannot help but think of the ‘armies’ of young scientists who were harnessed to create N.A.S.A in the late 1950s for the exploration of space. Or, today, the ‘armies’ of young adults (sorcerer’s apprentices, to be sure, but actually paid child labourers would not be a misnomer) all creating intrigues, plot outlines, juvenile beeps, ringtones and videogame music for multinational gaming enterprises, such as *Ubisoft* here in Montreal which operates its own ‘university campus’ and cultivates academic partners.³⁰ As always, the sor-

de ces technologies de pointe est donc un aspect du mythe de la recherche musicale dont il faut se débarrasser s’il est inhibiteur de la créativité. Nous avons pu entendre beaucoup d’œuvres utilisant les “logiciels de pointe de type ircamien”. Les résultats sont mitigés.

Michel Gonneville (né en 1950)

Technology and its applications, when embraced by a group or movement, can often be accompanied by doctrines that dictate what an individual composer *should* or *should not* do with it. Such doctrines and their yokes are not unique to technology-driven aesthetics however, lest we forget the admonitions of octave doublings and the like in 1950’s serial thinking.

Chris Paul Harman (b. 1970)

Il faut l’avouer : il est certains milieux musicaux, et pas des moins prestigieux, où l’on n’entre pas si l’on n’a pas intégré l’électronique à sa pratique compositionnelle. C’est devenu un passage absolument obligé pour faire son chemin dans la plupart des circuits, surtout à mon âge. Le problème, à mon avis, est que ces outils (je pense aux logiciels ircamiens mais aussi à Max/MSP) favorisent insidieusement certaines approches esthétiques au détriment de certaines autres. Or, je ne me retrouve pas dans les approches favorisées, approches qui constituent le “discours dominant” dans la musique contemporaine européenne, et particulièrement en France. Pour moi, utiliser ces logiciels tient toujours d’une sorte d’entreprise de détournement, de pervertissement de leurs fonctions habituelles. Je tiens à le préciser : ce “combat” contre le logiciel est intéressant, il me met face à mes répugnances et à mes limites et m’aide à préciser mon projet artistique au sens large.

Nicolas Gilbert (né en 1979)

One advantage of the composer learning to program his or her own patch, using a programming language such as Max/MSP, for instance, is the control one will have over the distinct details of the technical aspects of the piece. Programming is very time consuming, however, and there is a risk of finding oneself spending more time on the technical aspects of one’s piece than on the music itself. For this reason many composers employ programmers, leaving themselves more time to write music. In this case, there is the risk of the work of one

cerer-tutor manages to get someone else or something else do his bidding.

In the late '60s, Czech philosopher Radovan Richta (1924-1983) and his colleagues also proposed that technology evolves in three stages: tool, machine and automaton.³¹ But here, unlike Mumford's framework, their tripartite configuration 'downsizes' levels: a machine is not just a mechanical tool but it is a powered tool that replaces human physical effort where the operator controls functions as with an automobile, a train, a computer, electrical lighting, etc. Mumford's megamachine becomes a Radovanian machine. The automaton (dare I say robot? a word that owes its origin to the Czech language) is a higher order machine that, by means of automatic algorithms, eliminates or diminishes radically the factor of human control. Examples of such automatons include: digital watches, automatic telephone switches, pacemakers, computer programs, etc.

One cannot help noticing the obvious: in today's 'downsizing' trends, more and more power is applied to the toy, while kids skip the Toy-to-Tool stage in their development, moving directly from Machine-to-Megamachine-to-Automaton. And sensibilities, subtleties and refinements of judgment and imagination that once sprang from the interaction with non-powered toys – those that might have also served as 'tools for convi-

composer bearing obvious resemblance to another with respect to the technical aspects that result in working with the same programmer. I would question whether such work should not be considered as a collaboration rather than the work of only one mind.

Marielle Groven (b. 1984)

Dans le monde vinicole, on parle de normalisation du goût due à la standardisation des techniques. Les vrais amateurs [du vin] s'intéressent aux producteurs, qui s'emploient à mettre en valeur la spécificité du terroir. Ainsi en est-il des compositeurs. Il y a ceux qui peuvent générer beaucoup de musique avec des moyens techniques standardisés, donnant une musique sans grande profondeur mais bien faite car la technique est irréprochable et ceux qui font chanter le « terroir » par une connaissance intime et profonde du « matériau » premier (...) Mais le plus sérieux problème lié à l'utilisation d'outils informatiques mal contrôlés est la dilution de la pensée personnelle. Car, au fond, que cherchons-nous à dévoiler chez les jeunes étudiants compositeurs si ce n'est leur « voix ».

Denis Gougeon (né en 1951)

Assessment Wizard

What it does

The Assessment Wizard helps you setup a state of mind to be saved for use with your own Assessment mind-set. Although you can save any syntagmatic or paradigmatic view of the Exercise responses (cf. full-text versions), there are several exercise elements that my Assessment feature does not support.

Beginning an assessment file with this wizard ensures you start with a file that is critical of the SETUP WIZARD (WIZARD de CONFIGURATION). Here are two critical assessment files.

Your questions are a bit loaded. Is there any room for a balanced response to them? For example, I find it impossible to respond to a question that blithely refers to "the myth of musical research." Also, it seems a bit strange to be fishing for criticisms of the use of technology in electroacoustic music, since this genre by definition depends on technology for its existence. It is like criticizing the use of the piano in piano concertos. Would you accept responses that

viality'³² – fade away. As I see it, children who play with hyper-powered toys grow up to be adults with definitely a binary if not Manichean (moronic, Drucker might have said) outlook on things, especially when it comes to their dealings with other people. It's either yes-or-no, either 'my way or the highway.'³³

considered both positive and negative aspects of the issues you are discussing?

Sean Ferguson (b. 1965)

A priori : Je crois que tes questions sont drôlement « chargées » sur le plan normatif, apparemment tu sembles vouloir discuter des impacts de la technologie et de ses inévitables outils sur l'art, mais il me semble plutôt se dégager des matériaux de ton questionnement, une « anxiété de la disparition » qui pourrait être qualifiée de réactionnaire si on la regardait d'un point de vue politique ou social. Si j'observe tes questions, je suis frappé par l'existence d'un paradigme qualitatif et normatif, très contraignant pour celui qui doit répondre, une sorte de « credo en filigrane » dont voici quelques exemples (...) En fait il me semble que tu sois très angoissé par la « disparition » de certaines prérogatives, et ici je pense à cette définition très « spirituelle » de l'art, qui s'attend à ce que ses acteurs et par conséquent ses objets soient porteurs de « valeurs » telles que (...) Je ne désire en aucun cas remettre en question la pertinence de ce questionnement, en fait je trouve très poétiques et lumineuses ces « présentations » dialectiques, survolées par la philosophie de Hegel et ses « attentes » de synthèse ayant pour objectif ultime l'accomplissement de l'Esprit suprême. Par contre, je crois dans le contexte, qu'elles pourraient être qualifiées de « tics idéologiques », ou de pathologie typique d'un passage prolongé dans le milieu artistique-académique (...)

Yannick Plamondon (né en 1970)

*Ours is a brand-new world of allatonce [‘all-at-once’] ... We now live in a global village ... instant communication insures that all factors of the environment and of experience co-exist in a state of active interplay.*³⁶

Marshall McLuhan (1967)

Customize My Sorcerer’s Finale

“Speculum Speculorum ...

Sweeping, magical powers loom ever so effortlessly, ever so perilously for the person who, working or playing, sits or stands before a computer screen – the ‘mirror of mirrors.’ Some of these people are real sorcerers, real wizards,³⁷ others – hapless children – duped into thinking that they are. Leonardo DaVinci once claimed that *lo specchio è il maestro de pittori* (the mirror is the master of painters).³⁸ What he meant however was that one first becomes a painter before one embarks upon the ‘do-it-yourself’ test of truth which assesses one’s replication of nature (i.e., the painting) as furnished by its reflection in an mirror. This is an act of verification.

The computer screen has made all of us ocularcentric rather than auricularly sensitive, perhaps confirming the Heraclitian axiom that “the eyes are more exact witnesses than the ears.” Be that as it may, when eyes have it over the ears, when vision dominates hearing, then splitting/division/particle-acceleration have it all over gathering/multiplication/unification. Gnagflow Trazom’s world was auricular.

Then again there are also acts of falsification. Fifty years ago, while working with a mainframe computer at Bell Telephone Laboratories (New Jersey) – whose principal research goal then was to sweep away (i.e.,

unemploy) costly telephone operators by replacing them with robotified voices – the young Max Matthews revealed to the world that such a megamachine, an IBM704, could also be utilized as a new kind of ‘musical instrument.’ In voice simulation and modeling projects, *mutatis mutandis*, not unlike those conducted by Trazom, the proonym of Max/MSP went on to create revolutionary software “destined to form the basis of all contemporary digital musical systems. His audacious ideas were driven by the belief that ‘any sound that the human ear can hear can be produced by a computer.’”³⁹ Today, telephone operators are still happily at work and, any time I wish, I can listen to the default speaking voices of Zarvox, Victoria, Trinoids, Junior, Cellos, Bruce and Bad News!⁴⁰

... Incunabulum⁴¹ ...

A newly-born composition swaddled in PATCHWORK (the ‘baby’-version of OPENMUSIC), or in any other software bundle of joy, enjoys much prestige today. For, as it is the practice at IRCAM and related institutions, the Sorcerer here works *as* Apprentice, that is, works as an assistant or midwife (in French, *maïeuticien*) to the composer-creator. In that underground nursery-hatchery, there could have been no Boulezian offspring without Andrew Gerzso, no Nuñes without Eric Daubresse, no Manoury without Serge Lemouton, etc.: “En fait, si l’IRCAM a inventé une fonction dans la création, c’est bien ce personnage. Il peut être un musicien, qui a la fibre scientifique, ou un chercheur, qui cherche à établir des contacts beaucoup plus directs avec la création. Il peut venir des mondes informatique ou scientifique qui travaillent sur les formalismes, la logique. Outre la

diversité des profils, l'assistant musical doit être mobile. Passant par le renouvellement des compositeurs, la nouvelle politique de l'IRCAM sous-tend un renouvellement de l'élaboration des œuvres. Dans d'autres cultures, par exemple en Allemagne, le compositeur et l'assistant musical entretiennent des échanges extrêmement étroits,⁴² presque d'égal à égal, relations dont nous pourrions nous inspirer. Autre particularité, ici, compositeurs et assistants musicaux forment de vieux couples..."⁴³ (cf., Groven file, EXERCISE WIZARD.)

A case in point: Brian Ferneyhough's long years at IRCAM. His music "is sometimes developed to a point where it seems to go beyond itself. The speed with which different expressivenesses follow each other, and the density with which they superimpose vertically, are so great that a sort of overload can occur, one which transcends the restlessness of arousal, like a *film run through at ten times the proper speed* [the 'ocularcentric' emphasis is mine]."⁴⁴ Such a perception would normally make for laughter, as children readily understand in their interpretation of the toy-like fidgetiness of such sounds. (cf. Carvalho file, EXERCISE WIZARD.) Yet, in our day and age, the prestige associated with musical research, with the agency of sorcerers *as* apprentices, holds back our cachinnation.

The swaddling PATCHWORK also involved Ferneyhough in transcription, that is, in taking the computer screen output and 'reverse' copying it into complex, handwritten *Urtext* score manuscripts.⁴⁵ (cf., Frehner file, EXERCISE WIZARD.) The work of the sorcerer in those 'early days', the '80-'90s, was always veiled if not hidden.

... **Avada Kedavra**...

Composers who once worked with fountain pens, who stopped their writing – interrupted their inspiration – in order to go to the inkwell to tank up ('fill-'er-up'), or similarly, composers who worked with simple pencils, all must have viewed the arrival of the ink cartridge, the ball-point pen and the electric sharpener as important technological advances and tireless tools – like today's 'creative machines' with their attendant human and/or software resources: such indefatigable devices might make the writing of music easier. They were wrong. Eighty-five years ago, Thomas Edison announced to the world that the motion picture would one day replace textbooks in schools.⁴⁶ He was wrong. Might the Tablet PC speech recognition-to-text system literally replace our hands? replace the keyboard, the ink pen, the pencil of old, or one's need for scribes and transcriptions?⁴⁷ ("Look, Mom, no hands!") Maybe. But one would still have to (re)learn rhetoric and 'how to speak.' And if composers were to follow suit then they would have to (re)learn how to intone in order to 'sing their scores!' To be sure, computers will not replace the need for the tutor/teacher in schools. But then, maybe...

Modeling exercises, the 'replication of nature,' Xtreme mimesis, simulation, VR, hyper-reality, etc.: how is it that the spiritual values embodying 19th century decadence particularly in France (cf. Huysman's 1884 novel *À Rebours*; in English, *Against Nature* or *Against the Grain*) – that the idea of a thing is superior and more desirable than the thing itself – how is it that such values do not appear to embody in our time a decadent turn of the mind? My answer: the prestige associated

with research. And so we gladly fill our homes with 'new' gadgets, especially with toys for our children, the way Des Esseintes decorated his elegant residence with 'flowers': "This admirable artistry had long enthralled him, but now he dreamt of collecting another kind of flora: tired of artificial flowers aping real ones, he wanted some natural flowers that would look like fakes."⁴⁸ I understand this desire in our time *mutatis mutandis* to mean that androids and, by cross-fading morph, musical androids (compositions with electronic extensions) embellish and improve the natural, which happens to be a central tenet of the entire decadent movement. Again, the prestige of scientific research – at times dubious research – preempts any awareness, any perception of the 'decadent' elements.

Remember: Des Esseintes chose his flowers based upon an anti-mimetic principle, a kind of double reversal that declares the primacy of artifice over nature while, at the same time, overturning, reversing traditional artistic theories by affirming that it is not art that imitates nature rather nature, art (*tekné*, in Greek).⁴⁹ Humans, and as with their musical compositions, aspire to be androids while robots become the ideal toy for children. Gnagflow Trazom, it must be stated again, did not play with robots.

I concur with the following analysis made by Todd Oppenheimer in his 2003 book, *The Flickering Mind: The False Promise of Technology in the Classroom and How Learning Can Be Saved*. Computer technology, he says, "is used too much and very unwisely in the younger years, and not wisely enough in the older years."⁵⁰ Tutor and tutee require some real tutoring.

... EOF⁵¹

NOTES

1 Peter F. Drucker (1909-2005) in "The Guru's Guru," interview with Erick Schonfeld, *Business 2.0*, October 2001. See URL: <http://www.timeinc.net/b2/web/articles/0,17863,513950,00.html>. See also an obituary of the Viennese-born thinker, "Peter [Ferdinand] Drucker, the man who invented management," *BusinessWeek*, November 28, 2005, cover story. See also URL: http://businessweek.com/magazine/content/05_48/b3961001.htm

2. Title of a distinguished lecture in the science and technology of music given by Prof. Lewis (b. 1952) on April 19, 2007 on behalf of the Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT) at McGill University's Schulich School of Music. An excerpt from the lecture abstract: "The computer has become an irreversible part of cultural and social histories of the arts (...) For George Lewis, living, working, and performing with creative machines of his own design is closely intertwined with the study of how improvisation produces knowledge and meaning. As a kind of computer music-making embodying African-American aesthetics and musical practices, Lewis's work intersects with critical histories of new media, interactive music, and American experimentalism, as well as ethnographic and historical work on improvisation. Part memoir, part history and criticism, this talk explores, among other topics, Lewis's contention that notions about the nature and function of music inevitably become embedded in the structure of software-based music systems."

3. See, for example, Gérard Assayag, *Computer Assisted Composition today* (1998), at URL: <http://recherche.ircam.fr/equipes/repmus/RMPapers/Corfoug8/>

4. Peter Drucker, quoted in James Charlton, ed., *A Little Learning is a Dangerous Thing* (New York: St. Martin's Press, 1994): 65.

5. The name Gnagflow Trazom appears in a letter to Mozart's sister dated August 21, 1773; it also appears in the letter of October 14, 1777, where he reports to his father of his meeting with the fortepiano maker Johann Andreas Stein.

6. A nickname which W. A. Mozart gave to himself. See his letter of January 15, 1787 to Gottfried von Jacquin.

7. See URL: <http://dme.mozarteum.at/mambo/index.php>

8. Leopold Mozart, *Notenbuch für Nannerl*, H. Schüngeler, ed., (Mainz: B. Schott's Söhne, undated). Editions of this incomplete version go back to 1940 and 1955.

9. Salzburg.
10. A euphemism, *weiße Gold*, describing the fruit of Salzburg's regional salt mines.
11. The etymology of *talisman*: from Arabic *tilasm*; from Late Greek *telesma*, consecration ceremony; from *telein*, to consecrate, fulfill, from *telos*, final result, to initiate into the mysteries, to perform religious rites. A *talisman* is an object producing apparently magical or miraculous effects. It is not without interest to note that in WAM's "final works" the magical flute in *Die Zauberflöte*, K.620, acts precisely as a talisman, as does, in my opinion, the clarinet in K.622, the *Concerto for Clarinet*.
12. "Both Mozart and his father could readily recognize that [Christoph Willibald] Gluck held a pre-eminent position among opera composers, but Leopold had an old grudge against Gluck dating back to the early 1760s, involving imagined plots against himself and his children, supposedly instigated by Gluck. Leopold rekindled this animosity now that Mozart lived in Vienna (...) Leopold also expected Mozart to repay his financial debt to him, and a number of Mozart's views about composition seem designed to demonstrate the soundness of his [Leopold's] compositional principles, which would allow him to appeal to an audience and make more money than he could in Salzburg." See, *The Cambridge Mozart Encyclopedia*, Cliff Eisen and Simon P. Keefe, eds., entry on *Aesthetics*, available also at the URL: www.cambridge.org/us/catalogue/catalogue.asp?isbn=9780521856591&ss=exc
13. GarageBand forms a part of iLife, a group of Apple Corporation applications that include iPhoto, iMovie, iDVD, iTunes, and iWeb. With an adjunct application, JamPack 4, even symphony orchestra sounds can be exploited and mixed.
14. During a press conference following an official visit to the Canadian Government in February 2007, and in a story that went around the world, Microsoft founder Bill Gates told Reuters that he and his wife Melinda set a limit of 45 minutes *per* day of total computer screen time for video games and an hour *per* day on weekends, plus whatever time their eldest child, ten-year old Jennifer, needs for her homework. She plays with the *Xbox 360* and her apparent favourite pastime is a gardening game called 'Viva Pinata.' The Gates' seven-year old son Rory asked if that meant he was going to have dad controlling his computing experience for the rest of his life. Bill told his young son that only when he left home would he be able to set his own screen limits.
15. *Revue musicale S.I.M.* 9 (November 1913): 43.
16. Frank Madlener, *Vers un nouvel IRCAM*, interviewed by Bruno Serrou, January 19, 2006. See URL: http://www.resmusica.com/aff_articles.php3?num_art=2014
17. Cf. Jean Baudrillard, *Le système des objets* (Paris: Gallimard, 1968).
18. "Few people know," writes John Marchese in the *New York Times*, April 7, 2007, "that most of Stradivari's instruments have been significantly altered over the years to better meet the demands of modern performance. (...) In what other field [however] would someone pay more for a 300-year-old tool than for a new one?" See URL: <http://www.nytimes.com/2007/04/07/opinion/07marchese.html>
19. URL: <http://en.wikipedia.org/wiki/Toy>
20. Consider the "One Laptop *per* Child" movement. OLPC was begun by Nicholas Negroponte, co-founder and director of the MIT Media Laboratory. The non-profit organization hopes to provide every child in the developing world an open-source computer at a cost of approximately \$100 which has since risen to \$175. "Our commitment to software freedom gives children the opportunity to use their laptop computers on their own terms." The "XO" is built by Quanta Computer, which makes a \$3 profit on each device. See URL: <http://www.laptop.org/en/vision/people/>. Also URL: http://technaute.lapresseaffaires.com/nouvelles/texte_complet.php?id=81,123_99,0,042007,1349141.html&ref=cyberpresse
21. Brad Dick, August 1, 2004. See URL: http://broadcastengineering.com/digital_handbook/broadcasting_attend_school_cool/
22. *Ibid.*
23. Consider the educational project called *Curriki*. Scott McNealy, Sun Microsystems Inc. co-founder, has been promoting a "project to transform education the way digital music upended the recording industry. Though it's not part of his official duties (...), McNealy is spending a lot of time as pitchman for a project called *Curriki* – short for curriculum and wiki, which is a website allowing users to add and modify content and claim a piece of authorship. In the case of *Curriki*, parents, teachers and students can post and download free lesson plans, sample tests, book chapters and other materials. McNealy said (...) the idea is to lower the barrier to basic educational materials as more students get access to the Internet worldwide." See *Globe & Mail* (Toronto:

April 17, 2007). Also see URL: <http://www.theglobeandmail.com/servlet/story/RTGAM.20070417>

24. *Evaluation: turning technology from toy to tool (Report of the Working Group on Evaluation)*, ed. V. L. Almstrum et al., Integrating Technology into Computer Science Education Conference, June 1996, Universitat Autònoma de Barcelona. See ACM SIGCUE Outlook, vol 24, Issue 1-3, (Jan.-July 1996): 201-217. Also, <http://portal.acm.org/citation.cfm?id=1013718.237648&coll=&dl=ACM&CFID=15151515&CFTOKEN=6184618>

25. Cf. Darren Wershler-Henry, *The Iron Whim: A Fragmented History of Typewriting* (Cornell: 2006). Wershler-Henry is a professor at Wilfrid Laurier University (Ontario).

26. See Christine A. Finn, *Artifacts: An Archaeologist's Year in Silicon Valley* (Boston: MIT Press, 2001).

27. Nevertheless, at MIT in the early '70s, the student-run Tech Model Railroad Club was the site of the creation of the world's first video game on the school's mainframe computer. See Steven L Kent, *The Ultimate History of Video Games: From Pong to Pokemon – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press/Crown/Random House, 2001)

28. Lewis Mumford, *Technics and Civilization* (1934) (Fort Worth: Harvest/HBJ, 1963): 10.

29. See Lewis Mumford, *Myth of the Machine* (Volume 1: *Technics and Human Development* (1971); and Volume 2: *The Pentagon of Power* (Fort Worth: Harvest/HBJ Books, 1974).

30. See URL: <http://www.ubi.com/ENCA/News/Info.aspx?nid=3407>

31. See Radovan Richta et al., *Civilization at the Crossroads: Social and Human Implications of the Scientific and Technological Revolution* (1966, in Czech), (White Plains, New York: International Arts and Science Press, 1969).

32. Consider the work of Ivan Illich (1926-2002): his *Deschooling Society* (1970) argues that the top-down management of schools makes students powerless - and that the same top-down management is typical of the modern, technological economy that prevents people from learning. *Tools for Conviviality* (1973) makes the same criticism of technology in general. "Such a society, in which modern technologies serve politically interrelated individuals rather than managers, I will call 'convivial.'" See the e-text of *Tools* at URL: <http://opencollector.org/history/homebrew/tools.html#hid3M>

33. Cf. Harry E. Chambers, *My Way or the Highway: The Micromanagement Survival Guide* (San Francisco: Berrett-Koehler Publishers, 2004).

34. This term and all of the subsequent 'wizard' terms are drawn from the tutorials provided in the User Manual for FINALE 2007 notation software made by SmartMusic.

35. Marshall McLuhan and Quentin Fiore, *The Medium is the Massage* (Corte Madera, California: Gingko Press, 2005): 63.

36. Cf. Katie Hafner and Matthew Lyon, *Where Wizards Stay Up Late: The Origins of the Internet* (New York: Simon & Schuster, 1998). The wizard in question is Frodo, from the *Lord of the Rings*, a name given to early on-line computers.

37. Translation quoted from Martin Kemp, ed., *Leonardo on painting: an anthology of writings*, ed. with Margaret Walker (London/ New Haven: Yale University Press, 1989; 2001): 202.

38. Quoted from the introductory text for the *Max Fest* held at Stanford University on April 26 and 29, 2007. See URL: <http://ccrma.stanford.edu/maxfest/>

39. In 1961, Arthur C. Clarke attended a demonstration at Bell Labs of the voice synthesis research, "giving him the inspiration for the talking computer HAL9000 in his book and film 2001: A Space Odyssey. Forty-five years later, voice synthesis technology can be found in products as diverse as talking dolls, car information systems and various text-to-speech conversion services such as the one recently launched by BT. Many of these modern systems can convert text into a computer synthesised voice of quite respectable quality... Voice recognition has turned out to be a much harder task than researchers realised...." See URL: <http://www.aaai.org/AITopics/newstopics/machine6.html>

40. From Latin *incunabula* (swaddling clothes, cradle), from *cunae* (cradle, infancy).

41. One has only to think of the very close creative work of the technician Gottfried-Michael Koeing in the 1950s on behalf of Stockhausen and Ligeti and their electronic music projects.

42. Frank Madlener, *Vers un nouvel IRCAM*, interviewed by Bruno Serrou, January 19, 2006. " See URL: http://www.resmusica.com/aff_articles.php3?num_art=2014

43. Jonathan Harvey, in the Forward, *Brian Ferneyhough: Collected Writings* (Contemporary Music Studies), J. Boros and R. Toop, eds., (Amsterdam: Harwood/OPA, 1995): ix.

44. See *Handbook to Twentieth-Century Musical Sketches*, P. Hall, F. Sallis, eds. (Cambridge: 2005). The rhythmic sketch transcription

for *Trittico per Gertrude Stein* (1989) and the sketch transcription of '3rd Rereading Filter Sequence' for *Terrain* (1992) appear on pages 180 and 182.

45. See Larry Cuban, *Teachers and Machines: The Classroom Use of Technology Since 1920* (New York: Teachers College Press, 1985): 9.

46. See Richard Powers, "How to Speak a Book," *New York Times* (January 7, 2007). at URL: <http://www.nytimes.com/2007/01/07/books/review/Powers>

48. J.-K. Huysmans, *Against Nature* (London: Penguin, 1973): 97. "Cet art admirable l'avait longtemps séduit, mais il rêvait

maintenant à la combinaison d'une autre flore. Après les fleurs factices singeant les véritables fleurs, il voulait des fleurs naturelles imitant des fleurs fausses."

49. See Bertrand Bourgeois, "À rebours des grammaires des arts décoratifs" *Online Magazine of the Visual Narrative*, Issue 16. House/Text/Museum (February 2006) at URL: http://www.imageandnarrative.be/house_text_museum/bourgeois.htm

50. Todd Oppenheimer, *The Flickering Mind* (New York: Random House, 2003): 391.

51. End-of-File: the end of my finale.