い．そうそう，去年の暮，この本の出版 50 周年記念版が出ました．その冒頭に Chomsky 自身による新たな序文が収められています．

上に書いたことを整理すると次のようになります．ヒトは誰でも言語機能をもって生まれ出るが，実際それがどのような形で出現するかは，取り込む経験が何語であるかにより決定され，この出現形態を「内在言語」（以前の用語だと「コンピテンス」）と呼ぶ．もっとわかりやすく言えば，個別言語の知識のことです．言語運用（パフォーマンス）は，この内在言語と他の関連する知識を言語処理装置に入力として与えた場合の出力です．「人が誰でも持つ潜在能力の一つに自分で考えて自分なりの解を得る」能力についても似たようなことが言えるのではないかというのがなほみさんの「暴論」の「肝」かなぁと思います．

わたくしは「暴論」が少なくとも NG だとは思いません．ただ，ことばの場合は，「個別言語」というレベルでの多様性が関与しますが，なほみさんの場合には（当然ですが）それにあたるものがありません．そうであれば，言語機能論を持ち出すのではなく，同じく，Chomsky が言う「科学形成機能 (Science Forming Faculty, SFF)」のほうがよいような気がします．SFF も FL 同様，ヒトに固有で，SFF は経験を取り込んで，「科学形成能力 (Science Forming Capacity, SFC)」に個別化されると想定されています．SFF の考えは 70 年代ごろからの著作に現れ始め，ある程度まとまったものとしては，1988 年の Language and Problems of Knowledge（いわゆる，「Managua Lectures 言語編」）の第 5 章をお勧めしたいと思います．ただ，FL の場合と比べて，SFF のほうは理論的な整備や実証的な裏づけが十分でない部分が多く，その意味で，「思いつき (stipulation)」の域を出ていません．

こんな具合で，≪ Chomsky の用語法とはずれがあるけれど，考え方には相通ずるものがあるな≫というのが「暴論」を読んだ直後の反応で，その 1 行だけでも返信しようかと思いました．ただ，せっかく，反応するなら，きちんと文章にしてからと思い，「暴論」をプリントアウトしたものをずっとバックパックに入れて持ち歩いていました．

5 月の連休明けにはご返事をと思いつつ，夏の講演の詰めもあるので，6 月に入ったら，一度，東大へ出かけて，久しぶりに夕食でもご一緒しながら，自由に意見交換をしようと思い始めていたところでした．

なほみさん，ほんとうにごめんなさい．

悔いというのはこんなものなのでしょう．なほみさんを代表とする西海岸風認知科学とわたくしなどの東海岸風認知科学とは水と油のように思う人も多いけれど（まあ，「東海岸風」というよりも「MIT 言語学風」と言ったほうが余分な誤解を生む可能性が低いかもしれません），少なくともこころの本質とその活用支援を真剣に探るというレベルではそんなことはないとずっと思ってきました．だって，なほみさんたちの考え，≪おもしろい！≫と思いますもの．なほみさんも Chomsky やわたくしたちの考えに関心を持ってくれていたと確信しています．もっと腰を据えて，お互いの考えをぶつけ合う機会を作るべきだった，そんな悔いが残ります．

もう少し時間が経って，心が落ち着いたら，また書きますね．

Naomi's Vision: The Learning Sciences and Sciences of Practice

Marlene Scardamalia and Carl Bereiter
Professors, University of Toronto

Naomi Miyake was a wise, soft-spoken superhero of the learning sciences and "sciences of practice." We admired Naomi's work before we met her, and still frequently cite her doctoral research on explanatory reasoning. She visited our research lab in Toronto almost 30 years ago, the first of many meetings filled with laughter, great food and wine, and shared dreams and schemes. About a year ago Naomi wrote to suggest we meet. Marlene assumed a Skype meeting. Naomi had a better plan. She scheduled a 4-day trip to Toronto so that we could spend several intense work days on a plan to realize one of our shared dreams — what Naomi referred to as bringing the learning sciences and "sciences of practice" into greater alignment.

Several years earlier we had discussed the need for a new international initiative along that line — something that a number of other learning sci-

entists were inclined toward as well. At that time Marlene was a member of the large industry-supported project, Assessment and Teaching of 21st Century Skills (ATC21S), and Naomi was involved in implementing related goals in Japan. It seemed at that time that ATC21S, with its international outreach, might provide the needed context for a coming together of the science and practice of learning in the service of emerging demands of knowledge-driven and innovation-driven societies. Naomi championed formative evaluation to understand how we can evaluate individual learning processes to make full use of evaluation for tomorrow's classes. In an overview of a session she hosted at the University of Tokyo with her colleague Hajime Shirouzu (NIER), they characterized the challenge as follows:

> Society requires of every learner the competency to learn and empower her own competency in a sustainable way. International projects like ATC21S are under way that name those important, but still unclearly-defined competencies as "21st century skills" and consider assessment and teaching for them. These projects aim at going beyond the international comparison of benchmark test results. Instead, every country, state, or school tries to set their own learning goals, share big data not only of achievements but also of learning processes, and reflect on results of their action research. From those trials, we can learn about how to set assessable goals, to collect and analyze students' conversation, writing and actions in situ with full use of ICT, and to redesign future goals and classes.

We met several times in Toronto and Japan to discuss possibilities of a major design initiative. It soon became apparent that this initiative would need to be both broader and better grounded in contemporary science than any of the "21st century skills" initiatives spreading across school systems. It would be more about pedagogical innovation than assessment, and it would need to uncover new competencies, requirements, and opportunities rather than relying on committee-generated assessment standards. The three of us (Naomi, Carl, Marlene) were well matched: Naomi dreamed of a more powerful combination of the learning and educational sciences–a core common science. Scardamalia and Bereiter published an article titled "Does education for the knowledge age need a new science?" in which it was argued that education is ill-prepared to educate students as knowledge creators and that educational theory had to assimilate complexity theory in order to meet this new challenge. We, along with many collaborators, were trying to accomplish this through collaborative knowledge building pedagogy. Meanwhile, Naomi was working to reform Japanese education toward a similar end. She has worked tirelessly in collaboration with Hajime and university, policy, ministry, school board, school, and business collaborators, to advance new models of education.

At the same time, in her own laboratory at the University of Tokyo, she was doing groundbreaking work in new ways to engage children productively in work with ideas. One of our great joys when spending time in Japan with Naomi was observing children as they engaged in jigsaw learning with robots. Even without understanding what the children were saying, it was evident to us that when interacting with a speaking robot at their table, children joke with and speak more boldly to the robot than they would speak with a live teacher. Naomi transformed the jigsaw method into the knowledge construction jigsaw and, as we have elaborated in a recent article on self-organization in education, her robotics work sets the stage for impressive forms of human-machine collaboration.

We had yet another bond — we frequently talked about how wonderfully served the field is by the work of Ann Brown and Joe Campione. Our collective goal has been to enable large-scale, research-intensive work to democratize knowledge and establish a new order of educational achievement. Naomi and Hajime kindly traveled from Tokyo to Nara — the location of ICCE2014 — for a meeting. It was a glorious November

day and we walked and talked about design challenges underlying theory-driven big-data initiatives. Given the abundance of online educational data, big data is all the buzz these days. But in addition to big data, our work requires interconnected knowledge building networks spanning great diversity in student populations with data fed back into activity to support ever more advanced accomplishments. We have not set in place the formal international partnerships needed to share data, but fortunately, Naomi's gentle, modest spirit is matched through clear-minded, insightful leadership. She has helped establish a strong learning sciences community in Japan along with networks of schools committed to continuing the work she has championed. We are only steps away from the innovation networks we aim to establish.

We continue to search for special arrangements to ensure Naomi's work will continue, and toward that end we plan to launch an initiative titled Building Cultural Capacity for Innovation. We will do our best to realize Naomi's dream, as we understood it — to support a science of practice deeply embedded in the learning sciences — one that will advance education in our nations and through international collaborative arrangements.