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## UNPACKING CARS: DOING ANTHROPOLOGY AT INTEL

by Genevieve Bell



[Editor's Note: Genevieve Bell, whose PhD is from Stanford University, is a senior cultural anthropologist at INTEL, working on the anthropology of technology and its uses. Here she describes her latest research project, designed to understand how cars around the world can serve as windows into the future of mobile technology and computers.]

### Unpacking Frank's Car

I am always happy to be back in South East Asia – it smells like home, or at least one version of home. I lived briefly in Indonesia as a little girl, and later in Darwin, on Australia's far north coast. The particular combination – frangipani, diesel, rotting vegetation, with a hint of durian and the promise of something remarkably tasty being cooked on the next block – holds a special place. On this trip it was Singapore and Malaysia. I was traveling with a colleague and fellow anthropologist, Alexandra Zafiroglu, and we were eager to get started.

At 9:45a.m. it was already hot in the sun. The humidity was rising too, and the sweat was dripping down the backs of my knees. Alex and I were standing in the courtyard of one of Singapore's many high-rise apartment complexes. We were taking in the guard house, the electric gate, the pink blossoms floating on the blue tiles of the swimming pool, the sign that says "no smoking, food, drinking, floats, toys, and snorkeling," the blue-uniformed man sweeping the underground car park clean

with a bamboo broom, and the woman slowly cleaning the cars and flicking the wind-screen wipers up – a sea of wind-screen wipers jutting off their windows marking her progress.

We were waiting for a Chinese-Singaporean man in his forties whom we will call Frank, who lives with his wife and three young children in an apartment near us. Alex and I were both dressed modestly – we have done fieldwork in South East Asia before and know to dress conservatively, to wear shoes you can easily remove when entering people's homes, and to dress in layers to cope with the shifts between air-conditioning and the amazing humidity of the equator. We were also weighed down with gear – digital cameras, notebooks, digital recorders, and a step stool – not part of my usual field kit but Alex had insisted, and she turned out to be right.

Frank had a new car – a three-week old white Volvo SUV that he bought during Chinese New Year when his old car was damaged in a parking accident. He described the purchase of this car as inspired by omens and made possible by fate. As an imported European car, it was also a sign of his increasing status and success. It was a shiny new car that we found in the parking lot, parked nose out, carefully distant from a concrete support pillar. It still smelt new, and the interior seemed pristine. We wondered what we would find when we began to excavate. We were there to empty out Frank's car and catalog its contents, tracing the flows of technology in



and out of the vehicle and trying, if we could, to get a sense of how this car is inhabited.

### **The Stuff**

Slowly, methodically, working from front to back, we emptied every surface and compartment – the glove-box, the side door pockets, above the mirrors, on the dashboard, the console between the front seats, under the seats, behind the seats, the back seats, and the trunk compartment. Everything went on the ground cloth we had spread out nearby—actually a shower curtain in a nice neutral tone that we had brought along expressly for this purpose. Frank then went through each item, described what it was, and why it was in his new car.

When we were done, it was an impressive collection of stuff. To get the entirety of the ground cloth in the photograph, I needed to stand on the step-stool Alex had carried all the way from our offices in Portland, Oregon. In that picture, you can see a set of golf clubs, 6 full-sized umbrellas, 2 iPods, several pairs of scissors, pens, calculators, four pairs of sunglasses, piles of compact discs, DVDs, wet wipes, tissues, credit cards, parking coupons, maps, several bags of shoes, shoe bags, a Bluetooth® headset, remote controls for the in-car DVD players, wireless headphones, Volvo branded *ang pao* (red 'lucky' envelopes for monetary gifts), gift certificates, loyalty cards, batteries, air freshener, a forgotten week-old package of fish sausages, sun visors, sun shield, manuals for everything electrical in the car, grocery bags, spare keys, batteries, membership cards, a detachable GPS unit, water bottles, kids' toys, a tiny Buddha from Frank's mother, note pad, candy, chewing gum, anti-slip pads on which the Buddha and tissue boxes rest, quick start guide for DVD player, a towel, hand sanitizers, a car-trunk organizer, a chiller bag, Malaysian immigration forms and an expired parking access coupon for the Formula One car races.

Surveying his car's contents laid out on the ground, Frank laughed somewhat ruefully: "It is more than I imag-



ined," he said. And it was more than we imagined too. After all, this car was only three weeks old, and it seemed so empty when we first opened the doors to inspect the interior. In the days that followed, we would unpack other cars in Singapore and the Malaysian city of Penang, and find that most shared this capacity to unfold far more stuff than was visible on the surface. It was always very exciting.

### **Cars as Field Sites, Cars as Mobile Technologies**

So why are we unpacking cars? And why is this anthropological? And why might we be doing this for Intel? There are more than 800 million cars currently on the world's roads, representing a significant investment of resources, including the larger fiscal demand of building and maintaining road infrastructure. Furthermore, cars are a significant site of human activity. The amount of time we spend in cars is surprisingly long and shaped by myriad factors – location, occupation, culture, age, gender, fuel pricing, weather, road conditions, and government regulation. In America, the average citizen spends between two to three hours per day in a car; in Australia, it is closer to two hours; in Malaysia and Singapore, it is less than one hour. Not as much time as we spend sitting on our sofas, or sleeping, or at the office, but still enough to be a significant part of our days. Commuting, after all, remains a highly stressful part of any working day.



But why might cars be interesting to a technology company? As it turns out, in recent years, cars have become increasingly technological spaces. In addition to the built-in technologies like automatic braking and air-bag sensors that ensure performance and safety in ways mostly invisible to drivers and passengers, a proliferation of in-vehicle systems explicitly targets occupants. These systems provide entertainment, way-finding, and clear visualizations of previously hidden functioning (ie: petrol consumption, mileage, battery life, outside temperature, etc). The average passenger vehicle contains more than forty pieces of discrete microprocessor control modules; these electronic components account for more than forty percent of the car's production cost. Not surprisingly, automobile manufacturers have developed sophisticated visions about future "smart" cars that can serve as mobile living rooms, full-function home theatre systems, and proactive computer environments.

And why is it anthropological? For all the cars on the world's roads, surprisingly little social science research is dedicated to making sense of them, or to exploring the tensions between cars as designed and cars as inhabited and embodied.

Some anthropology looks at cars as forms of transportation and also as important sites of identity work, as potent symbols of modernity, wealth and other cultural registers, but there is almost nothing about what is inside cars. We wanted to see cars with fresh eyes and to think about them as field sites in and of themselves. We started with some very simple questions: what is a car, what does it mean to own a car, to use one, to care for one. Armed with a very basic set of tools we set off to interview car owners and users in the US, the UK, Australia, Singapore, China, Malaysia, and Brazil. We wanted to see what people carried with them and to understand how cars functioned as sites of technology consumption and human activity, and how they became imbued with meaning.

## **The Making of an Intel Anthropologist**

As much as this unpacking of cars makes sense as a research project, it is unlike anything we had done before at Intel. I have worked at Intel for a long time, and I like to push the boundaries of our research. When people find out I work as an anthropologist at one of the world's largest technology companies, there are usually two questions: how did you end up at Intel, and what exactly do you do there? The first has a deceptively simple answer— I met a man in a bar in Palo Alto in 1998 who introduced me to the world of anthropology in the high-tech industry. In a very Australian moment of self-invention, I realized I could step off the tenure track into a world about which I knew nothing but which promised great adventure and greater possibilities. The second answer follows from the first — I have been lucky enough to carve out a job doing what I love and making it count.

It should be said, however, that I did not always intend to be an anthropologist, let alone an anthropologist working for a large global technology company. My mother is an anthropologist, who came to it later in life, and as a result I grew up in the anthropology departments of Monash University and the Australian National University. She jokes that I was kicked out of my first anthropology class — an introduction to social organization — when I was four:



matrilateral cross-cousin marriage should not come so easily to a pre-schooler. I spent my other formative years in a series of Aboriginal communities in Central and Northern Australia as my mother did fieldwork, worked for various governmental bodies, and ran her own ethnographic consultancy, before returning to a research position in the Australian university system. I grew up around anthropology and anthropologists who pushed the boundaries of the discipline and worked hard to make it meaningful in many different circumstances.

Beginning with the likes of James Mooney, one of the first anthropologists on the payroll of the United States government in the late nineteenth century, stretching forward to the current debates around researchers embedded within the US military, anthropologists have long sought and frequently found ways to make interventions into non-academic institutions and thus meaningfully impact daily life. Indeed, in both America and Australia, the traditions with which I am most familiar, anthropologists have always worked across institutional boundaries and borders and answered to a range of masters and causes. Some people describe this work as applied or practicing anthropology. I am not sure that the gloss of “applied” or “practicing” anthropology fully captures the work that I or my team does.

### **Evolving Anthropology at Intel**

In the 1990s, Intel was just beginning a long period of reinvention from a pure semi-conductor manufacturer to an enterprise more involved in the build out of the digital world, a period ongoing today. The impulse to hire social scientists generally, and anthropologists in particular, arose as the markets that Intel had traditionally served changed and grew beyond recognition. Since the late 1990s there have been teams of social scientists at Intel doing different kinds of research. In the early days, our role was pretty straightforward: help educate Intel engineers about life beyond the building. This meant helping to interpret the complexities of cultural and social practices and the ways in which those practices might shape people’s relationships

with technology, as well as people’s patterns of resistance, rejection, adoption, and creative re-use. We did quite conventional multi-sited ethnographic inquiry. We looked at emerging middle-class households in urban Asia and their complicated relationships to new information and communication technologies. We studied health-care providers in homes and hospitals and mapped their uses of digital and analog devices. We studied classrooms and televisions, teenagers, and families with small kids. We had a core team of researchers at Intel’s advanced research and development laboratory, and over the years we moved out into the product groups, always retaining a strong charter of driving a more human-focused company. We channeled Ruth Benedict’s lovely notion that anthropology’s real job was to “make the world safe for people.”

My new research group at Intel – Interaction and Experience Research – is comprised of nearly one hundred researchers, from ethnographers and interaction designers to computer scientists and physicists. We are charged with reinventing how we all experience computing. As Justin Rattner, my boss and Intel’s Chief Technology Officer, likes to point out, we are “already late.” By which he means, our relationships with computing are long overdue for an overhaul. We have a strongly interdisciplinary approach that shapes everything from our framing questions, to the projects we tackle, to the ways we choose to share our thinking. Currently we are exploring changing notions of story-telling and social participation, as well as charting the shift in the usage of cameras, phones, and televisions, and hacking the latest screens, printers, and sensors to see what we can make with them. And we are continuing to do research with a comparative and global focus – Brazil, Germany, Indonesia, China, India, the United States have all been field sites this year.

The challenge has always been how to present our work back at Intel. How can we best take those rich textured rhythms of daily life and render them vividly in an engineering culture. Interestingly, it remains one of the hardest parts of my job and, in many ways, the most intel-



lectually compelling. In my current research group, we experiment with photography, images, web-pages, text, sound, performance, ambient disruptions, presentations, installations, poetry, reports, books, and science fiction. In conjunction with designers and engineers, we attempt to generate technology designs and prototypes that convey an important idea or sensibility. We try to reframe the questions. We do not ask what will make people more efficient, we ask what will make them happier, what they will love, and then design accordingly. We try to change the process by which technology is designed and developed, not just the technology itself. We try to find ways to bring the voices of everyday people back into the process of thinking about and designing technology.

### **Cars as Contested Spaces: What They Tell Us About Technology and Culture**

So, back to Frank and his car's expansive contents. The notion of "excavating" cars as an archaeological metaphor came unbidden to Alex and me one afternoon in a drab, grey Intel conference room – we were riffing on research methods and wondering what came after television – something we had been studying for years. I wanted the research group to start tackling cars as a site of technology consumption. It was a place where we had not spent any real time; it seemed to be where technology was going, led by the people we had been studying. It was also a methodological challenge for cultural anthropologists. After all, it is a little tricky, at least at first blush, to take a car's genealogy or work out what participant observation might look like around a daily driving commute. But I liked the possibility of disruptive images for Intel's senior leaders – the contents of many cars that did not echo their experiences but that in an accumulation were somehow unassailable. Alex actually knew enough about doing archaeology to be dangerous. The work also drew on post-processual archaeological theory and the idea of tracking the traces and flows of objects in and out of space, which we reasoned might have particular resonance when it came to cars.

So what do the contents of Frank's car tell us – as researchers, as developers, as experience designers, as technologists – about socio-technical practices and the possible directions for computing? The presence of all manner of creature comforts – movies, music, tissues, scent, spiritual protections, food, and candy – reminds us that we spend significant time in cars, engaged in all manner of activities beyond strictly getting from point A to point B. Cars are also – quite clearly, as judged by their material debris – a rich interaction space: we spend time sitting together with close family members, friends, and other social acquaintances. Beyond their function as a social space, cars appear to operate as a staging point for activities – recreation, exercise, work, recycling – and also as a form of extended storage – golf clubs, loyalty cards, donations, and umbrellas. Viewed this way, the contents (and indeed all the other cars we have excavated too) point to the ways in which cars serve as important sites of human activity and cultural practice, and as such warrant further attention.

In all our excavations, it also quickly became clear that cars are already and always have been sites of personal technology consumption – phones, Bluetooth, headsets, music players, mapping systems, portable DVD players, etc. Cars function as sites in which a great deal of technol-



ogy rests – some of it built into the vehicle (i.e., in-vehicle information and navigation systems), some brought in and out of the car daily (i.e., mobile phones and laptops), and some that has found its way into the car and never left (i.e., chargers, SIM cards, digital music players, navigation systems). This means cars are full of cables, plugs, batteries, and non-manufacturer's parts and accessories, together with modifications to make these technologies work inside a car. It all felt a little *ad hoc* and unsettled.

Indeed, our conversations with Frank and other drivers, owners, and occupants of cars, made it clear that cars are a contested space when it comes to new technology. What makes sense to bring into a car, to leave in a car, or to install in a car – all are still being negotiated. This negotiation is impacted by many factors – legislation, social regulation, guilt, perceptions of safety and crime, urban density, parking structures, commute time, just to name a few. As such, imagining and designing technologies for cars, for technologies to be used in cars, and for the worlds that cars will inhabit is a more nuanced undertaking than many imagine.

### Cars: The Future of Computing

Listening to Frank talk about his car, I was struck by the fact that cars are so much more than forms of transportation. They are, in point of fact, highly charged objects. They say something about who we are and who we want to be. They are also part of much more complex systems, ecosystems, environments, and imaginations. In this way, cars resemble many other contemporary technologies: our smart phones, laptops, even tablets and e-readers. Standing on Alex's step-stool with all of Frank's stuff on our shower curtain, I realized it was easier to excavate a car than a smart phone, and that in so doing, we might have found a window into the future of mobile technologies and computing.

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ence Research Lab; Katrina Jungnickel, Carolyn Anderson, and Alistair Kemp. We have changed the names and details of our research participants to protect their privacy.

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### VIDEO STORIES ABOUT THE SMITHSONIAN'S EARLY ANTHROPOLOGY COLLECTIONS

Among the first collections of the Smithsonian were anthropological materials, gathered by international explorations and field studies led by exceptional, passionate, and often eccentric individual scientists and collectors. Six videos about these significant and historical 19th century collections can be viewed at [http://anthropology.si.edu/founding\\_collections.html](http://anthropology.si.edu/founding_collections.html). The collections come from the United States Exploring Expedition (1838-1842); the North American Mound Explorations (1881-1892); Edward Nelson's Western Arctic Expedition (1877-1881); the 19th century field research of ethnologist James Mooney who lived with the Cherokee, the Kiowa, and other tribes; anthropologist Frank Cushing's work with the Zuni of New Mexico; and Diplomatic Gifts from kings, queens, and diplomats. These stories are told by NMNH anthropologists Adrienne Kaeppler, Bruce Smith, William Fitzhugh, JoAllyn Archambault, Gwyneira Isaac, and Deborah Hull-Walski. This series was made possible by a grant from the Smithsonian Women's Committee.



## RECOVERING VOICES: DOCUMENTING AND SUSTAINING ENDANGERED LANGUAGES AND KNOWLEDGE

*by Joshua Bell*



What happens when people stop speaking their local language and carrying out their traditions? What knowledge of the world is lost when these practices cease? How can cultural anthropologists, linguists, and community scholars work to address this global problem? What ways can museums in general, and the Smithsonian in particular, serve as active resources helping communities engaged in cultural and language revitalization projects? How can such collaborations transform museum practice, data management, and public understanding of language and knowledge loss?

The search for answers to these and other such questions has given rise to the Smithsonian's new Recovering Voices Project ([http://anthropology.si.edu/recovering\\_voices/](http://anthropology.si.edu/recovering_voices/)), an interdisciplinary research and public initiative created through a collaboration of the Smithsonian's National Museum of Natural History (NMNH), National Museum of the American Indian (NMAI), and Center for Folklife and Cultural Heritage. Working with communities eager to sustain and revitalize their cultural traditions, Recovering Voices (RV) is working to marshal the collective strengths of these three institutions to address the issues surrounding language and knowledge loss.

The Recovering Voices Project is interested not only in the academic understanding of these phenomena, but also in the ways in which the Smithsonian's diverse collections of audio recordings, ethnographic artifacts, natural history specimens, film, photographs, and texts can be used to help communities around the world continue and foster language and culture programs. With current estimates predicting that by 2100, 90% of the world's 6,000+

known languages will disappear or be on the brink of extinction, it is urgent that we address the loss of languages and associated cultural knowledge in communities.

Languages hold thousands of years of history and are vital resources for documenting and understanding the Earth's biological and cultural diversity. When languages disappear, society loses unique environmental and cultural information as well as specific insights into many fields of knowledge and thought including mathematics, biology, geography, agriculture, history, and religion. Language is a critical window into the creativity and the capacity of the human mind. Perhaps most importantly, language and cultural knowledge help guide and ground communities in the face of political, economic, and social disempowerment. As this process progresses, communities are deeply affected, and the diversity of human creativity and our ways of understanding and engaging the world are irrevocably diminished. This is both a local and a global problem that results in an irreversible loss in our shared cultural patrimony, our ability to comprehend the universe, and to pass that multifaceted vision to future generations.

Drawing upon the Smithsonian's scholarly expertise, comprehensive collections, public outreach capacity, and convening power, Recovering Voices has been working over the past two years to develop innovative strategies to conduct interdisciplinary and cross-cultural research in order to effectively collaborate with communities that are working to abate language and knowledge loss. Three key principles direct this work:

1. Developing new collections-based methodologies for advancing research in language/knowledge studies and documentation;

2. Strengthening partnerships and building new lines of collaboration; and
3. Engaging the public through providing access to speakers of endangered languages, cultural experts, researchers, and collections.

This synergistic work is being accomplished through collaborations among anthropologists, biologists, folklorists, geographers, linguists, mineral scientists, and museum professionals. Counteracting language and knowledge loss through this intentionally diverse mixture of scholars, and with the focus on knowledge, *Recovering Voices* marks a critical and holistic approach resulting in productive collaborations with communities and broad-reaching public programs. Sensitive to the politics and histories between museums and communities, *Recovering Voices* is being carried out with interested communities but after negotiations as to the nature of the collaboration. Collectively we are sensitive to the different needs and concerns of communities regarding collaboration and issues surrounding heritage documentation and revitalization. Through a range of public programs, scholarly and artist fellowships, consultation with indigenous experts, museum and online exhibits, and symposia, *Recovering Voices* helps communities and scientists address time-critical aspects of the loss of endangered languages and knowledge, and promotes public awareness and support.

Through such integrated efforts we will continue to explore how to better make the museum's materials an active resource for communities engaged in cultural and language revitalization projects. We also will continue to explore how the knowledge materialized in our collections can be integrated into our databases and thoughtfully conveyed to the public. Doing so makes room for other ways of knowing, which helps make the Smithsonian better stewards for this cultural patrimony. Museum objects in all their diversity are much more than their material form: they embody particular sets of skilled action, are manifestations



Joshua A. Bell works with Eric Vai'i and other members of the Mapai community of the Purari Delta of Papua New Guinea to record the local names for trees. This work is being done in an effort to document changing perceptions and knowledge of the environment due to logging. Photograph courtesy Sebastine Haraha 2010.

of ways of engaging and knowing the world, and are concretizations of knowledge about the environment.

Take for example a red, yellow, and black feathered Hawaiian cloak known as *'ahu'ula*, traditionally worn by the Hawaiian nobles. These important items of chiefly adornment materialized the *mana* or power of the chief, female and male labor, the sky, forest, and the divinities associated with the birds used to make these items. The cloak's braided *olona* fibers (*Touchardia latifolia*) that form the cloak's infrastructure ensnared prayers and genealogies chanted by the *kahuna* (priests) during the cloaks' making, which when combined with the sacred feathers woven into particular crescent patterns, made the cloaks into powerful condensers of divine forces.

Similarly, linguistic documents written for the Bureau of American Ethnology's Truman Michelson by Meskwaki speakers in Tama, Iowa, in the early 1900s, using the Great Lakes syllabary, contain seldom-used vocabulary. Such manuscripts offer insight into the language's grammar and relate knowledge about traditional practices car-



ried out during the winter. Today, just as the cloaks preserved at the Smithsonian offer present-day Hawaiians insight into their technical and artistic heritage, so too do the documents and sound recordings offer community members the means by which to read and hear the words of their great-grandparents and also offer them more sources by which to sustain their revitalization efforts. All objects possess these types of relationships. Recognizing this and finding ways of activating the Smithsonian's collections' potentials in this regard is critical to Recovering Voices.

As this initiative unfolds, those involved in Recovering Voices look forward to challenging our preconceptions about our collections and re-imagining our relationships with communities around the world. Our long-term collaboration with Alaskan communities for the recently opened Smithsonian exhibit in Anchorage (*Living Our Cultures, Sharing Our Heritage*) is an important model that we

look forward to replicating in our project areas in North America (Anchorage, Southwest and Midwest), Mexico (Oaxaca), and the Pacific (Papua New Guinea). The Recovering Voices initiative will engage and inspire audiences through a variety of media. We are developing a web portal highlighting our research and that of our partners. We will also create focused radio, film programs, and festivals, and are working towards a Folklife Festival in 2013 and an exhibit at the National Museum of Natural History for 2014. Our hope is that these efforts will help spark public interest in the issues surrounding linguistic and cultural diversity, and, in turn, prompt that public to value different perspectives and aspects of our global heritages.

*Joshua Bell is chair of the Recovering Voices Project and Curator of Globalization, Department of Anthropology, Smithsonian Institution*

## THE IMPACT OF WRITTEN TELECOMMUNICATIONS TECHNOLOGY ON THE WORLD'S LINGUISTIC DIVERSITY

*by Gabriela Pérez Báez*

(Editor's Note: Gabriela Perez-Baez is Curator of Linguistics in the Anthropology Department, National Museum of Natural History, Smithsonian Institution, and a member of the Recovering Voices Program. Here she highlights the impact and challenges of written telecommunications on the world's linguistic diversity through a case study of one indigenous language from Mexico.)

### Introduction

Of the world's several thousand distinct languages, only a small fraction are used in written telecommunication. For example, even in content that contains different language translations, Wikipedia articles are written in only about two dozen languages. Despite long-held goals of software localization, developers' ef-

forts only cover a few dozen languages. For instance, Apple's Mac OS X offers user preference settings in only 18 languages, 14 of which are European. Despite the challenges, there is growing interest in opening written telecommunications media for larger numbers of the world's languages, 90% of which see their long-term survival at serious risk.

### Linguistic Diversity and Language Endangerment

Humans speak somewhere between 4,500 and 7,000 languages. Thirty percent of these languages are spoken in Africa; another 35% are spoken in Australasia and the islands of SE Asia, and some 1,200 languages in New Guinea alone. The Americas are home to approximately 1,000 languages, including about 200 Native American languages in the United States. In contrast, the over 30 languages of

Europe amount to less than 1% of the world's languages, yet many of them are widely represented in written telecommunications. Only about 80 languages are spoken by as much as 80% of the world's population, while 20% of the population is distributed across the remaining thousands of languages. Languages such as English, Spanish, or Mandarin Chinese are spoken by hundreds of millions of people each, while other language communities consist of thousands, hundreds, and sometimes only a few speakers.

Every single language embodies knowledge about human adaptation to natural and social environments, as well as insights into each culture's development through time. Every language contributes to our understanding of the human language faculty and our brain's inner workings. However, as many as 90% of them risk extinction as spoken languages by the end of this century. For many social and political reasons, languages become endangered as their domains of use – the social spaces such as the family, the community, the workplace, and education, in which a language is spoken – become fewer and more restricted, with dominant languages taking over those domains.

The fact that written telecommunications are not available to the majority of languages excludes most languages from yet another domain of use. In other words, written communications have a linguistically homogenizing force that contributes to language endangerment. As awareness of this issue increases among language communities, technology developers are responding. To develop localized versions of software, especially for data input and display, requires an in-depth understanding of the linguistic, social, and cultural systems of the community to be served. The following case study of one of the largest indigenous languages of Mexico illustrates some of the necessary linguistic considerations needed in order to open the domain of written telecommunications to a new language community.



Map of Mexico

### Meet a Zapotec language

“Zapotec” is not a single language form, but rather a family of languages comparable to the family of Romance languages. This family exhibits significant common traits but with enough differences to make it difficult if not impossible for speakers of different Zapotec languages to understand each other. Zapotec languages are pre-Columbian languages whose ancestral speakers can be traced back to over 2,000 years to the ancient Zapotec civilization. The actual number of distinct Zapotec languages is a matter of ongoing debate among linguists given the complexity of this language family but the number may be in the dozens.

The complexity of the family of Zapotec languages comes in great part from the complexity of their phonology – that is their sounds systems. Let us consider the way in which vowels are pronounced. Zapotec languages can have anywhere between four and six vowels and interestingly each vowel can have a different phonation type – that is, a different way of articulating the vowel. For instance, Juchitán Zapotec spoken in the eastern end of Oaxaca in the Isthmus of Tehuantepec, has five vowels and each can be pronounced in one of three different ways. A modal



vowel is a regular vowel in which the vocal chords vibrate unimpeded as in [e] in ‘wet’. A rearticulated vowel is one where the glottis closes to interrupt the flow of air and the sonority of the vowel and then releases to allow both to continue. The English expression ‘oh, oh!’ is close to what rearticulated vowels in Juchitán Zapotec sound like, where the [o] is interrupted and then allowed to continue. A checked or glottalized vowel is one in which the vocal chords close up but do not release, ending the sonority of the vowel sharply. The phonation differences determine the meanings of words; in linguistic terms, these differences are contrastive. For instance, in Juchitán Zapotec, the word *gye* means ‘stone’ and features a modal [e] while *gye’* where the vowel is glottalized and marked by an apostrophe, means ‘flower’. Similarly *gi* with a modal vowel means ‘fire’ while *gi’* with a glottalized vowel means ‘excrement’. The examples in (1) show contrastive vowel phonation:

- (1) *gela* ‘horseshoe’ *ge’la* ‘depth’ *geela* ‘night’

Zapotec languages are also tonal, meaning that a change in the pitch of a vowel can be contrastive. In Juchitán Zapotec there are three tones. There is a contour rising tone where the pitch changes throughout the articulation of a vowel going from low to high. Then, there are two register tones, a high and a low tone in which the pitch of the vowel stays high in one case, low in the other, throughout the articulation of the vowel. In the word *nanda* ‘cold’,



Gabriela Pérez Báez’s collaborators Rosaura López Cartas and Reyna Guadalupe López López from La Ventosa, Juchitán, Oaxaca.

both vowels are low tone while in *nanda\** ‘hanging’ the second vowel has a rising tone marked by an asterisk. Tone and vowel phonation interact with yet another feature that is prosodic stress – a system where one syllable is given more prominence than all others in a word. The interaction of vowel phonation, tone, and stress creates a complex system of contrast between words. Let us compare the last two examples with two more words that have the same consonants and vowels but have different tone, vowel phonation, and stress properties. The stressed syllable is marked in bold in the last column in Table 1.

Table 1. Phonological features in Juchitán Zapotec

Juchitán Zapotec	English	Word-final	Word-final	Stress
		Vowel Phonation	Vowel Tone	
<i>nanda</i>	‘cold’	modal	low	<i>nanda</i>
<i>nanda*</i>	‘hanging’	modal	rising	<i>nanda*</i>
<i>na-nda*</i>	‘sour’	glottalized	rising	<i>na-nda*</i>
<i>na-nda!’</i>	‘hot’	glottalized	high	<i>na-nda!’</i>

The challenge is to represent orthographically the various phonological features of words and to convey, in writing, all of the information that a reader of Juchitán Zapotec may need to understand a written message unambiguously. In the words on Table 1, vowel phonation, tone, and stress are represented orthographically so anyone who knows how to read this orthography will know exactly how to pronounce each word to convey its meaning. Low tone is not marked because it is the most frequent; any vowel without a tone mark is then a low tone vowel. As mentioned earlier, an asterisk marks a rising tone; the exclamation mark indicates a high tone. Modal vowels do not take any special marking, but glottalized vowels take an apostrophe and rearticulated vowels as in *geela* 'night' are marked with a double vowel in analogy to the articulation, glottal constriction, and rearticulation of the vowel. Stress is generally in the first syllable of the written word but in some cases it is not. A hyphen is then used to precede the stressed syllable as in *na-nda\** 'sour' and *na-nda!* 'hot'.

### **Telecommunications and Linguistic Diversity**

What would it be like for speakers of Juchitán Zapotec to type or text in their language using available interfaces? It is not easy even though, for instance, the orthography is designed to avoid the use of diacritics – symbols above or below a letter to indicate a change in pronunciation – that can be difficult to type in most PC-based computer keyboards. That is why tone is marked with a \* and a ! which are readily available in any computer and even in typewriters.

So Juchitán Zapotec can be easily typewritten on any modern computer keyboard. However, texting is a very different matter. Even in sophisticated swiping systems such as those in Android phones, a message in Juchitán Zapotec requires toggling back and forth between the letter keyboard and the symbols keyboard. With possibly every word in a message requiring a symbol, toggling back and forth between keyboards could get annoying very fast. More modest cell phones may require multiple pulsations over a

single key to get one character, an inconvenience that is minimized in certain phone models by predictive text – spelling suggestions made by the operating system. However, these systems are designed to assist the user with dominant languages such as English or Spanish, but no such system exists in Juchitán Zapotec. Clearly, technology can be relevant to issues of language endangerment.

Juchitán Zapotec is the most widely spoken Zapotec language with some 70,000 speakers and possibly more. Cell phones are ubiquitous even in the most modest communities. Texting by young people is quite common, but *alas!* it is done *in Spanish*, in part because all the necessary exclamation marks, asterisks, and apostrophes are a hassle to type, yet are essential to convey meaning unambiguously. Also, and perhaps due to insufficient use of the Juchitán Zapotec for texting, no txtspk – whether for texting or for chatting – has developed in the language. Even though Juchitán Zapotec can be easily typed on any computer keyboard, the interface of most computers and of software, including the internet browsers used in Mexico, is in Spanish. This motivates the use of the dominant language (Spanish) over any other. For example, the internet site of *Zapotecos del Mundo*, an online Zapotec community mostly of Zapotecs from the Juchitán region, is very active with several postings a day, but these are overwhelmingly in Spanish. The domain of written telecommunications in Mexico is clearly Spanish and not yet available to Juchitán Zapotec nor to most other indigenous languages spoken in Mexico.

### **Technology and Its Role in Reversing Language Endangerment Trends**

Languages become endangered as their domains of use shrink and become fewer in number. Numerous factors, interrelated in complex ways, lead speakers to use a dominant language such as Spanish over a language such as Juchitán Zapotec in the workplace, the school, public life, and so forth. As technology becomes more widely available to larger numbers of users, it becomes a new domain





Gabriela Pérez Báez at work with her collaborator Rosaura López Cartas with whom she has worked on a dictionary of Juchitán Zapotec for close to ten years.

of language use, yet one that at the moment is accessible only through a very reduced number of languages.

Significant progress has been made to design interfaces and keyboards around the particulars of languages such as Spanish, French, or Italian that require diacritics, and Chinese, Russian, Japanese, and Arabic that use non-Roman characters. Quite promising developments have opened written telecommunications to languages such as Hawaiian, Maori, Inuktitut, and more recently, Cherokee, for which an iPhone interface now exists.

Much more work is needed. Efforts are underway, for instance, at Mozilla México, to localize its browser for Mayan and for Southern Sierra Zapotec users. Similarly, Wikimedia México, a nonprofit educational organization affiliated with the Wikimedia Foundation, the parent of Wikipedia, has an emerging project to develop content in indigenous languages of Mexico. These new developments represent the opportunity to turn written telecommunications into a domain of use for more indigenous endangered languages around the world, thereby actively participating in the maintenance of the world's linguistic diversity.

## Resources

UNESCO Atlas of the World's Languages in Danger  
<http://www.unesco.org/culture/languages-atlas/index.php>

Archive of the Indigenous Languages of Latin America Ethnologue [www.ethnologue.com](http://www.ethnologue.com)

Hans Rausing Endangered Language Program  
[www.hrelp.org](http://www.hrelp.org)

Instituto Nacional de Lenguas Indígenas (INALI)  
[www.inali.gob.mx](http://www.inali.gob.mx)

World's Atlas of Linguistic Structures  
[www.wals.info/](http://www.wals.info/)

Zapotecos del Mundo

<http://zapotecosdelmundo.ning.com/>

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## MEET LINGUIST GABRIELA PÉREZ BÁEZ

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## EARLY CHILDHOOD LANGUAGE AND CLASSROOM DISCOURSE

by Courtney B. Cazden



Before going to graduate school, I was a public school primary teacher in a working class district in Connecticut (1954-61). My first- and second-grade students came from stable families—white, African American, and early migrants from Puerto Rico—whose fathers worked on assembly lines at places such as Singer sewing machines or Sikorsky helicopters. The elementary school functioned well, albeit traditionally. However, in the privacy of the staff room, we teachers shared our disappointments that so many of our elementary school graduates would end up in the lowest high school tracks.

During these same years, public discussion of the need to improve K-12 education was stimulated (as now again) by external events—first top-down by Sputnik and the space race with the Soviets and then bottom-up by the civil rights movement that demanded an end to legal segregation, as well as to racial and social-class gaps in educational opportunity. Academics began to advocate school reforms, some even suggesting students' language, especially "Black dialect," as a possible barrier to higher achievement. I was eager to learn more.

So in the fall of 1961, my husband and I and our two children moved back to the Cambridge area where we had met, and I began a doctoral program at the Harvard Graduate School of Education. We read Noam Chomsky's linguistics papers and in a course on the Psychology of Language, Roger Brown talked about the social psychology of language use. I was "hooked" and without ever being fully trained as a linguist, psychologist, or anthropologist, I began building a career at the intersection of education and these three fields.

My early interests in social class and cultural differences in children's language continued as well as my delight in the creative agency of each individual.

### Early Child Language Development

At that time, Roger Brown was beginning a new kind of research on children's language development. Instead of giving tests to age-graded groups, he initiated much more labor-intensive observations over time: audiotaping, transcribing, and analyzing natural interactions between a child and parent at home. Brown started with two children of Harvard graduate students. When I joined the project as a research assistant, I asked if we could add a third child from a working class family, "Adam" and "Eve" were joined by "Sarah," neither of whose parents had gone beyond high school (Brown 1973.)

I visited Sarah every two weeks, taping two hours of conversation between her and her mother. I transcribed the tapes as accurately as possible, down to the level of the smallest unit of meaningful language such as the noun and verb inflections—i.e. the noun both plurals and possessives, and the verb both present progressive, "ing," and the regular past tense -ed. To decide when a researcher could



*AnthroNotes* editors invited Harvard Professor Courtney Cazden to reflect back on her pioneering studies of early child language development, classroom discourse, and differential treatment and cultural differences across social, economic, and cultural groups.



assert that a child had “acquired” one of these grammatical inflections, Brown established an arbitrary criterion: if the child was supplying the inflection in spontaneous speech on 90% of the occasions in which it was grammatically required. So if Sarah said, “Mommy eat” when her mother was at that moment *eating*, the missing inflection—*ing*, would be counted as an omission.

Studying developmental phenomena across children requires a measurement or metric for making comparisons. **Chronological age (CA)** is the convention and is expressed in months of age, but we also used average **mean length of utterance (MLU)** in morphemes (equals the number of different minimal units of meaning) as an alternative. (While *Mommy eat* has just 2 words (or two morphemes), *Mommy eating* has 3, with the noun inflection “ing” considered a “bound morpheme.”) The comparison of similarities and differences among the three children according to these two metrics became informative. Chronological age and mean length of utterance in this research are comparable to chronological age (CA) and mental age (MA) in various studies of intellectual development. Like mental age, MLU is a single global measure, and equating children on it yields additional information on the relative development of more specific abilities, such as the acquisition of complex grammar.

When we compared the three children on chronological age, the developmental sequence was clear: Eve had by far the fastest development, achieving an average MLU of 4 when she was only 27 months old, while Adam and Sarah did not construct equivalently long utterances until they were 40-42 months old. But if age was ignored and MLU was the metric, the order of developmental progress changed dramatically. At average MLU of 2.25, only Sarah had acquired one of the inflections, plurality. When all three children had an MLU of 3.5, Sarah had acquired 5 inflections, while Eve had 4, and Adam only 2.

In addition to what could be considered the errors of omission when noun or verb inflections were grammatically required but not yet supplied, the three children

also made some errors of commission. Before they learned to distinguish regular and irregular forms, they created over-generalizations (OGs) of the plural (*mans* instead of *men*), possessive (*mines* instead of *my*), present indicative (*doos* instead of *do*), and past (*goed* instead of *went*). OGs derive from a child having learned the rules of English grammar. All three children first produced correct irregular forms and then for a time alternated them inconsistently with incorrect OGs, and finally observed the mature distinction. Sarah first used the correct irregular “went” at 27 months, alternating thereafter with “goed.” She continued using both until “goed” disappeared after 49 months. Later, other researchers confirmed this three-step sequence in a larger sample of children.

Since over-generalized forms were never heard in parental speech, they are particularly intriguing evidence of young children’s creative cognitive agency at work. While all three evidenced this cognitive process, we also noted individual differences in frequency. While Eve and Sarah supplied only 7 OGs of the possessive *mines*, Adam alone supplied 36; he also metaphorically over-generalized content words as in “They *talking*” about two irons that faced each other on the ironing board.

In their early work, Roger Brown and Ursula Bellugi had hypothesized that a particular form of parental response they called *expansions* might provide especially useful information for the child’s acquisition of grammar. For example, if the child says, “Boy fall down,” the parent might reply, “Yes, he fell down.” They hypothesized that such expansions might be an especially helpful form of interaction because the response encodes the correct grammatical forms at the moment when the meanings they express were still likely to be present in the child’s mental attention.

My doctoral thesis (Cazden 1965) was a small experimental study designed to test this hypothesis with 12 children age 28-38 months in a language-impooverished private day-care center in an African American community of Boston. The children received daily individual play ses-

sions with especially trained tutors for three months. Children randomly assigned to the “expansion” group received affirming and deliberate expansions; children in the “modeling” group received an equivalent density of affirming and well-formed responses that were relevant to the child’s topic but carefully not expansions of the child’s utterance. The third control group children had opportunities to play with the toys and books in pairs, but interactions with the adult were kept to a minimum.

Our hypothesis was *not* confirmed. While children in both treatment groups gained more than those in the third control group, children in the modeling group gained the most on all six measures of their grammatical development. In the natural speech situation, expansions and non-contingent modelings of well-formed utterances often occur together. The parent in the “Boy fall” situation might have added something like, “Do you think he hurt himself?” But in a controlled experiment, there had to be a strict separation. As a result, the expansion-dense adult responses could be perceived as uninteresting and so attended to less, whereas the adult modelings were in effect *extensions* of the child’s original meaning and thus potentially more interesting. The density of expansions in natural conversation may thus be a more valid indicator of its value.

In a more detailed analysis of expansions, we found that Sarah’s utterances that omitted inflections were followed much less frequently by a parent utterance that included the appropriate inflections (only 29%) than were Adam’s (51%) and Eve’s (49%). Comparing just the fastest and slowest developers, there were 294 expansions for Sarah and 427 for Eve. That is, Sarah received significantly fewer expansions even in absolute numbers, although the period of time covered by the time each child reached MLU of 5.0 was 23 months for Sarah and only 9 months for Eve. Thus we could tentatively conclude that at least these basic aspects of grammar learned before school seem to be learned despite differences in the child’s oral language environment.

### **Back to the Classroom: San Diego**

In 1974-75, I went back to primary school teaching in order to test the real-world relevance of some of the knowl-

edge about language development that I had been analyzing and teaching. I wanted to teach working class children again. I also wanted to collaborate with sociologist Hugh (Bud) Mehan at the University of California, San Diego, So I taught 25 children, all either Black or Chicano, in a combined first-second-third grade class in east San Diego, with Mehan as the researcher taping and analyzing our classroom interactions.

Mehan (1979) reported his detailed analysis of the participant structure of the interactions, and his work was as innovative in its time as Brown’s description of the grammatical structure of children’s early utterances the decade before. In brief, Mehan described in detail the participant structure that has come to be called the “default” “IRE/F” sequence of teacher Initiation, student Response, and teacher Evaluation/Feedback. My reflections as the teacher are recorded in my introduction to his book and in a more personal account (1976). We have each reported elsewhere separate studies of children’s display of competence in this classroom setting.

It was a challenging year for me, but memories of individual children are still vivid more than 37 years later: Alberto for his invented spellings in the captions for his amazingly detailed drawings, such as “I lik to rid on a bot”; and Greg for his quick sense of humor: When he overheard my bilingual co-teacher explaining that she would be taking some children to her bilingual education class because “We need some real live children,” he quipped, “Ain’t no one dead in here is there?”

Given my previous research, I responded to three aspects of these children’s language differently than I might otherwise have done. First, I welcomed invented spellings like Alberto’s, which I perceived as evidence of his valuable attention to the sounds in each spoken word. Second, Black English was so omnipresent that I ceased to hear it in utterances such as Carolyn’s: “He on the wrong page” and “There go Leona’s”—examples of natural cultural differences that were in no way barriers to anyone’s understanding.



The third aspect involved my interpretations of test-induced distortions in children's speech. In response to requests from early childhood coordinators in other California school districts, I tried out the CIRCUS battery of oral language tests from Educational Testing Service to see if it might be useful for the oral language evaluation then mandated in California. One of the subtests asked the children to complete such statements as *Here is a child. Here are two \_\_\_\_\_*. Eight of these items asked for such irregular forms. The seven native speakers of English gave 35 "incorrect" over-generalizations out of 56 possible responses: *childrens, feets, mines, morest, gooder, etc.* Having spent so much time earlier coding transcripts for just such items, I felt sure I would have noticed if they were that frequent in the children's spontaneous speech. On the regular plural, possessive, and comparative items, the children got 74 out of 98 correct. Something was strange about missing only the irregulars in the test situation.

I could think of no way to elicit tokens of *mine, most, better* and *best* in a more casual situation, but eliciting plurals seemed possible. From *Ebony* magazine, I cut out pictures of a group of children and a group of men. For pictures of feet, I drew around my own. A few days later, I found a moment to ask each of the children individually and as casually as possible, "What's that a picture of?" The over-generalized plurals dropped from 15 to 6.

One possible explanation for the over-generalizations may be inherent in the test situation itself. Oral language testing may inevitably elicit more monitored speech, thereby shifting language production to what William Labov has termed hypercorrections, favoring forms that are more prestigious (in dialects) or more rule-governed (in development) (Cazden 1975). In other words, the children in the testing situation were offering more incorrect answers (over-generalizations) simply because they were trying to be more careful, actually over-correcting their natural speech.

## Back to the Classroom: Research

A few years after San Diego, I shifted my university research back to my initial interest in classrooms, only gradually realizing how different, difficult, and less satisfying that would turn out to be. For one, switching from studying a pair of interactions to large groups has huge implications, especially the difficulties of taping student speech and keeping track of individual speakers. In addition, interactions within the family are typically among trusted familiars within a single cultural and linguistic group, while demography in the U.S. (and other developed countries such as New Zealand) means that teachers are very likely to be strangers and from the dominant culture, no matter what proportion of their students are from a non-dominant minority.

Fortunately my first classroom research was in one primary-grade setting during "Sharing Time" (or Morning News). One child narrated a personal experience to which the teacher responded, sometimes in the middle and always at the end. In her doctoral research, Sarah Michaels (1981) had done a fine-grained linguistic analysis of one California teacher's negative responses to the narrative of an African American girl. When Michaels moved to the Boston area, we continued that research, replicating in Boston a teacher's negative treatment of what we came to call "episodic" narratives of primarily African American children. We explored possible causes of the teachers' reactions to stories that seemed to them to be "rambling" rather than tightly focused on a single story idea.

Possible causes of negative reactions from teachers included the greater length and complexity of the episodic narratives and the topic's unfamiliarity or lack of significance to the teacher. In addition, there was the cultural difference between child and teacher. Both of our teachers were white, and in the Massachusetts classroom 96% of the white children's narratives were topic-centered in contrast to only 34% of the black children's, which were primarily strung out narratives of various happenings.

To further explore a possible ethnic base for the teachers' differential responses, Michaels and I conducted a small matched guise experiment in which mimicked versions of the two kinds of narratives, with dialect differences and social class markers removed, were played to five black and seven white students at the Harvard Graduate School of Education. When the adults were asked to comment on the quality of the narratives and the probable academic success of the child narrator, the white adults were much more likely to find the episodic narratives hard to follow, while black adults noted differences but appreciated both.

Leona's story that we named "At Grandmother's" evoked the most divergent responses. All the white teachers rated Leona below children who told simple topic-centered stories. The black adults, in contrast found the story, "At Grandmother's" easy to understand and interesting with lots of detail and description. All the black adults except one rated the child as highly verbal, very bright and/or successful in school. Two expanded on the importance of the child's grandmother in the story, explaining that the holiday is an occasion when she gets to spend the night with her grandmother who is an important figure in her life. The black teachers also said that if you missed that inference about her grandmother you missed the whole point of the story. Missing the point was exactly the case for the white adults (Cazden, 2001).

### **New Zealand**

In subsequent research in New Zealand (NZ), it became clear that such differential treatment is not confined to racial differences in the U.S. While in NZ on a Fulbright fellowship, I played this same tape to three groups of white teachers, graduate students, and speech therapists. Their responses were very similar to those at Harvard, all but one finding "At Grandmother's" difficult to follow.

Also in New Zealand, I discovered similar white teacher responses to indigenous Maori children in one-on-one situations. Because of national concern for the under-

achievement of Maori students (about 15% of the population, comparable to African Americans in the US), New Zealand literacy educator Marie Clay wanted to look closely at the engagement of the youngest (5-year old) students, and how their teachers provided for cultural differences. She and her assistant observed Maori, Pacific Island, and white children for six mornings in six New Entrants classrooms. In these classrooms, the children were taught by white teachers, who focused particularly on individualized reading and writing activities with their students. The researchers wrote down all teacher interactions with the two children from each group who were nearest to their 5<sup>th</sup> birthday. Researchers repeated this process with different children during the second term when the classes were larger due to the addition of a new group of just-fives.

The researchers found that all the children, new to school though they were, stayed on task in their individual activities of reading, writing, and drawing more than 90% of the time. But the attention of the circulating teacher was distributed unequally across the ethnic groups, especially in extended interactions when the teacher in some way asked the child to "talk more" (TM).

In the first term, the Pakeha and Pacific Island children averaged more than 5 TMs per morning, but the Maori children received less than 4. In the second term when the classes were larger, it is not surprising that there were fewer opportunities for interactions with the teacher for all the children, but the relative Maori disadvantage increased: more than 3.5 TMs for Pakeha and Pacific Island children vs. less than 2 for Maori. Teachers admitted to Clay that the Maori children "were harder to talk to." Clay stressed the potential consequences of such differences accumulating over entire days throughout the school year, but she did not explore underlying causes.

### **Current Research Interests**

In recent years, both before and after my retirement from Harvard, I have been more active in writing than in doing empirical research myself.



Much of my interest has remained on discourse within the classroom, along with differential treatment and cultural differences. *Differential treatment* and *cultural differences* refer to two different perspectives on the single problem of achieving greater equity in learning opportunities. As frequently used, the terms refer to perspectives that contrast with each other. The differential treatment perspective usually criticizes *over*-differentiation (as in the Sharing Time and Talk More examples above), thereby unintentionally reinforcing, even increasing, inequalities in particular knowledge and skills that were present before entering school. The cultural difference perspective, in contrast, usually criticizes *under*-differentiation, and asserts that differences should be taken into account more rather than less (the focus of much recent research).

The cumulative work of many researchers contributes to a more complex and less simply oppositional picture. Differential treatment can be helpful as well as harmful, and a focus on generalized cultural differences can detract from close observations and empathetic listening to individual learners.

Currently (at age 85 but still active) I work twice a year in Australia on an independent research team evaluating the “Stronger Smarter Learning Communities Project” (SSLC), a large national intervention project to improve the education of Aboriginal students. The SSLC program is directed by an Aboriginal educator, Chris Sarra. A major tenet of the SSLC program is “high expectations leadership” that can counter deficit thinking and racist stereotypes, still pervasive in Australian culture.

As part of our evaluation, we interviewed several principals. One spoke strongly about his beliefs:

I passionately believe in the capacity and future of our Indigenous children and community. . . . It's the latent racism of low expectations and the fields that we construct within the school that really add to disengagement of Indigenous kids. . . . If you've got 10% of Indigenous students in your senior

school, then you should have 10% of your kids in physics. . . . I'm working on challenging the teachers to review their own practices, so that if a student fails, it goes from 'blame the kid' to 'How am I going to get them over the line.'

As the evaluation research continues, we will learn more about what is happening in the classrooms to translate such verbal expressions of high expectations into enhanced learning opportunities for Aboriginal children. Beyond the importance of this work in Australia, it is another attempt to answer the fundamental questions about barriers to learning and achievement among children of lower socio-economic communities, questions I took with me to Harvard from that working class school in Connecticut some 50 years ago.

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