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Future Mix: Remodelling Biological Futures

Introduction. While much of human-animal studies concerns the question of the human-animal border (how it is both maintained and dissolved, how it might be challenged or re-imagined, what are its ethics and its politics), a difficulty surrounds the question of where this question can be asked *from*. Much of Donna Haraway's recent work, for example, addresses the *ethics of situation* — exploring not only what are the questions to be asked, but how are they situated, and the politics of their location. Haraway begins her most extended consideration of this question to date, *When Species Meet* (2008), with a reading of Derrida's influential essay "The Animal That Therefore I am (More to Follow)" (2002), in which Derrida reflects upon an encounter in which, naked in his bathroom, he engages with his cat. The questions Haraway asks in this instance concern the meaning of both situated knowledges and responsive thinking — in other words, the hows, the wheres, and the whos of the "animal question," as well as its "whats."

Derrida's essay about his cat draws on one of the most important themes in his work as a whole, deriving from his dialogue with the work of Martin Heidegger, and often concerning the role of human speech. Following the ancients, and in particular Plato, speech for Heidegger is definitive of a human tradition that is, to put it bluntly, profoundly threatened by modern technology — for example even by the typewriter. In a famous passage from Heidegger's "What Is Called Thinking," which has been cited by many animal studies scholars (and which is crucial to Derrida's work on animals), he describes the crucial difference between animals and humans as the animal's lack of a hand: "Apes, too, have organs that can grasp, but they do not have hands. The hand is infinitely different from all grasping organs—paws, claws, or fangs — different by an abyss of essence. Only a being who can speak, that is, think, can have hands and can be handy in achieving works of handicraft" (16). The hand, for Heidegger, is not only the essence of humanity because it is "handy" in the sense of hand-related skills, such a cabinetry or knitting. As Heidegger explains:

The craft of the hand is richer than we commonly imagine. The hand does not only grasp or catch, or push and pull. The hand reaches, extends, receives and welcomes – and not just things: the hand extends itself, and receives its own welcome in the hands of others. The hand holds. The

hand carries. The hand designs and signs, presumably because man is a sign. Two hands fold into one, a gesture meant to carry man into the great oneness. The hand is all this, and this is the true handicraft. (17)

Heidegger's commentaries on the human hand have been the subject of much commentary, in part because they are so central to his overall philosophical concern with human being-ness, but also because they are, like much of Heidegger's writing, somewhat cryptic. He claims, for example, that "the hand's gestures run everywhere through language, in their most perfect purity when man speaks by being silent" (16). This is because the hand, while practical and useful in a utilitarian way, is also a sign of a sign — a sign of signing, perhaps, but also of the human as a sign of itself. Above all the pointing or signing hand enables thought: it is co-extensive with, one with, human thought. As Heidegger says: "Every motion of the hand in every one of its works carries itself through the element of thinking, every bearing of the hand bears itself in that element. All the work of the hand is rooted in thinking" (16).

A critique of the essentialist logic of Heidegger's "handism" — his handthropomorphism, to coin a phrase — was at the heart of Derrida's 1987 essay on the German concept of *Geschlecht*, also translated as "species." In "Geschlecht II" (1987), Derrida is critical of the way in which Heidegger has (mis) "handled" the "question of man" — in part by equating it with an unexamined, essentialist (and, Derrida implies, racist) history of "a certain humanism, a certain nationalism, and a certain Europocentric universalism" (168). He describes Heidegger's version of "I think and therefore I am not animal" and "my hand is the sign and means of my thought and their unity as my being" (my paraphrasing) as "dogmatic" (173). Derrida goes on to claim that Heidegger's position on human exceptionalism is diagnostic of its profound essentialism ("a decisive symptom concerning the essential axiomatic of the given discourse") and he dismisses it as tautological: "this traditional statement presupposes an empiric or positive knowledge whose titles, proofs, and signs are never shown" (ibid.).

Perhaps these were some of the thoughts occurring to Derrida in his bathroom, naked in front of his cat. Certainly he was thinking about animal thinking, and about the meaning of the silence of his cat, for, as Haraway notes in her reading of Derrida's reflections on his wordless encounter: "He did not fall into the trap of making the subaltern speak" (21), noting that Derrida concedes that "It would not be a matter of 'giving speech back' to animals but perhaps acceding to a thinking ...that thinks the absence of the name as something other than privation" (Derrida 416, cited in Haraway

20). As far as Haraway is concerned, this questioning response to responding (“whether it is possible to know what respond means, and how to distinguish a response from a reaction” 20) is a helpful advance over the assumption that animals can only think like we do, or not think at all. But it is still not a very co-present thought-process *with* the animal to figure out what this silence might mean. Hence Haraway’s emphasis on a more companionate, enduring, prolonged, mutually curious, interactive redefinition of something more ... er, *humanimalian*.

In her quest for a more fully *companionate* version of what thinking, responding, or speaking – or knowing – animals might involve, we are reminded of Haraway’s earlier essay on “Situated Knowledges,” published in 1988. Like Derrida’s critique of Heidegger’s essentialism and anthropomorphism, which ultimately take for granted the very presuppositions that need explaining, Haraway’s 1988 essay is aimed at the tautological reasoning underlying the supposedly universal and value free model of scientific objectivity. In the same way that Derrida is, above all, critical of the “we” Heidegger assumes when he describes, for example, “we men,” so too is Haraway concerned with the problem she describes as “the radical historical specificity, and so contestability, of every layer of the onion of scientific and technological constructions” (186), a “we” from which certain categories of persons (women, natives, the poor, the deviant, etc.) are excluded in the name of “neutrality,” “facts,” and “truth.” As humanimalistic readers of Haraway may recall, one of the primary examples supporting her conclusion that “only partial perspective promises objective vision ... feminist objectivity is about limited location and situated knowledge” (190) is what she has learned from walking her dogs “and wondering how the world looks without fovea and very few retinal cells for colour vision” (190). We may think the photograph, the ultrasound scan, or the microscope enhance objective vision, but, Haraway insists, these technological eyes each offer their own “highly specific visual possibilities” each of which “shows us that all eyes, including our own organic ones, are active perceptual systems, building in translations and specific ways of seeing” (190).

It is from this point of view that Haraway argues Derrida did not go far enough in his effort to explore his cat’s response to him in their brief encounter. The cat, for example, disappears from his essay henceforth, and Haraway concludes that Derrida thus “failed a simple obligation of companion species; he did not become curious about what the cat might actually be doing, feeling, thinking, or perhaps making available to him in looking back at him that morning” (21).

Therefore, as a philosopher he knew nothing more from, about, and with the cat at the end of the morning than he knew at the beginning, no matter how much better he understood the root scandal as well as the enduring achievements of his textual legacy. Actually to respond to the cat's response to his presence would have required his joining that flawed but rich philosophical canon to the risky project of asking what this cat on this morning cared about, what these bodily postures and visual entanglements might mean and might invite, as well as reading what people who study cats have to say and delving into the developing knowledges of both cat-cat and cat-human behavioural semiotics when species meet. (22)

The rest of Haraway's book, as readers of this journal will appreciate, concerns the question of what an ethics of co-responsiveness between humans and animals has involved, does involve, and could involve beyond the mere philosophical acknowledgement of a deficit chronicled by Derrida and his ilk. However readers may judge Haraway's success or failure in this endeavour, there is no doubt either that she has assiduously mapped this terrain in a highly original and creative manner, nor that she has placed an ethics of play and curiosity as forms of knowing at the centre of this deliberately polemical project. Haraway's book can be read as a personal and practical guide to what humanimalian companionship does or might involve or require, but it also deserves credit as a reinvention of philosophical method that is as fundamentally post-Cartesian as it is pro-canine.

Back to School. There were many reasons I was strongly reminded of Haraway's longstanding concerns with animalist perspectivalisms, situated knowledges, and play-as-philosophy while I was involved in the school sci-art project did not, at its outset, have an animal focus. Having read portions of the draft of Haraway's book, and heard many of its central arguments in talks she had given, I had adopted some of her "dog's eye view" methodologies myself — not least while I was writing about Dolly the sheep in *Dolly Mixtures* (2007). Together Haraway and I had visited the outstanding animal scholar Thelma Rowell and her Soay sheep in Yorkshire, where, like Haraway, I had been taught useful lessons about how sheep recognitions of each other help us to see how very little we know about what the term "society" even means. This was the question with which I ended my book *Dolly Mixtures*, by suggesting that we not only have more in common with sheep than we think, but that Dolly's genealogy is increasingly our own — biologically, technologically, and culturally as well as socially.

In a way, this is exactly what Heidegger warned against – as have his students, including, for example, Jürgen Habermas, Hannah Arendt, and Herbert Marcuse in their outspoken critiques of technology.¹ A counter-question question, as Derrida argues, is whether technology is already a mediating force that belies the very distinction between humans and animals Heidegger takes as his tautological first premise.² Arguably, we would not be living in such close proximity to so many sheep without agriculture or domestication, for example, and it is just as useless to define human sociality as if these ubiquitous proximities were anything less than formative of who “we” are as it is to insist that agriculture is purely natural. Agriculture is a good example of the complex mix of the animal, the human, and the technological that categories such as “nature” are no longer adequate to describe. However, the means of addressing these complexities are less “ready to hand,” as Heidegger might have put it – or at least so far as the established canon of philosophy, including Derrida, is concerned. Haraway suggests otherwise. In her view we are being “co-worlded” with animals all the time, in every way we can imagine, at every layer of the onion of our being and theirs. She also argues this is nothing less than the most important ethical and political question we need to take seriously in the name of “thinking” about “being” – and she claims, like many feminist theorists, that it is the “being with” of being that matters to its politics.

My own work has largely involved questions of the human and the technological, and has only recently “gone animal.” I was myself led in the animal direction by Dolly herself, who was, somewhat in contrast to her fame as a clone, a very demanding individual. This was one of many paradoxical features of Dolly’s identity that led me to consider her origins in more detail. In the end, *Dolly Mixtures* is a book that asks how we might understand the thick genealogies of contemporary innovations in reproductive biomedicine and bioscience through the novel biological relations to non-human animals they produce, taking “biological” in this instance to include connections produced and shaped through biological science – and thus our “kinship” with Dolly the sheep (to whom I argue we are biologically related).³ How these new “biological relations” are engendered by both old and new technological capacities and animal connections is the one of the important questions Dolly ‘stands for’ as an *iconic companion animal*. A task thus remains for the humanimalistic scholar of elucidating such animals – their ontologies, their politics, their ethics, or their “stakes,” as Haraway would put it. Work in the “new kinship studies” in anthropology has begun to explore how these new *biotechnological relations* are perceived, represented, and

enacted in contexts such as assisted conception,⁴ genetic diagnosis,⁵ and gamete donation,⁶ as well as how meanings created in these sectors borrow from, and travel to, other contexts of the (re- or de-) biologization of relationality.⁷ In a parallel, sometimes overlapping, universe, work in the animal studies area has explored changing understandings of biological ties in contexts as diverse as agriculture,⁸ domestication,⁹ evolution,¹⁰ zoology,¹¹ biological oceanography,¹² and tourism,¹³ among others.

In the following analysis I consider how these two sets of questions about technology, biology, and kinship overlap in the context of an experimental pedagogical project in a British high school. Through a case study of a school art-science project, called “Future Mix,” which concerned the new possibilities opened up by transgenesis, cloning, regenerative medicine, and stem cell science, I consider how both ethical and practical questions raised by new biological connections take shape pedagogically in a classroom, and aesthetically in student artworks. I suggest that the results of this experimental sci-art school project provide engaging and instructive resources in the task of fleshing out new biological connections, such as those implied (and forged) by the cultivation of, for example, admixed human-animal hybrid embryos. At a moment of considerable public debate over such questions, in Britain and beyond, the Future Mix project sought to explore the future of recombinant biological substance not only in the abstract, or literally (as in “the biological facts”), but through collective acts of artistic creation which took place interactively over time. To the extent Dolly is what Roy Willis called a “signifying animal,” one of the things I have suggested she stands for is that existing definitions of biology “have been, in a sense, remixed, resequenced, and provided with a novel form of amplification” (22). Here was a chance to participate in a project that stretched the envelope of *mixtures* even further. From the outset, I was very interested to see where Future Mix would lead.

As described on the project website (www.futuremix.org.uk), Future Mix was designed “to generate discussion on transgenic research among a young audience” using “a fresh approach to the potentials, challenges, and questions of this cutting edge research” that involved “bring[ing] together art and science inventively and playfully.” A collaboration between Artakt (www.artakt.co.uk), an art and science consultancy, and the Wellcome Trust, the project built on previous exhibits and collaborations broadly contributing to the artistic movement known as bioart,¹⁴ while also drawing its inspiration from the increasingly complex fusion between sci-art and science communication. The project team included an artist (Carl Stevenson), two scientific advisors (myself and Chris Mason, a biologist from University College London), the Director of Artakt, Caterina Albano, and her team based at Central St Martin’s College

of Art and Design in London, as well as teachers from the participating high school and representatives of London's Royal Institution. Future Mix was developed and managed by ArtAkt as part of their distinguished history of national and international collaborations focused on art, science and the body, including the highly successful exhibit *Spectacular Bodies* at London's Hayward Gallery in 2000.¹⁵ Over the summer of 2007, the team worked together with staff at South Camden Community School in Central London to devise a syllabus that would introduce students to new areas of bio innovation with a view both to informing them about these areas as part of their formal science curriculum, and generating imaginative, artistic responses to the possibilities they offered. The students were to show their art work as part of a larger exhibit, "Crossing Over: Exchanges in Art and Biotechnologies," to be held at The Royal Institution (one of the UK's oldest and most prominent science museums in Mayfair) as part of its re-opening in 2008.

In designing the lecture-artwork sessions scheduled for September and October 2007, the team quickly encountered a revealing difficulty that came to dominate our initial preparations, namely how to avoid reproducing the most clichéd versions of our topics with which we were all familiar from the media, and which might be considered "obvious" jumping off points for teaching. This "Jurassic Park" dilemma proved to be a problem of anticipation in several senses. As we anticipated how the students might view topics such as cloning, stem cells, cybrid embryos, or regenerative medicine, we found ourselves struggling to avoid the stock "Frankenscience" scenarios with which these issues are routinely associated.¹⁶ While familiar, and an obvious point of reference, these tabloid translations of new technology unhelpfully rely on staple plots of rogue scientific discovery and monstrous-offspring to evoke bio-shock, horror or disgust. Similarly, we determined that both the deliberately provocative versions of bioscience conveyed in bioart projects such as Eduardo Kac's "GFP Bunny"¹⁷ and the "monster movie" mode of bio-horror familiar from popular cinema (e.g. *Species* [1995], *Alien* [1979]). These were genres of cultural anxiety we wanted not only to avoid but to challenge, in which engineered humans and animals are ubiquitous symbols of moral degeneration. Our official goal, as stated in the project application to the Wellcome Trust, was to encourage students to "imagine the next generation through art and science" and our unofficial task was to accomplish this without resorting to clichés.

As a consequence, Chris and I quickly realized we faced a doubled-pedagogical load in stimulating students to engage imaginatively with the future possibilities of

regenerative biology, while also seeking to produce an antidote, or counter-genre, to predictable images of cloning, transgenics, and tissue engineering that are routinely either techno-utopian (e.g., genetic enhancement) or dystopic (e.g., Margaret Atwood's *Oryx and Crake* [2003]). Our formula for engaging students was to attempt to anchor all of the sessions in actual laboratory work, linked to practical clinical applications, with a view to keeping the case studies narratively simple but empirically detailed. Often veering quite far out of our way to avoid provoking knee-jerk responses to highly polarized debates such as those over GM foods or "mad cow" disease, we chose a translational idiom in the double sense of using near-to-clinic applications as pedagogical devices to offer students practically-orientated future biotechnological imaginaries with which to work.¹⁸ We chose four areas: cloning, regenerative medicine, gene therapy, and life-extension technologies for short PowerPoint lectures that Chris and I devised and taught in fifteen minute segments at the beginning of each session.

Future Mix was intended to "explore the boundaries between human and non-human, nature and artefact, science and art" and "to critically and imaginatively engage with biomedicine and bioscience through scientific presentations and artistic experiments." In addition to a syllabus and an art installation, the course was intended to create an online resource for high school science teachers. In designing our lectures we carefully selected "crossover" topics that would combine some basic science with a range of translation-near applications, leaving enough room for these to be explored in a simple in-class art workshop that would follow up on key themes. Together, these preliminary lectures and art "practicals" would aggregate into a culminating exhibit (we hoped), which might involve a combination of visual, virtual, sculptural and textual components (we reassured each other somewhat anxiously that all of this was indeed a realistic scenario as the start of the school year marched rapidly toward us).

Predictably, in practice, it was all much more "off plan." Although the project did eventually meet all of its goals — or even exceeded them, depending on your point of view — there were many points at which we wondered where on earth we were headed, never mind how we would ever get there. As Caterina, our Director, dryly observed on our first day in class, in October 2007, amidst a volume of noise and a level of chaos I initially found completely intimidating, "I am not sure a team of six will be enough." Renowned for their uneven educational quality, under-resourcing, and overcrowding, British "comprehensives" are the equivalent of US public high schools, only more markedly subordinate to private secondary education, known in the UK as either public or grammar schools. South Camden Community School (SCCS) is a comprehensive adjacent to the British Library and the new St Pancras station, and is

large by British standards, with 1500 pupils. It is ethnically diverse with more than 80% immigrant children, mostly boys from recently immigrated families, many of which are Muslim from Somalia and Bangladesh. A larger than average number of students at SCCS come from families on income benefit, and many fewer go on to higher education — thus earning the School the official status of “deprived” (“deprivation” is determined in the UK by the ratio of the proportion of students who receive free school lunches to the School’s average scores on national exams). Nonetheless, South Camden Community School is seen as a rising star. The teaching staff at the School has often been praised for its dedication and under its dynamic head teacher, Rosemary Leeke, SCCS has begun to rise in the crucial OFSTED ratings, and sent its first graduate to Oxbridge in 2008.

Everything is relative, of course. On the first day we began teaching it took more than 10 minutes simply to get the 30 or so students to be quiet, so that Chris could begin his lecture. To exercise more control, Ty, the science teacher, originally from Hawaii, began serving detentions on the particularly rowdy students — which then meant he had to leave the room with them. Of course, while he was out in the corridor ministering to his miscreants things got even more out of control inside the classroom. By the end of the first “lecture” it was pretty clear to Chris and me that we would have to MC as well as teach, and that “discipline” was probably going to be much less useful than a loud voice and a sharp sense of humor.

Since the combination of a lecture and an art project in a one hour slot — meaning actually 50 minutes — was ambitious to begin with, we kept the first week simple by getting the students to draw parts of their bodies they would, and would not, consider replacing, and then explaining why.



(Photo by Sarah Franklin)

We became more ambitious in week two, for which, following my short presentation about Dolly's origins in a project to provide treatments for Cystic Fibrosis, Carl designed an art project involving each student "cloning" his or her hand in plaster of Paris. Needless to say this activity was exuberant and exhausting, as well as very messy.¹⁹ But we were on a roll. Carl had a preternatural calm about him that made me wonder at times if he had been molecularly altered for urban high school teaching. But in fact he simply had a lot of experience and a very good understanding of how to give our wordy science lectures an imaginative handle the students could literally grab onto. (Heidegger would have had a field day.) The next phase of artwork (following Chris's lecture on regenerative medicine) involved smashing the plaster of Paris hands with a hammer, while photographing each stage to make a time-lapse movie of the hand's gradual disintegration into rubble. (Here Derrida might have stepped in.) Run backwards, the hand's reconstitution looked like regeneration, and run as a loop the effect was oddly mesmerizing, as the hand regrew and disintegrated in a cyclical sequence that looked seasonal — like a tree shedding its leaves, and thus "natural." Certainly, the students thought it was engaging — they had stopped being late for classes and begun to come up with new ideas for projects. The next step was to add sound to the films, using the open source software Audacity, which allows users to "clone" sections of recorded speech — again, running them backwards or forwards in loops. These cloned audio tracks were then spliced together to form an audio commentary/ backdrop to the regenerating hand movies — forging a simple but suggestive interplay between biological and digital "cloning" (as well, as it happened, between "handing" and thinking).

One thing quickly led to another up until the Christmas break, and along with increasing momentum, the project steadily gathered interest and participation until it had literally become a “pet project” for the entire School. By the time of the launch of Future Mix in early February, everyone was talking about the elaborate display in the School’s main lobby that grew more crowded by the day. The scene was indeed both unusual and intriguing. In her own paddock, lined with Astroturf, a life-size plaster of Paris Dolly the sheep stood surrounded by visual and digital artwork on wall-mounted monitors. On her sculpted white body were written messages from students—mostly about what it would be like to be her in the future. The messages were printed in a font composed of “cloned sheep letters” formed by groups of students dressed as sheep, who lay on the floor of the gymnasium to make a separate photograph for each letter. On the walls, floor, and furniture — everywhere — were more messages, and on computer terminals around the room the students’ films of their artwork were being shown.



(Photo by Sarah Franklin)

I was taken aback when I walked through the school's main entrance into the brightly lit and festive lobby. It was a typically cold and rainy February evening — already dark as night by 5pm. I had not seen Carl, Ty, or the students since Chris and I had finished our lectures in December, and I had no idea what to expect. The amount of time, care, thought, and passion that had gone into the exhibit amazed me, as did the depth of insight conveyed by the show. It was like entering a nativity scene morphed with a high-tech media installation, and narrated on the back of an illuminated manuscript, who was also a sheep (the new vellum). Not divine, but ovine — or both — the final exhibit was better than many I had visited on similar themes in leading national galleries.

The students were also transformed: polite, friendly, and relaxed, they could not have been more poised — or proud. After taking my coat and offering me a drink they escorted me around. I was still damp from the light evening rain and entirely lost for words, stunned by the brightly lit and vibrant scene in front of me. Some of the students sat inside the paddock alongside Dolly, while others showed their classmates more of the online environment that could be viewed on laptops in various parts of the room. Everyone seemed very satisfied with the outcome. A reporter from the local press was taking interviews and photographs.



The unifying theme that had clearly emerged was the alphabet, or sheep-a-bet, that formed the recurring motif of the exhibit's components — its spine, its skin, and its DNA. The cloned sheep letter alphabet recapitulated the “ABCs” of cloning and regenerative medicine the students had been taught in the classroom, but they had personalized these, and converted them into a form of address — not so much posing questions to the future but to the figure who was seen to embody a shared but uncertain biological futurity, namely Dolly. Through the cloned sheep alphabet the students had created the building blocks of a new language not only by themselves, but also literally *with* themselves. Moreover they had formed all of the individual letters as a group—or flock. In another online film on the website, the flock posed questions among themselves as clones — waving to the viewer, creating a friendly interface, of the kind Dolly herself is often associated with—a soft and woolly gateway to the future of biological control. (I encourage readers to visit the waving sheep-a-bet flock “in person” on the project homepage, www.futuremix.org.uk.)



(Photo by Sarah Franklin)

In contrast to the frequent depiction of DNA as a disembodied code, the clonagrams sent by the students to Dolly used embodiment and companionship as the medium for their message. Playing with the cloning theme's endless chains of association, they clearly revelled in its pleasantly repetitive possibilities to perform imitation, mimicry

and masquerade, and they had mobilized these possibilities in the form of conversational play. In a third artwork series depicted on the website, the large white sheep (Dolly) was used as a message board to display a series of questions about the future and toward cloning. As she is shown rotating on screen, pop-up questions in balloons would “translate” the various words on her body—in a kind of cartoon whiteboard dialogic of call and response:

Clockwise:

“If I lived to be 300 years old?”

“I would be lonely if everyone else died before me.”

“Would I get lazy if I had that much time?”

Counterclockwise:

“I only want to live to eighty.”

“Everyone around me would die but I would keep on living.”

“I would have time to do more good things.”

“What would it feel like to meet my great, great grandchildren?”

Similarly, the students’ questions transcribed onto Dolly’s body addressed the advantages and disadvantages of immortality and cloned identity – often with reference to relationships, belonging, and identity.

“If I wasn’t a clone I wouldn’t feel left out.”

“I always have someone to play with with a similar personality to my own.”

“It’s like having another brother or sister – I am never alone.”

“I will always have a compatible organ donor.”

“It’s weird because I am always surrounded with others who look like me.” “Do we have the same thoughts or the same personality?” (2 clones ask at once)

“Everyone looks like me, which gets boring. Who is the real me?”

“Sometimes we get on but sometimes I hate myselfes.”

Reflecting on cloning with a class of students who made creative use of diverse media — including themselves — to pose questions about the future of bioscience and biomedicine proved a useful experience for me, not least by providing a contrast to the insights gained through ethnography or more conventional academic research. Both science studies and cultural studies approaches seemed overly literal, serious, and narrowly academic compared to the student’s playful multi-perspectival responses to Dolly, their dialogic interpellation of her as themselves, and their “imaginative but real” engagement with her future connections as a cloned sheep. Their ability to respond as individuals and as a group, and to translate their responses into an artistic interface, which is now also an online educational portal, reminded me of the value of artistic license to provoke and inquire without any necessary expectation of finding “answers.” It also reminded me of the sociality of thought, which is at its best when it is both serious and allowed to play.

I recalled with a newly acquired appreciation of their irrelevance my initial hesitations and concerns — the “double anticipatory dilemma” Chris and I had experienced trying to imagine means of engaging with a biotechnologically engendered futurity that eschewed the well-worn genres of enhancement, disaster, or disgust. In evaluating Future Mix, I saw that the students (and Carl) had understood this challenge much better than I had from the outset. I stood in admiration of the students’ ability and willingness to put themselves into the picture of what unfamiliar biological futures might mean, and not only for what we understand as humanity. Despite the relative absence of animals from our initial syllabus, they had presciently chosen “the animal we already are” in replicating Dolly. Future Mix, it seemed to me, had more than passed our “ear mouse test” — the measure of its ability to create new idioms and interfaces, rather than clichés, through which to engage with uncertain biofuturities. The ear mouse — an experiment in tissue engineering whereby a human-looking ear was grown on a scaffold on a mouse’s back — has become one of the most iconic images of transgenic futures *because of what it looks like*: it looks like a human ear

growing on a mouse's back, creating a contrast that serves as a signature for the transgenic imaginary we might call *future mix as future shock*.

The ear mouse, and its vivid, or even lurid, visual associations, was the kind of "mixture" that inspired Future Mix (in part as a tribute to some of Leonardo's chimerical creatures). The irony, from a literal point of view, however, about the ear mouse is that there is nothing transgenic about it at all: it is simply a mouse that has been made to grow new skin over a scaffold shaped like a human ear. It is 100 percent mouse, but disturbing because it looks human. Dolly is the reverse image to the ear mouse, in the sense that what is remarkable about her is that despite being the "poster sheep" for high tech bioscience, she looks perfectly normal.

What struck me about the students' readings of Dolly in Future Mix was the extent to which they had successfully shed the ear mouse imaginary, and instead made such an effort to enter Dolly's world, and to see the future from her eyes. What has remained with me most about their engaging installation was its tone — combining a "speaking from," a "speaking among," and a "speaking with" to arrive at something other than "speaking for," or "speaking to" (they thus also produced an eloquent alternative to the often patronizing context of science communication). In contrast to the familiar format of debate over the social impact of biotechnology, so often staged and performed through recitations of fact vs. fiction and stock for and against positions, the students managed to be practical, empathetic, critical, and insightful, while also creating an original interpretation that above all was based on proximity.

Future Mix thus took me down a different path of thinking about how to imagine, to respond to, and to represent the new "biological relatives" in our midst. It also made me think about these issues from a different point of view — that of an inner city high school filled with teenagers approaching the end of formal secondary education. As a result, I was better able to appreciate a defining feature of mainstream debate about future biological possibilities, including new biological ties to animals, which are their distance, remoteness, and lack of connection. Drawing on their own bodies, experiences, relationships, and conversations as resources, the students forged a material-semiotic connection of shared substance with an imagined figure of a lonely future clone based on an iconic animal model. They achieved this through an artistically expressive tool (the sheep-a-bet) that was itself a symbol of their own companionship and sociality, as well as a vehicle for communication. With their alphabet they had initiated a dialogue, which was recorded in corporeal, bodily, fleshy writing. Literally glued together to form the surface of her skin, the students' messages to Dolly used the

language of form as content—conveying proximity, humour, identification, belonging, concern, curiosity, and attention through their laboriously constructed mode of address. By this means the students engaged unfamiliar biotechnological possibilities and entities by socializing them, using conversation, co-habitation, costume, choreography, and correspondence. Their approach was respectful but playful—literally a bit of a romp, as the process of posing for the letters had clearly involved quite a few collective contortions on the gymnasium floor.

Dolly's role in this dialogue was to function as a friendly interface in between the familiar world of the farmyard and the future of biological control — and it is a role by which she is increasingly defined, most often, as in this case, by people who are remote from her in both time and space. This is why Dolly's function as a figurative icon is the reverse of that performed by ear mouse — whose eye-catching mixed morphology is so influential because it perfectly matches expectations of what recombinant or transgenic biological futures will look like and will mean (horror, loss of humanity, degeneration). Although strange, the ear mouse is iconic because she performs *the familiar form of strangeness we expect*: she is phenotypically hybrid in a manner that appears visually to confirm an interspecific pedigree that is not in fact hers (for she is “pure mouse,” as it were).²⁰ This contrast, in addition to helping us parse genres of biotechnologically-assisted genealogy, points to the changing role of companion species in what might be considered either the next phase, or the seamless continuation of, domestication (and not only as it has been understood so far, but in terms of its “structuring absence” in the haunting form of animal-human bonds that mock these categories' distinctiveness). In a future hall of landmark hand-made mammals, we might imagine a series of dioramas: The DuPont/Harvard Oncomouse, Dolly the Cloned Sheep, the Babraham Institute's Geep and Shoat, and the Human-Cow Cybrid Embryo. The scene is apt both because it begs the question of what kind of staging this would be, and asks where its edges are (is the fancy pigeon hand-made too? the nude lab mouse?). Why not go back to the offspring of Walter Heape's eighteenth-century experiments with embryo transfer from a rabbit to a hare? Or the early IVF experiments with Golden Hamsters at the Worcester Foundation for Experimental Biology in the 1940s? John Gurdon's Cloned Frog families? For that matter why not Robert Bakewell's Dishley Sheep? Or Darley Arabiana?

As such a hall would make clear (and much of bioart precisely depicts the surreal/ baroque/ masquerade/ grotesque, etc. of our past and future connections to animals),

we have forged and mapped our definitions of species, domestication, and genealogy through companion animals in a wide variety of contexts from the beginning. True, a transgenic may be a quantum leap away from a selectively bred dairy ruminant, a pet cat, or a Thoroughbred, but these imbrications share a common ancestry in *made kinds*. This ancestry is mixed, fluid, and remains biologically under-described — the very categories used to secure its borders (species, breed, gene, kin, lineage, kind, *Geschlecht*) are undone by the force of events and the aggregation of historical change. It is not only biological futures that remain uncharted. In the same way histories of trans-oceanic trade and colonialism reshape our understandings of domestication and environment, so too questions of biological form can be recast as diasporic genealogies (Norway rat, American Gray Squirrel, English Spaniel, Barbary Sheep).

As Haraway has shown, the history of attempts to classify or *order* animal cohabitants, significant others, and surrogates — the model organisms, pure bred lines, experimental colonies, livestock, pets, wild types, studs, mutants, hybrids, chimaeras and clones — shows that they are too densely historically interwoven to be neatly secured by law, principle, or decree.²¹ They are unstable, and it is one of the primary shifts in anthropological models of domestication that it has come increasingly to be understood as a disciplining process that also *generates* disorder.²² Stefan Helmreich has described “the way culture eddies into nature to transform it” (7), and there is no doubt these eddies make us what Haraway in *When Species Meet* calls “messmates” with other animals and the ecosystem in the process.

Fitting, then, that the messy substances plastering together Dolly’s body at the centre of Future Mix would offer the suggestion of trans-substantiation for a companionate collage of bodies and a classroom meeting of minds. These were lessons the Future Mix project confirmed. In language that privileged care and concern over certainty, proximity over distance, and exploration over denunciation, the clonagram conversation with Dolly opened a space in which viewers were presumed to be “mixmates.” The work of the Future Mix collective — which included professional artists but was primarily led by high school students — provided a model of pedagogy as well as art in making its form part of its message about the uncertain futures of bioscientific innovation. During a period in which new biological ties between scientific research, national identity, human and animal reproductive substance, and the future of healthcare and agriculture are being significantly remolded, such guidance is especially appreciated. In all of these respects Future Mix reframed — or possibly even domesticated — the future of biological control within a model of companionate

relationality anthropologists are likely to recognize as more prehistoric than post-human.

More to the point, however, are the ethics of “the animal question” this project articulates more clearly than much contemporary anthropology, or, it would appear, than most of western philosophy. In response to the question of what is being said about Dolly in this project, there are undoubtedly significant absences, such as the fact that domesticated sheep are bred almost entirely for human purposes, and so was Dolly. Neither the pedagogical input to the course nor the art exercises emphasized human-animal questions, thus reinforcing a consistent absence of attention to this topic. And we might add that using Dolly as a figurative doppelganger is merely once again to impose on animal bodies the burden of human wants.

That said, however, the project did arguably achieve an important lesson at the level of form—in terms of how the conversation was imagined and revealed, and in terms of how the students and their animal were situated in this encounter. As a lesson, that is, not only in not giving back speech, but attempting to do so, an encounter is at least staged and prefigured in which the very technics of speech, of language, of words, have been reconstituted for a specific task. Perhaps even this recognition alone — of the need for reinvention of the most basic means of conducting a new kind of ethical dialogue about the biological futures humans and animals share — is something even Dolly herself might respond to.

Notes

1. For an interesting argument against these positions, see *The Craftsman* (2008), by Richard Sennett, himself a student of Arendt.
2. Such a question would be more in line with the work of Marx and Engels, who see the hand itself as a form of technology. See further in Raymond Tallis’s *The Hand: a philosophical inquiry into human being* (2003).
3. So too are humans increasingly intimately connected to the biological colonies, or lines, of banked human stem cells that comprise a new demographic dimension to the human population, while also being one of its new “tools.”

4. See Edwards, *Born and Bred: Idioms of Kinship and New Reproductive Technologies in England* (2002); Edwards et al, *Technologies of Procreation: Kinship in the Age of Assisted Conception (2nd Edition)* (1999); Franklin, *Embodied Progress: A Cultural Account of Assisted Conception* (1997); Strathern *After Nature: English Kinship in the Late Twentieth Century* (1992) and *Reproducing the Future: Anthropology, Kinship and the New Reproductive Technologies* (1992).
5. See Finkler, *Experiencing the New Genetics: Family and Kinship on the Medical Frontier* (2000); Franklin and Roberts, *Born and Made: An Ethnography of Pre-implantation Genetic Diagnosis* (2006); and Rapp, "Cell Life and Death, Child Life and Death: Genomic Horizons, Genetic Diseases, Family Stories" (1999).
6. See Konrad, *Nameless Relations: Anonymity, Melanesia, and Reproductive Gift Exchange* (2005).
7. See Carsten, *Cultures of Relatedness: New Approaches to the Study of Kinship* (2000) and *After Kinship* (2004), Franklin and McKinnon's *Relative values* (2003); Strathern, 1999 & 2005.
8. See Franklin, *Dolly Mixtures: The Remaking of Genealogy* (2007).
9. See Cassidy and Mullin, *Where the Wild Things Are Now: Domestication Reconsidered* (2006).
10. See Haraway, *When Species Meet* (2007).
11. See Ritvo, *The Animal Estate: The English and Other Creatures in the Victorian Age* (1989) and *The Platypus and the Mermaid and other Figures of the Classifying Imagination* (1997).
12. See Helmreich, *Alien Ocean: Anthropological Voyages in Microbial Seas* (2009).
13. See Desmond, *Staging Tourism: Bodies on Display from Waikiki to Sea World* (1999).
14. See Anker and Nelkin *The Molecular Gaze: Art in the Genetic Age* (2004); Kac *Signs of Life: Bio Art and Beyond* (2007); and da Costa and Philip, *Tactical Biopolitics: Art, Activism, and Technoscience* (2008).

15. See Kemp and Warner, *Spectacular Bodies: The Art and Science of the Human Body from Leonardo to Now* (2000).
16. See Turney, *Frankenstein's Footsteps: Genetics and Popular Culture* (1998).
17. See Kac, "Transgenic Art" (1998) and *Signs of Life* (2000).
18. Somewhat paradoxically, and idealistically, we were aiming for imaginative trajectories that would "keep it real."
19. I still have clothing from which some of the plaster has been impossible to remove.
20. And see Ahmed, *Strange Encounters: Embodied Others in Postcoloniality* (2000) on "familiar" strangeness.
21. See Friese (2008).
22. See Cassidy and Mullin (2007).

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