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Form Follows Function

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LYN BALDWIN

Form Follows Function

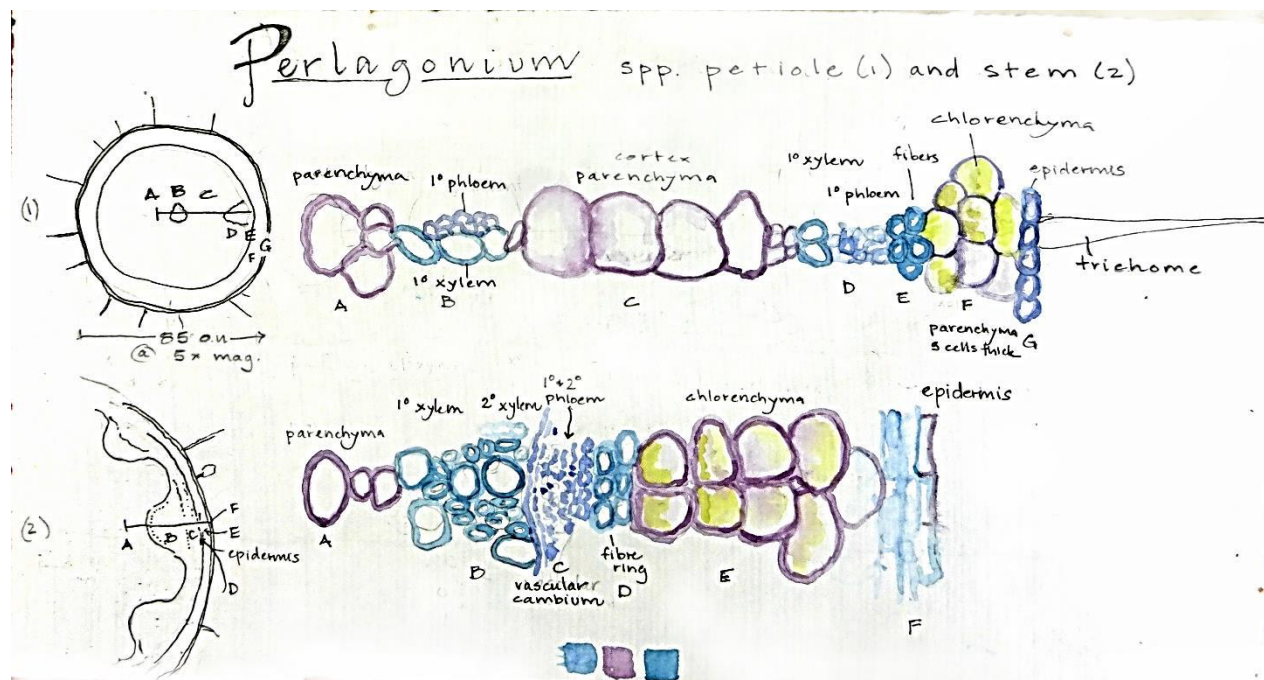


Natural history field journal frontispiece, 2016. Megan Abbott.

I'm in the hall. Banished from my normal place inside the botany laboratory immediately behind me. Across from me, brown brick walls run left and right, punctuated at distinct intervals by glass cabinets housing biological artifacts. The thick wash of bodies moving past subsides to a few isolated quick-walks of students nearly late and then echoes into an awkward silence. Sitting here, immobile in a space clearly designed for travel, I realize for the first time how these brick walls have constrained my working life. More trips made through this hall, to this door, than perhaps to anywhere else on campus.

Twelve years ago—nearly to the day—I arrived in this building and quickly found its structure disorienting. All the halls looked the same and even with just three floors, I got confused between the second and third. They'd put me in the basement that first December, and, coming in early, going home late, I'd scurried from office to laboratory. I'd missed my very first Faculty Council, confused about which events a brand new, probational faculty member was to attend. Surely, I thought, one was *elected* to Faculty Council. I'd gone instead to the botany lab to practice cutting geranium stems into one-cell thick sections with a razor. Following the directions left behind by my predecessor, I stained individual sections with toluidine blue and mounted each on a microscope slide. Trained as a plant ecologist, I remember gasping the first time I saw the crystalline beauty that lies at the heart of plant anatomy.

Cells with different functions—photosynthesis versus support, protection versus conduction—have walls that differ in thickness and construction materials. In a fresh stem brimming with chlorophyll, different cell types will mass together in an undifferentiated green. Dark blue in the bottle, the magic of toluidine blue stain is that it colour-codes cells by the type of molecules that construct them. A thirty-second soak in tol blue turns green tissue into a stained-glass window of purple and turquoise blue. Along with differences in cell shape, the differential staining of tol blue allows botanist and student alike to decipher the logic by which individual cells build, brick by brick, into stems.



Perlagonium (geranium) spp., petiole and stem, stained with tol blue, lab journal excerpt, 2016. Lyn Baldwin.

Inside the lab, students in my new natural history class are completing a mandatory course evaluation. In a few minutes I will be allowed back in for the culminating exercise of this course—not a typical end-of-term lab exam, but a writing workshop. This past Monday, in groups of four, these students from departments across campus (theatre, general studies, interdisciplinary studies, history, natural resource science, and biology) submitted essays to each other. It is now Thursday, 10 a.m. Over the last two days, they were meant to read and comment on each other's drafts. In a few minutes I will go in. Not to lecture, not to discuss, but to listen. Above all else, my job will be to mask my own anxiety. I want this to work. I want the students to be supportive and constructive; I want them to engage with each other's writing, to respect the different perspectives each carries with them. It's just not the type of teaching I ever expected to attempt in this botany lab.

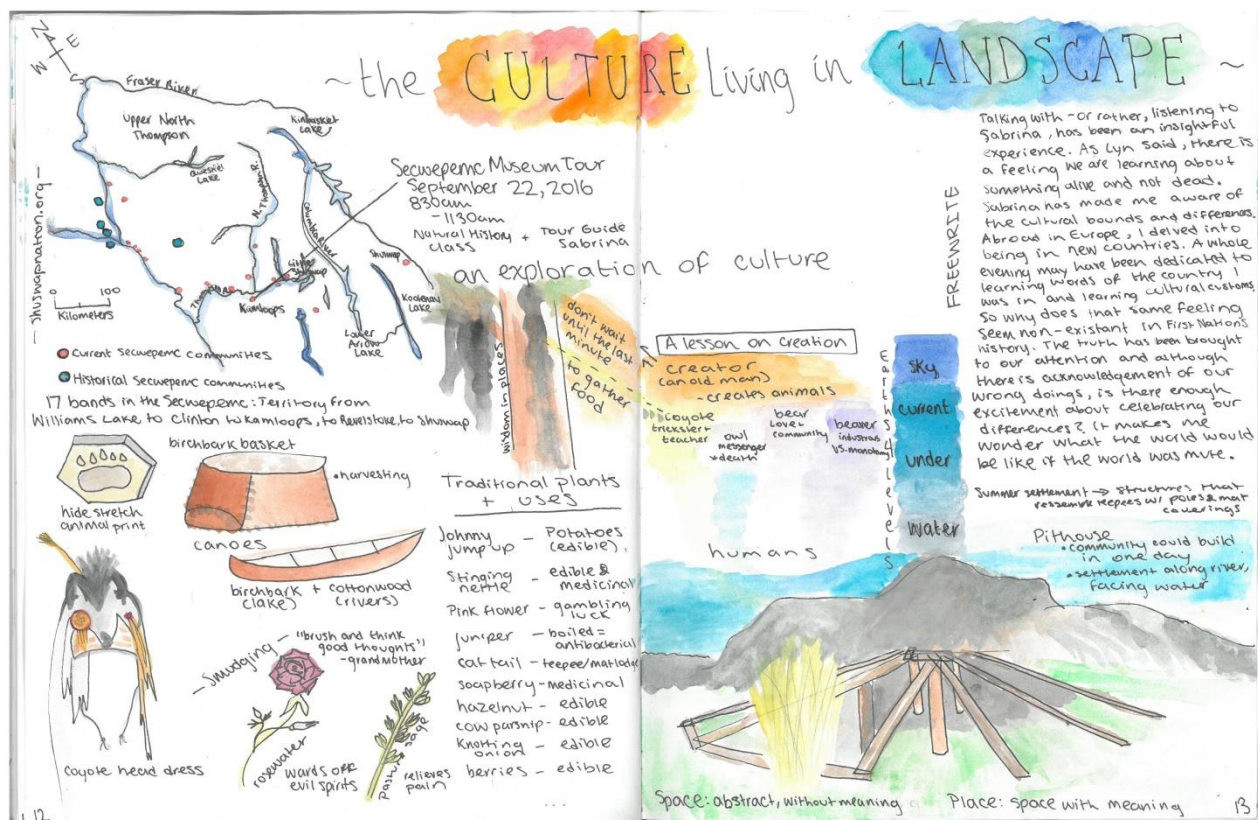
Later this afternoon, the room beside me will be swamped with botany students sectioning and staining, analyzing, and describing. Implicit in all that they do will be the idea that form follows function. Biologists say it in one breath. How, we ask students, does the anatomical structure (or form) of a leaf or a stem or a root reflect its function? We know there are exceptions, but when we look at the internal anatomy of any plant organ we interpret the structures of individual cells—sclerenchyma and collenchyma, palisade and spongy parenchyma, tracheid and vessel elements—as evolutionary adaptations that allow them to function. Complicit with this reasoning is the understanding that evolution doesn't innovate out of thin air. Evolution, we assert, acting upon the variation that arises from chance, carves what works from what doesn't.

Sitting here, waiting to go in, I wonder if the same doesn't hold true in teaching. Just as no flower appears wholesale, newly minted on the face of this earth, no course appears out of thin air.

Maybe the anxiety I feel, the risks I nearly wish I hadn't taken, are a necessary part of carving what works from what doesn't. I'm sure the students must be almost finished. I take a deep breath and, as the door beside me opens, find some small comfort in the familiar geography of the room I am about to enter.

Inside the lab, it's bright. Students mill at the back bench, filling mugs with tea. Earlier, in celebration of our last meeting together, I stacked bakery scones next to the kettle. Collectively, our group is diverse. Unlike most of my courses, I am not the oldest person in the room; neither am I the only parent. Three of us have given birth, three parent on a daily basis and one is waiting for her first grandchild. We include the descendants of European settlers, an Inuit man from northern Newfoundland and several whose parents were born in southeast Asia. Two of us are terrified of birds, at least three fish on a regular basis, and one has hunted polar bear. One young woman grew up in a motel room; nearly half have never lived anywhere else but the small city in which we study. In the room, the students' energy verges on manic; some, I think, are sleepless. Or maybe just nervous. Certainly, I think, everyone feels the imminent release of end of term.

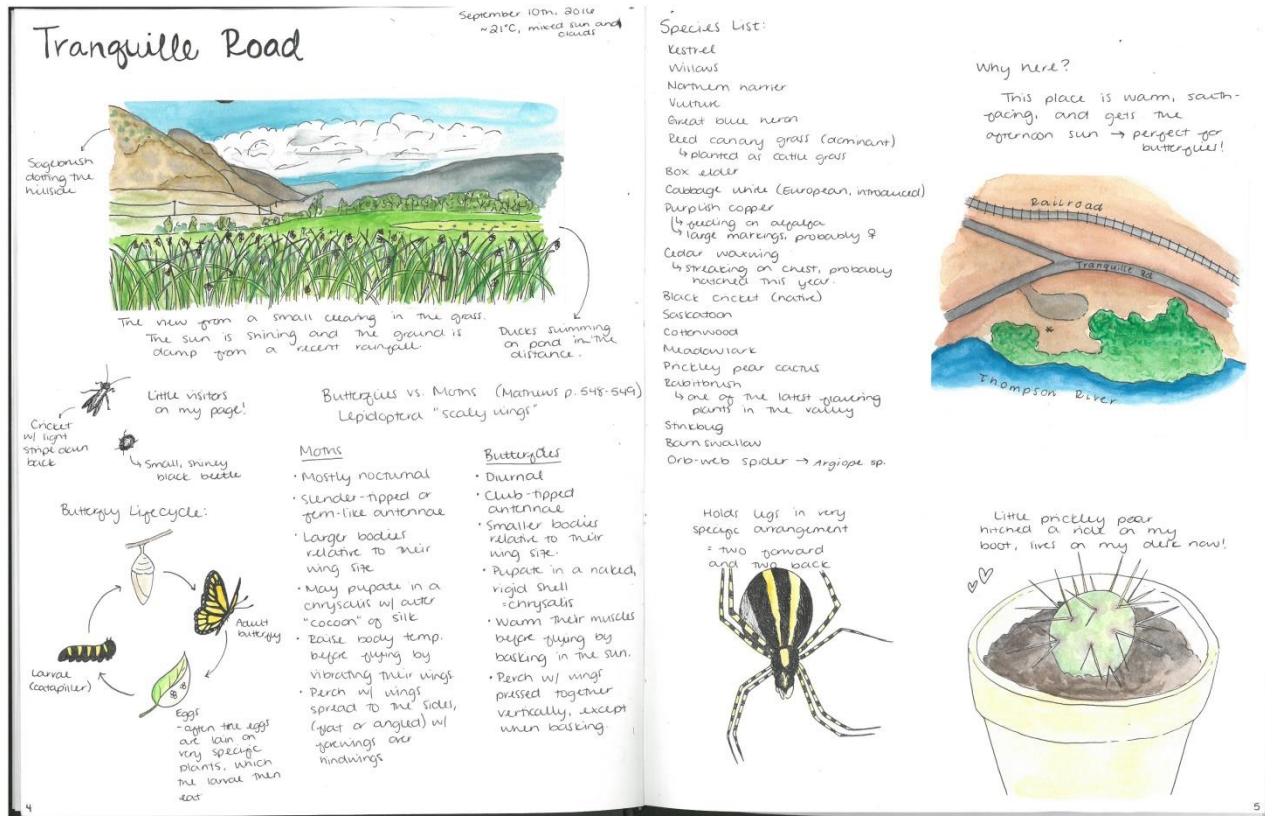
This is the second essay the students have workshopped together. They are in different groups from the first workshop, but these students now have a wealth of experience with one another. We've chased butterflies along the Tranquille River, drawn rolling hills in the Lac Du Bois grasslands, illustrated artistic maps, night-walked under foggy skies, and visited with salmon and bighorn. We've learned from mapmakers and fisheries biologists, astronomers and ornithologists. It hasn't all been easy. I lost the two self-proclaimed theatre girls in the grasslands and was given a stern verbal reprimand (with the threat of a thousand-dollar fine) by a sanctimonious railroad cop when we traversed the tracks in an unregulated crossing to walk beneath hoodoos. Our visit to the Residential School exhibit at the Tk'emlúps te Secwepemc Museum left no one unchanged.



The culture living in landscape, field journal excerpt, 2016. Madison Ellis.

Above all else we've read: Ted Chamberlin and Candace Savage; Kathleen Jamie and Robert Macfarlane; Wayne Grady and Dick Cannings; Keith Basso and Barry Lopez. All writers chosen because they had something to say about the influence that the natural world had on their lives. Only later will I be startled by the recognition of who's missing. Books by Richard Wagamese, Jeannette Armstrong, and Garry Gottfriedson—Indigenous authors whose words are rooted in the same landscape we've walked—sit on my bookshelf, but not in our reading list. Even as I worry about the underlying cause for their absence, I will not doubt the necessity of Indigenous voices nor the students' desire to hear them. Richard Wagamese wrote, "The land defines all of us." If I want the form of natural history to cultivate community, to help rebuild relationships, the voices of all those tied to land are needed. Certainly, a hesitation to hear Indigenous voices was no part of the students' response to the Residential School exhibit. A recognition of our complicated legacy, including its shame, yes; a desire to know more, to do better, yes; hesitation, no.

Even this year, no writer goes without discussion. In class, some, including me, have talked too much; others have rarely spoken up. I've learned to trust what students write in their field journal more than what they say in class. In many ways, the students have remained true to their original disparities—the theatre girls nearly always want more character development, the biology crowd more facts, but none question the common ground of the course. That is, the natural world is worth our attention.



Tranquille Road, field journal excerpt, 2016. Megan Abbott.

When everyone has their tea and scones, the groups separate to the four corners of the room. I look down at the stack of essays on the lab bench. I know the topics are diverse, reflecting our time together. I also know that it's not just me who has taken risks. Woven in among the bits of natural history are other stories: a student's nearly instinctive desire to please her father; the weight of unwanted burdens; a fear of working dead-end jobs forever; the hope of new beginnings; the loss of those they've loved.

In class, we've talked about the power of constructive feedback, about what it means to support each other as authors, about how to separate the narrator from the author of each piece. From my position behind the four-foot-high black lab bench at the front of the room, the fume hood throbs. It's a constant irritant in this room, but for once I am glad for the white noise that separates one group from another. I slide to one end of the front bench and listen to the closest group.

"I love your similes and alliterations, but I felt like the science got bogged down in the second paragraph."

"I think there's an opportunity to build up the character of the narrator's father, to set the scene of the phone call when they're talking about navigating by stars."

I slide to the other end of the bench as the conversations continue—some similar to the words I penned earlier on each essay, others strikingly divergent. Not all the students remember to

remain quiet as feedback is offered—the lure of ideas pulling them across established protocol. But what strikes me is how the feedback goes beyond mere grammar. Responses tackle structure, point of view, narrative arc. The noise in the room builds; in multiple groups, laughter erupts.

I look up; with its immobile black benches stretching across its interior, this laboratory was built for dissections, not writing workshops. The only space for small groups to gather are the four corners. With two groups clustered at either end of the front bench, I'm penned in behind. But I need to hear more. Not wanting to disturb either group, I hoist myself up, standing tall atop the bench, seeing the room from a new perspective, before slipping back to the floor on the other side.

In the next group, one woman submitted her essay late—only last night—and her group is firm yet generous.

“You missed the deadline, so I didn't have time to make comments, just to read it through once.”

“If you want, I'll finish reading it and send comments to you.”

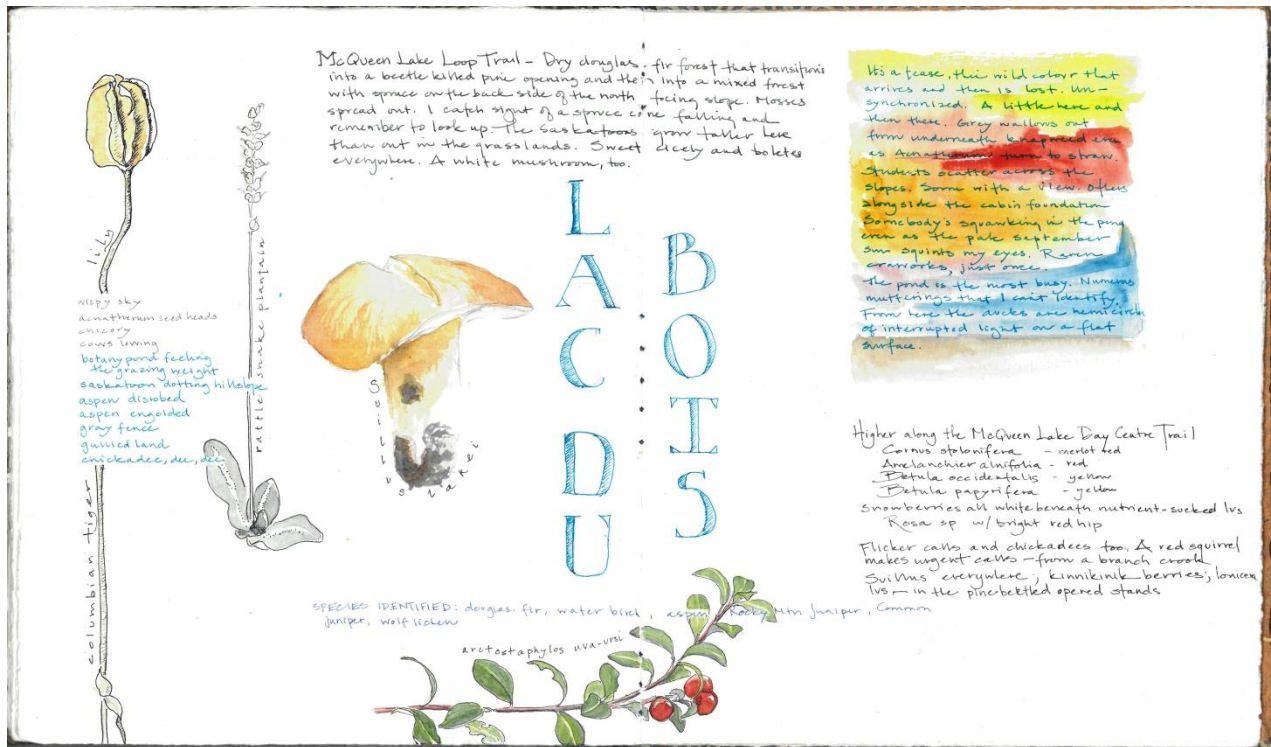
In each group, I watch individuals write down their peers' comments, trusting the guidance of one another. Not all will be incorporated. Based on our last workshop, I know some will prioritize what I say over that of their colleagues in their final edit.

Do these students understand, I wonder, as I drift from group to group, the gifts they give to each other? Not just the specific words or insights, but the gift of themselves as readers. The opportunity they provide to be heard, to be considered.

I will, after the final drafts are turned in, assess the written comments they gave one another. But I have neither the mechanism nor the need to mark what is happening right now. What I see in this room—in this one cell nested within the larger geometry of an institutional building—is a generosity of spirit and accountability that is far less about grades and far more about community. I know the ability to share my own writing was transformative: how could I not want the same for these students?

Nearly in unison, each group is working on their last essay. As the final group wraps up, one student asks that I create another Dropbox folder for sharing the final essays. She'd like, she says, to read everybody's.

The workshop is over. But the students linger. Before they go, they get me to agree to teach a bookbinding workshop over the Christmas break. They want, they say, to hand bind their next field journals, rather than having to rely on store-bought ones. They'll organize it, they say. You give us the list of materials and we'll get everything ready. You'll just need to show up.



Lac Du Bois, field journal excerpt, 2016. Lyn Baldwin.

It's time. I sho the last student out the lab door.

Form follows function. Does the same hold true in teaching? In writing? Maybe. And maybe this slow-growing realization is the reason that I'm still vibrating with satisfaction even when all students have gone. After twelve years of teaching, this natural history course is the one where I've had the most freedom to prioritize *doing over knowing, reflection over memorization*. As I wash the last of the tea cups and stack them in the cupboard, I think that the function of this course has rested less in its built environment, with its immobile benches and too-loud fume hood, than in the lived experiences I could facilitate for the students. It's not been solitary work: much of the scientific content was provided by other faculty coming in to give guest lectures and I was mentored in teaching writing by a colleague across the campus. And today's workshop is not the only piece of this course that's felt risky. Earlier this semester, I found myself limiting how much I shared with my biology colleagues, worried that they would find the work of this course trivial. After all, the class has analyzed no statistics, compared no molecular data, dissected no bodies. But if natural history is "attending to and representing the natural world" then my challenge over the last thirteen weeks has been to create structures that would facilitate students writing their own natural history.

The primary tool of the course has been nothing more than the students' field journals. Within these books—written and illustrated by the students—text has jostled against image, science against art, internal reflections against external observations. These books served as vessels into which the students poured their reading responses, field sketches, and notes from our guest lecturers, before distilling out a weekly field reflection. No architecture—whether it is of stem,

laboratory, book, or course—is neutral. I’ve not been surprised to find their weekly field reflections growing more powerful, more potent, over the semester. Neither have I been surprised that many used the understanding cultivated within their field journals as the skeleton for the essays they’ve just finished workshopping.

Swimming with knowledge

Salmon species that could be expected during the Adams River dominant Salmon run include:

- Sockeye**
Oncorhynchus nerka
Red salmon
- Chinook**
Oncorhynchus tshawytscha
King salmon: darker gray
- Coho**
Oncorhynchus kisutch
Bluebacks: silver salmon

Salmon are important to terrestrial ecosystems bc their carcasses and eggs provide scum derived C, N, P to their natal streams, supporting algae and invertebrates. Nutrients can be found 500m away from rivers. Pacific salmon are known as a keystone species in freshwater systems.

Life Stages of Sockeye Salmon

- Eggs:** hatch in about 6-7 weeks
- Alevin:** feeds off yolk-sac for several weeks
- Fry:** 5-10 weeks old and swimming
- Parr:** several months old
- Smolt:** 1-2 years old, will grow and head out to ocean
- Adult:** spend 2-3 years in ocean
- Spawning Adult:** spawn and die within 2 weeks

Redds: It is the spawning nest that is built by female salmon in the gravel of streams or the shorelines of lakes. It is formed by the female using her tail to dig in a small area of gravel in the bottom of the stream or shore. Here she forms several depressions forming egg pockets in which she deposits her eggs.

Conifers: Western Red Cedar, Douglas Fir

Shrubs: Hawthorn, Blackberry, Huckleberry

Deciduous Trees: Aspen, Cottonwood

* Jack mites (snaky tickers) can obtain access to females by darting in during a crucial moment, releasing their sperm and fertilizing some of the eggs the dominant male fought for.

Type = a salmon greater than 30 pounds!

26

Swimming with the Salmon
October 10th - 16th, 2016

Kathleen Jamie's first sentence in "The Braan Salmon" was divine. It was not what I was expecting given the title of the piece so I was intrigued and curious. She goes on to use exceptionally descriptive words to describe the chamber overlooking the falls. "A damp elegant room, it opens onto a half-moon balcony, and you can stand on the balcony admiring the scene as the spray and updraught dampens your face" (p. 59). After describing the Braan River, she uses three words to create a powerful sentence that will guide the rest of her written piece, "Mostly we're concerned" (p. 60). Explaining her thought process while observing the struggling salmon, Kathleen effortlessly demonstrates the striking effort required of these fish and the shocking number who are weaker than the current of rushing water.

While reading about the use of binoculars, I was curious if Kathleen Jamie was using this example as a sort of introduction to the idea that we can't always see what we don't focus on. "Makes you wonder what else is going on, doesn't it?" (p. 64). It made me think of how the photography group came to take picture of the salmon and the Braan River, but never really focused on the fight of the fish. As she and her neighbour, Robin, chatted, I was just as shocked as Kathleen to hear that the poor salmon in the Braan who are swimming with all they have, will never make it to the spawning grounds because of the waterfalls and hatchery programs set up upstream. Some comfort came as Robin explained that the salmon can give up and spawn downstream, but I will still be saddened by the thought of these fish not being able to complete their life goals because of human edits and manipulations. Kathleen hit the nail on the head when she called it hopeless.

And then came the heaviest lines of all. "They say the day is coming - it may already be here - when there will be no wild creatures. That is, when no species on the planet will be able to further itself without reference or negotiation with us. When our invention or restraint will be a factor in their continued existence" (p. 65).

After reading the foreword in "Return to the River" by Roderick L. Haig-Brown, I was left feeling guilty for the selfishness and inconsideration of my species. I was glad I read Kathleen Jamie's piece before hand in order to warm me up slightly for Roderick's intense piece.

In my own writing I have been struggling to set the scene so I was delighted by the subtle example Roderick provided me. The first part of his piece went on to describe the edited river and the suffering salmon within. "The white patches of worn fins and scarred backs showed up first in restless movement, out of time with the rhythm of the stream's flow" (p. 4). I was thankful for Brian Heise's presentation of salmon in our natural history lecture, for I felt I was better able to understand and visualize the actions of the salmon, such as the females preparing their redds. I have to admit though, I felt a little uncomfortable reading the seemingly dirty details of the male-female salmon encounter, especially with the old man creepily and also too intently watching. It was an innocent

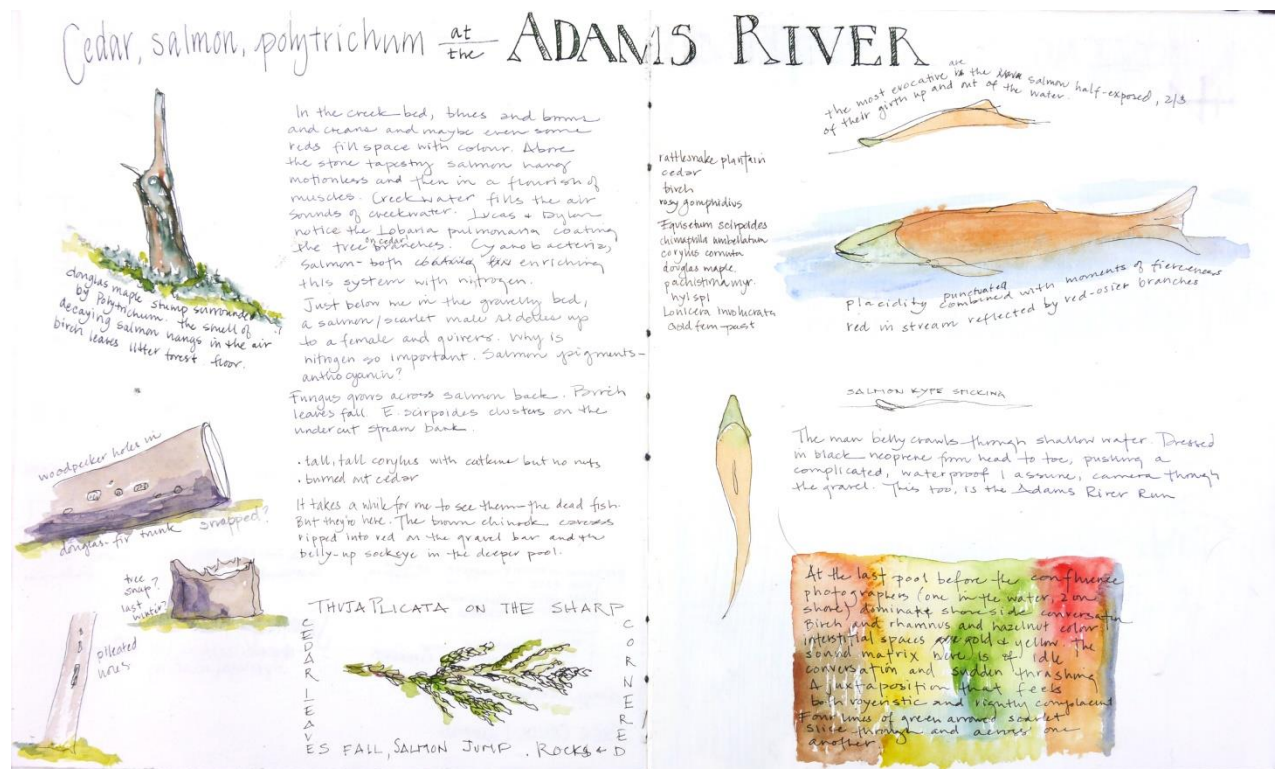
27

Swimming with knowledge, field journal excerpt, 2016. Chelsea Reith.

But here’s the thing: in evolution, innovations have a life of their own. Sometimes an evolutionary innovation that has been sculpted by natural selection for one function will be co-opted for another. Long before feathers lifted dinosaurs into birds, proto-feathers—originating as wiry scales on the backs of flightless dinosaurs—served as a means of keeping warm or attracting mates. Everything in this course—the field journal, the readings, the writing workshop—was set up to allow students to *experience* natural history. But maybe before now, I never understood the reciprocity of natural history. That is, in teaching us first to notice, and then to care about, our more-than-human neighbors, natural history stories a place for *us* alongside them. *Beside*—rather than *apart from*—the more-than-human world. Do the students understand, I wonder, the gift they’ve given me? Their embrace of the tradition that I hope might help heal the world.

I can't know anything for sure until I see the students' final work, but I think back to the hub-bub midway through the workshop when one group was laughing and another was wrestling with verb tense; one with character and the other with how much science is too much. In that moment, I think, the form of the proceeding semester culminated in function. All sixteen students engaging in each other's rendering of the natural world. All acting with confidence in their role as readers, as authors of natural history. Students finding human truths, building community, through the mundane moments of a momentous world. A sight no less incandescent, I think, than the stained stem sections that my botany students will make this afternoon in their lab exam.

I push open the lab door to leave. This Thursday there's no Faculty Council; I turn left, heading for my office, navigating without thought through the brick-lined hallways of the place where I work.



Cedar, salmon, and *Polytrichum* at the Adams River, field journal excerpt, 2014. Lyn Baldwin.

ACKNOWLEDGEMENTS: I would like to express my deep gratitude to the students of natural history at Thompson Rivers University who have been so willing to reach across disciplinary boundaries in order to explore the place(s) we call home. I have learned from you all. I am particularly indebted to Megan Abbott, Madison Ellis, and Chelsea Reith for contributing excerpts from their illustrated field journals to accompany this piece.

LYN BALDWIN teaches botany and ecology at Thompson Rivers University in Kamloops, B.C. where she investigates the ecology of landscape edges and the synergies of art and science in natural history. Lyn's creative non-fiction essays have been published in *Terrain*, *Cirque*, and the *Journal of Natural History and Education*. For the past decade, Lyn's field journals have been exhibited in libraries, museums, and universities. Most recently, her solo exhibit, *Finding Place: Exploring Home through Field Journal Art* spent three years travelling through Alberta and British Columbia.

Having lived most of her life in British Columbia with a brief interlude on the Saskatchewan prairies, **Megan Abbott** will complete her undergraduate studies in biology at Thompson Rivers University in 2018 with a research project examining the suitability of urban gardens for native bee pollinators.

Madison Ellis balances research in microbial ecology with part-time work for Parks Canada and in the fall will move from her home in Kamloops to begin graduate work in polar microbiology.

Raised in Kamloops, B.C., **Chelsea Reith** finished her B.Sc. in biology at Thompson Rivers University in 2017 and is spending this spring working in a dolphin research centre and exploring Europe as she waits to hear if her dental school interview is successful.