

The 10th MacClement Lecture

Mathematics and Poetry

Queen's University, Faculty of Education

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This annual lecture honours the life and work of William T. MacClement, Professor of Botany and first Director of the Queen's University Summer School.

I dedicate this 1995 lecture to Bill Barnes, colleague, teacher, and friend. Much of what I say here is inspired by our 10 year collaboration in the Mathematics and Poetry course at Queen's. His poetry classes gave me a new and very powerful set of standards for my teaching of mathematics, both for the quality of my material, and for the way I presented it to the class.

I am grateful to Mac Freeman, the coordinator of the Lecture Series, for his encouragement and enthusiasm during my preparation of this talk.

I'm going to speak about teaching but everything I will say you already know. That's just as it should be. "The teacher," says Northrop Frye, "...is not primarily someone who knows instructing someone who does not know, but rather someone who attempts to re-create the subject in the student's mind¹ ..."

So tonight we will try to re-create the teacher. I'll draw my examples from the two fundamental subjects in the curriculum: mathematics and poetry--they are fundamental because they support the two great subdisciplines of the academy of the Arts, the sciences and the humanities. Mathematics provides for the sciences a language and an aesthetic standard, embracing such things as economy, simplicity and explanatory power. Poetry does exactly the same for the humanities. You can see why I object to the current name of my Faculty: Arts and Science--it violates this organizational scheme. It could be called the Faculty of Humanities and Science, but a better name would be simply the Faculty of Arts.

When Mac approached me last December with the idea of this Lecture, I seized the opportunity--they need to hear about passion and magic! I exclaimed darkly, and I am just the person to instruct them. I will decry the heavy #9 binder twine with which we try to tie off the holes in our educational objectives; I will weep into my pedagogical handkerchief, dance like a butterfly upon the stage, tantalize my audience with magic tricks, work them for gasps and sighs, and sound a clarion call for passion.

Well, okay. That's certainly one side of the teaching coin, and for most of my career, that's the side I have concentrated on and kept brightly polished the better to see or hope to see my own reflection in its shining face.

But there's another side, which I've only recently begun to pay attention to. I will talk about these two aspects together and explore their relationship. I have had trouble finding names for them. Heads and tails isn't bad, but I want something more imaginative.

Thomas Moore is author of *Care of the Soul*; in his later book *Soul Mates* he gives us this poem by the American writer Mary Mackey.

love comes from years
of breathing
skin to skin
tangled in each other's dreams
until each night
weaves another thread
in the same web
of blood and sleep

and I have only
passed through you quickly
like light

and you have only
surrounded me suddenly
like flame².

Here is a pair of symbols for the two sides of my coin: BLOOD and SLEEP. If you look closely at the words, you can tell they were forged on the same anvil, by the same blacksmith, they have the same pattern of letters, the same poetic value, and they share the same web. But they have different energies.

Blood is passion. It is a display of the imagination, a roller coaster, a rock opera, a rabbit pulled from an empty hat. The web of blood is a network of interconnecting streams and rivers, flowing,

branching, probing, building to a climax, the bursting of a bud in the early spring.

Sleep is an act of caring, a web that heals and restores, that returns us to where we belong, that knits the raveled sleeve. Sleep is a painting, a psalm of praise, an affirmation, the careful fitting of storm windows in the late fall.

It is interesting that they both serve as symbols of death, but again with quite different energies.

Another pair of symbols I will use to distinguish the same two aspects is the RIVER and the LAKE. This is the title of a recent book of poetry by Joanne Page: the river which foams and rushes forward carving its path among rocks and fallen trees, and the lake which seeks its just level, rising and falling with the seasons, raising ripples in the wind. The river is needed to carry you to new places round bends which open up new landscapes, but you also need the lake--a place where you can stop paddling and know that you will not be carried away or smashed on the rocks. Here is Joanne talking about the lake.

high summer sun tracks small fish

in deep water
minnows and their shadows
visible but absent

at the same moment

and with one movement
reverse, dart & shiver
through lilyreed anchors,

fleet and golden
stream lined
these small fish swimming

arc in noon dazzle
as I circle this other side of presence
called loss

how it will rise
unbidden, slivers
searching for a larger story.³

I think understand blood pretty well, but sleep I have had more trouble with--I understand its importance but still I seem to resist it. I am too full of a sense of time gone by, of life unlived, a pressure to move forward; my dreams are sad and chaotic, full

of soulful encounters, barely grasped, and I cannot really believe that sleep has much to offer to me--or my students. Somehow I cannot shake off the feeling that it's a waste of time.

In the same way, I am more comfortable on the river than on the lake. I seem to need new vistas, to wonder what might be around the next bend. I need to learn to trust the lake. I need to trust that it will rise unbidden, if I give it the quiet time and the space. The lake is about sitting still in the canoe, not far from the edge, the student in the stern, letting your focus relax and penetrate the surface, catching the slivers darting this way and that, do you see them? there? there! yes! suddenly they are everywhere, and you follow them together, searching for a larger story.

There is a third pair of images which are important to me. When Helen Luke⁴ talks about pride, she distinguishes the pride of the lion from the pride of the unicorn. The pride of a lion is the pride of one who is prepared to fight even to kill and be killed for what he believes in. It is the pride of the warrior, who has come to a mature understanding of what is right and stands clearly and unambiguously in its service. But there comes a time when this pride must be abandoned and transmuted into the pride of the unicorn. When this happens, he has no more need to fight, for he has begun to find his nourishment through that love which is beyond love-hate opposites, beyond right and wrong. The unicorn harms nothing, her horn is lifted in a remote and lovely pride as we glimpse her now and then on her swift course. This pride can only appear in one who has already fought bitter and bloody battles within herself; to move beyond this battle of opposites requires an imaginative vision. So that's another pair of symbols I might paint on the two sides of my coin: a LION and a UNICORN.

Sitting in the Pilot House a month ago across from my sister with a pint of bitter: the pilot house being the place from which I steer the boat when I am on the river, and the bitter being how it feels to be told by her that I have an excess of pride, and that it is time for me to find some humility. She was talking about the pride of the unicorn. I knew there was some stuff I had to do.

And so part of what I hope to do this evening is to try to understand sleep, the lake, the unicorn. But to do this we must first recognize blood--the lake is only fathomed by those who have travelled the river, the lion precedes the unicorn.

Blood

Blood has two components, the red cells of passion and the white cells of magic. Passion is the elemental over-reaching yearning for life, and magic is the awe which returns us to innocence. Magic passes through us like light, and passion surrounds us like flame.

Here's Kim Chernin describing her reactions to her "first analysis."

It was he who made her aware of these tendencies, encouraging her, gently, persuasively, to balance them with self-reflection, an ability to name, a capacity to tolerate conflict, to acquire, therefore, an ability to choose. Her fascination with him--his thought, his life, his person; his unknown relations to wife, children, friends, colleagues; the books in his study, the pages neatly stacked on his desk--drove the analytic process for her. It was her passion for him that brought her to a first, faint glimmer of desire to plant herself on the side of the rational. If that was the shore on which he stood, she would have to be there too, to stand beside him.⁵

This is an interesting paragraph, but I am cautious about identifying the analyst ("he") with the teacher; for me he is more closely allied to the material. Perhaps it is the task of the teacher, not to play the role of the analyst, but to construct (or reconstruct!) him for the student--out of (or within!) the teacher's imagination, his questions, his own passion for the subject. So that "his unknown relations to his wife" have crucial analogues in the relationships of the material to other things that matter to the student. This is a theme I return to at the end, particularly in the Cohen passage.

Increasingly my own pedagogical focus is not on knowledge but on energy. I feel I have succeeded if my students leave my classroom not with more knowledge but with more energy than they had when they arrived. When I manage to get that right, everything else seems to fall into place-- the knowledge that they need, they somehow seem to get. It's not an easy goal, but the key is to choose the right examples. In the sciences, we often err in using examples which are too complicated. We want to cover everything and we uncover nothing. The best examples are extremely simple but offer a challenge to the intuition--students are thrown into

hotly debating groups. The door is open for passion and magic.

In high school, on the other hand, the examples are usually simple enough, but they are too often insufferably boring, and passion and magic give them a wide berth. Almost everything in our current grade 12 math text book is inimical to blood; I would never take it to bed with me. Can you imagine using a book in one of your courses that you would never want to read yourself for pleasure last thing at night?--blows the mind doesn't it--what kind of message would you be giving to your students?--aren't you lucky you're not a grade 12 math teacher. If there are works of art in this book, and there are one or two, they are eclipsed by the laborious sequence of examples and exercises which cuts the work up into small pieces and chews each morsel over and over until no taste remains. And as a final insult, all the odd numbered questions are answered.

On the other hand, the book that is used in the grade 12 poetry curriculum contains works of art which can be read and reread simply for the love and beauty of the poem. They were not written to conform to ministry guidelines, but emerged at moments of wondrous insight, flowing into the world as gifts to us all, scattering their petals behind them. They can be read again and again and bring renewed pleasure each time.

What accounts for the difference between the two books?

That's an interesting question, and you will find it is not so easy to answer as you first think. You might guess that it reflects the differing natures of the two subjects, for example the hierarchical character of mathematics, the need to do things in a fixed order, many precise technical skills, the importance of moving quickly, not only for the student, but for the teacher who has an endless list of topics to cover, and recover, and recover, whereas the technical requisites of poetry are less constricting, more forgiving. I've thought about those kinds of differences a lot, and I'm pretty sure that none of them will stand up to examination. At least they cannot be used to justify this book.

Now let's be fair. It's commonly accepted that if we didn't have the drill and the answers to all the odd numbered exercises, the students would make errors like this:

$$2^x 2^y = 2^{xy}$$

and when they grew up the bridges they build would fall down.

Well, I don't get worked up about falling bridges any more; I'm more worried about the failure to think clearly and imaginatively and inventively(!) about what a bridge really is or might be. Thomas Huxley said that truth is much more likely to emerge from error than from vagueness. In fact I make analogous errors all the time in my work, but they are usually discovered and often turn out to be instructive because they occur in the context of a larger problem, whereas our students are usually asked to do fragmented calculations in which errors do not return to sting you with their tales. Thus my concern is not for the error but for the student who does not know how to work with it, or better still, how to play with it. The student who falls into this error again and again may just be making a statement about life among the even numbered exercises. Instead of proscribing it as a bad answer, try prescribing it as a good question. Tell your student to take it off his head and put his hand inside of it and see if he can find a rabbit. Like this:

$$2^2 2^2 = 2^{2 \times 2}$$

$$2^3 2^{3/2} = 2^{3 \times 3/2}$$

The real difference between the math text book and the poetry text book derives almost totally from the economic value that society has put on mathematics that it does not confer upon poetry. If poetry were considered crucial to the economic well-being of our nation, there would be highly prescriptive ministry guidelines for the grade 12 poetry course too and most of the approved poems would have been written by a committee. The skills needed to read and analyze a poem would have been identified and codified, and instead of the Gauss and the Pascal, the Cayley and the Fermat, the Euclid and the Descartes⁶, all male I might add, you'd have the Milton and the Blake, the Wordsworth and the Keats, the Elizabeth Barrett Browning (how do I love thee? let me count the ways) and the Emily Dickinson.

What bitter irony: that the superior valuation of mathematics is what is responsible for the disasters of our math curriculum.

Even more ironic is the possibility that poetry may have more deep economic worth than we have had the courage to imagine. In our search to understand ourselves as humans, we are increasingly using scientific methods of investigation. But some of the poems I have read offer far more insight than any of the sociological studies I have seen, and

much more in the way of direction, hope, and inspiration. We are in danger of overlooking the enormous value of poetry and more generally of music and drama in enabling us to feel connected with ourselves and others and the world about us.

So we need more poetry in the math curriculum. Here's one that was in fact written many years ago by my grade 12 math teacher:

$$2^4 = 4^2$$

There. Is that not lovely? Simple and profound. Well, simple. Perhaps not yet profound, not with an ordinary imagination like yours and mine. At the time it was given to me I was not equal to its challenge, not until much later when I was browsing through an old book and I came across the second stanza. Yes, there's another verse, and if my grade 12 teacher had only given it to me, she could have left me alone for a week, and spent her time instead drinking morning coffee in the staff lounge and reading poetry—all for the want of a second stanza.

$$2^4 = 4^2$$

$$\left[\frac{9}{4} \right] \frac{27}{8} = \left[\frac{27}{8} \right] \frac{9}{4}$$

Now there's a poem--it is my gift to you tonight. And in case you don't teach grade 12, here's one for grade 11.

$$2\sqrt{\frac{2}{3}} = \sqrt{2\frac{2}{3}}$$

$$3\sqrt{\frac{3}{8}} = \sqrt{3\frac{3}{8}}$$

Such poems are not easy to find, and more and more I devote my efforts in the calculus reform movement to finding them and trying them out on my students. In this quest, it is good for me to have the Math and Poetry course⁷—there is no set curriculum, I can use the best poems that I have, and the two subjects set competing but complementary standards for one another.

Here's a Robert Frost Poem.

Nothing gold can stay

Nature's first green is gold,
Her hardest hue to hold.
Her early leaf's a flower;
But only so an hour.
Then leaf subsides to leaf.
So Eden sank to grief,
So dawn goes down to day.
Nothing gold can stay.

Holding the Gold

The response to passion and magic is wonderful but the energy it fills us with can be scary; we feel torn, vulnerable, unstable, a pressure to yield, to surrender, to let go. But such a release carries with it a loss of energy and innocence, and other losses as well. Here's Thomas Moore in *Soul Mates*:

Sometimes values collide. We may feel a strong desire to live a life of satisfying sex and sensuality while at the same time something in us longs for solitude and even chastity. In this collision of values our only option may be to remain within the tension. The modern tendency to resolve tension as soon as possible is so unconscious and feels so natural to us that at first it may seem strange to consider remaining willingly in our discomfort. We want solutions and resolutions, and we want them quickly, but there are several benefits to being patient with contradictions and paradoxes.

The first is an expansion of soul. Over time tension gives rise to thoughts, memories, and images that bring greater breadth to imagination. The soul grows bigger as it holds more thoughts, instead of shrinking them all down to the size of a single solution...

Another benefit is the possibility of finding more profound and lasting solutions to our life problems. If we rush to solve a problem, the solution will need to be something ready-made or quickly put together, and will most likely be a project of the ego; but if we sustain the tension created by two worlds colliding, an unexpected solution will emerge eventually from the opening to soul that tension creates. If we tolerate moments of chaos and confusion, something truly new can come to light.⁸

Holding the tension is holding the gold. It is the imaginative act from which creation emerges. Read *Zen and the Art of Archery*⁹ for a wonderful exploration of this idea. The right shot flies from the bow of the archer who is able to hold the unbearable tension of the string. It's not at all easy, but we all know in our own lives how important it is, and when we have that tension, even though we are struggling with it, we know how unwilling we are to yield.

For example perhaps there was a time or will be a time in your life when you are compelled to leave those you love and care for and be alone, and be an outcast, and reject a number of commonly accepted values, and find that in the process you have hurt or apparently betrayed those you love. And when the time seems to come for you to rejoin the community, you are suddenly wary. Because you have discovered, that for all the pain and incomprehensibility of your exile, there was a tremendous creative energy, a tremendous rush of life, a tremendous searching for truth, that you fear you might now lose.

Another way to think about this tension is in terms of questions and answers. Indeed, there's a sense in which the Grade 12 math text is about answers and the poetry text is about questions. And blood responds to questions and thickens and congeals when exposed to answers.

Here's Northrop Frye again:

To answer a question (a point we shall return to later in the book) is to consolidate the mental level on which the question is asked. Unless something is kept in reserve, suggesting the possibility of better and fuller questions, the student's mental advance is blocked.¹

And here's George Whalley in a 1959 address to a graduating class:

It impresses on us constantly that we should seek diligently for fruitful questions and let the answers fall where they may. A good question stimulates thought, and wonderfully heightens perception. An answer, unless it be the answer of decisive and considerate action, is destructive; it can be a narcotic blocking further thought and perception.¹⁰

Don't misunderstand me. I'm not saying that answers are not important and I'm not saying that you should refuse to answer your student's questions. I'm saying that of the two, questions are the rarer, the more highly prized, and that our task as teachers centres around them. In the math classes that I have observed, including my own, the question is too often received as a burden, a new load to be carried, and the answer is accepted as a deliverance. But the reverse is more likely to hold up: answers restrict us; questions set us free.

I think my students understand this well enough--so why do they so often plead for the answer? Is it because they are too feeble to hold the tension? Is it because they have a burning desire to build a bridge? Not at all: it is because they fear that someone will ask them for it in a three hour exam in a warmed over skating rink, and then presume to judge them on the basis of the answer they give. When will the education research community recognize how massively exams subvert and derail our pedagogy? A good start would be examinations which ask for questions instead of answers. though I do not mean to take the game of jeopardy as a model. Jeopardy is in fact a scam--it only appears to seek questions. What it actually demands are answers disguised as questions--the most insidious form of deceit. Warn your children.

Blood is not easy to manage, to control, to feel comfortable with. And that's the second part of your job--the other side of the teaching coin. In that contradictory, innocent, vulnerable, highly creative state of unresolved tension--the chaos of passion and the unworldliness of magic--they need your support. That's what sleep is all about--that's what happens on the lake-- that's why we need the unicorn who has somehow managed to move beyond the tension of opposites.

Sleep

There's a wonderful villanelle by Theodore Roethke about sleep.

The Waking

I wake to sleep, and take my waking slow.
I feel my fate in what I cannot fear.
I learn by going where I have to go.

We think by feeling. What is there to know?
I hear my being dance from ear to ear.
I wake to sleep, and take my waking slow.

Of those so close beside me, which are you?
God bless the Ground! I shall walk softly there,
And learn by going where I have to go.

Light takes the Tree; but who can tell us how?
The lowly worm climbs up a winding stair;
I wake to sleep, and take my waking slow.

Great Nature has another thing to do
To you and me; so take the lively air,
And, lovely, learn by going where to go.

This shaking keeps me steady. I should know.
What falls away is always. And is near.
I wake to sleep, and take my waking slow.
I learn by going where I have to go.¹¹

Waking to sleep!--as I have said, I find this aspect of teaching more difficult to grasp. I have some trouble with it in my own personal life, and that may be one of the reasons. So rather than attempt a coherent analysis, I will offer five meditations.

1. A stunning passage quoted from Anita Finkel in Carolyn Heilbrun's *Writing a woman's life*:

New York City Ballet is the company where partners scarcely touch. One of the unique aspects of the company is a special approach to partnering, the art of the man's presenting the woman and supporting her in her lifts, extended arabesques and multiple turns. While on the surface New York City Ballet's practices resemble those of other schools of ballet, a careful examination of the technique of partnering here reveals that the dancers have transformed the mechanics of support into something original and surprising.

Conventionally, the role of the partner is to supplement the ballerina's strength, to create the illusion that she can balance longer, soar higher, spin more quickly and securely. George Balanchine took the situation and transformed it. He wanted the ballerina to possess, genuinely, on her own, the strengths and abilities partnering had created the illusion she commanded. Today at NYCB, the woman acknowledges her partner out of generosity of spirit and a desire to share the challenge of dancing, but she does not really rely on him.

There is no missing the company-wide distinguishing feature of minimal support.... The *pas de deux* should give the woman maximum freedom, liberty rather than dependence.... Perhaps most important are promenades, moments when the woman, balanced in arabesque, is displayed from all angles as her partner walks around her. As he does so, and it is remarkable, he supports her, if possible, not with his hand, but with the merest touch of his fingertips on hers.¹²

There's a skin pulled taut over the surface of the lake beneath which the minnows dart. Even when you sit quietly in the canoe, and relax your eyes to penetrate the surface and see the slivers, the surface is there, stretched out before you--it calls you, it tantalizes you to step out and dance upon it, supported only by the merest touch of your teacher's fingers.

I was lucky that as an undergraduate that I had a teacher who knew the lake as well as he knew the river. His name was John Coleman. One of Bill's teacher's at Chicago was also such a man: his name was Norman Maclean and Robert Redford made a movie about him which was called, interestingly enough, "a river runs through it." The movie was playing at the "Cat Centre" when Bill died, and one of the things we were about to do was to see it.

2. The Mary Mackey poem about blood and sleep was only a fragment of the whole. It is strange that I did not pay attention to this when I first saw it in Thomas Moore's book and was so captivated. But later, in my desire to understand sleep better, I searched it out:

The Kama Sutra of Kindness: Position No. 2

should I greet you
as if
we had merely eaten
together one night
when the white birches
dripped wet
and lightning etched
black trees on your walls?

it is not love
I am asking

love comes from years
of breathing
skin to skin
tangled in each other's dreams
until each night
weaves another thread
in the same web
of blood and sleep
and I have only
passed through you quickly
like light

and you have only
surrounded me suddenly
like flame

the lake is cold
the snows are sudden
the wild cherry bends
and winter's a burden
in your hand I feel
spring burn in the bud.¹³

I was struck when I first read the entire poem at how different the tone was from what had been suggested by the fragment--more detached, much more wary. She wears a struggle on her face. She asks how she is to greet a question that she has once encountered, in light and flame--how she is to honour and maintain the tension. She does not ask for love--that would be too much. Answers are not the answer for her. Knowledge is too awesome a responsibility right now. Love, answers, knowledge--maybe, maybe if you're ready, if you're really ready, but can you hang onto the white birches and the black lightning?-- can you sustain the tension on the surface of a cold lake?-- the wild cherry bends; your blood is poured upon the snow; spring burns in the bud.

I no longer mind the student who sits in the very back corner of the class slouched down his chair, his body language proclaiming with silent eloquence his unwillingness to risk involvement, his defiant status as outcast. He at least sees that the stakes are high, that if he is let down by his teacher he has something to lose; he knows the lake is cold. He is not yet a lion, he does not quite know how to fight for what he feels to be right, or even if he wants to. He does not really want answers now, but is open for questions. He waits.

3. My students are not at home. Of course they are energized by my blood, my energy, my leaping about the stage, but they do not really feel that they belong. And without that feeling, they will never presume to venture out onto the surface of the lake--they do not trust that they will not sink. Instead they will release the tension, let go of the gold, ask for my entire arm for support; they will ask for love, but they will not be ready for it.

It is evening and I find myself sitting in the cathedral. I am in jeans for I had not intended to come, but I was in the library across the street when it closed at five, and I knew that evensong began just then, and I recalled that my daughter was singing at that service, so I entered just as the choir was coming in. I sat over at the side, behind one of the massive pillars, where I could have a clear view of the choir, but be protected from the details of the service. The cathedral was full, which meant that something was going on, and I was relieved to have my library books with me, in particular a collection of Ken Danby's paintings--lots of nice rivers and lakes. Sitting there, browsing through the paintings, I was aware of how much of an outcast I felt, of how I did not belong in this holy place, of how I was a fraud, wanting to listen to the choir, but not willing to raise my own voice in song.

The choir is singing the psalm, and suddenly I decide that I myself do not feel at home in this world--I always seem to sit at the side, mostly hidden by some ornate pillar or other, and I feel the beginning of tears. Of course it is just the psalm--how absurd that I should feel sorry for myself--but I let them come anyway to see what they will bring. How is it that everyone except me seems to be able to live the way we're all supposed to live, and do the things we're supposed to do and love in the way we're supposed to love? What has happened to make me such a misfit? And I find myself reaching out towards my daughter up in the choir stalls, hoping by touching her to locate myself in this place. And in doing that, of course, I discover what it means to be at home.

I can belong to the choir, and if I wish, not even for long, but only for the psalm, I can pass through it like light in the singing of a single verse, and it can surround me like flame. Or to the offer of the woman beside me to share her order of service, or to a symbol hanging on the wall. And in that act I have belonged to the entire cathedral as completely as to those tears which it released in me, tears that are in fact the certificate of ownership.

I ask too much of my students--my blood gets up and I thrust an entire cathedral of calculus upon them, with its pages and pages of even numbered creeds and catechisms, and I expect them to feel at home. It's absurd. Give them instead a single poem and allow them all the vast moments of the universe to attach their cocoons to it. Feeling at home is not a global but a local experience: attach yourself firmly to a single symbol, and the entire cathedral is yours. But remember that this attachment must be renewed again and again, in each moment and at each occasion, it is this continuous act of creation--rather of re-creation--that is the task and the privilege of the artist.

4. Bill Barnes¹⁴ has written quite a long poem about questions. It is called *Quaestiones Deo*. Here's how it begins.

I sit upon the rock-face, which is being
assaulted by the waves' hammering,
admiring as always
the stability of anything stable
(worrying at the same time also
about the relentlessness of water
in motion).

For Bill it is the rock that plays the role of the lake and the hammering of the waves is the turbulence of the river. Evidently you need some flexibility with these symbols. How, he asks, does the rock harness the waves to create life?

Up from the cracks and scars
along the rock,
where I can see no soil, nothing at all,
are growing
not just the cedars
with their scrawny, clutching fingers
of root,
but the flowers
also,
delicate thrusts of yellow and purple
and red,
having made their own green for backdrop,
asserting as they seem to do
not merely the ubiquitous, almost
inevitable
reaching of life,
but the supererogatory fragrance
of beauty, too ...

In the cracks and the scars, exploded open by the battering of the waves, grow the cedars and the flowers, and your fingers, those magic fingers of yours, are the scrawny clutching roots.

5. I end with a prose poem of Leonard Cohen. I choose Cohen because of the raw vitality of his work, because he transformed poetry and song with a style, an intelligent vision, an integrity and an audacity that makes us all envious and that can energize today's teenage generation--most of all perhaps because he was a favorite of Bill.

It is called *How to speak poetry*¹⁵, but of course it's also about how to teach. As expected, it is both wildly humorous and pallingly serious. The following version has a few omissions.

Take the word butterfly. To use this word it is not necessary to make the voice weight less than an ounce or equip it with small dusty wings. It is not necessary to invent a sunny day or a field of daffodils. It is not necessary to be in love, or to be in love with butterflies. The word butterfly is not a real butterfly. There is the word and there is the butterfly. If you confuse these two items people have the right to laugh at you. Do not make so much of the word. Are you trying to suggest that you love butterflies more perfectly than anyone else, or really understand their nature? The word butterfly is merely data. It is not an opportunity for you to hover, soar, befriend flowers, symbolize beauty and frailty, or in any way impersonate a butterfly. Do not act out words. Never act out words. Never try to leave the floor when you talk about flying. Never close your eyes and jerk your head to one side when you talk about death. Do not fix your burning eyes on me when you speak about love. If you want to impress me when you speak about love put your hand in your pocket under your dress and play with yourself. If ambition and the hunger for applause have driven you to speak about love you should learn how to do it without disgracing yourself or the material.

What is the expression which the age demands? The age demands no expression whatever. We have seen photographs of bereaved Asian mothers. We are not interested in the agony of your fumbled organs. There is nothing you can show on your face that can match the horror of this time. Do not even try. You will only hold yourself up to the scorn of those who have felt things deeply. We have seen newsreels of humans in the extremities of pain and dislocation. Everyone knows you are

eating well and are even being paid to stand up there. You are playing to people who have experienced a catastrophe. This should make you very quiet. Speak the words, convey the data, step aside. Everyone knows you are in pain. You cannot tell the audience everything you know about love in every line of love you speak. Step aside and they will know what you know because they know it already. You have nothing to teach them. You are not more beautiful than they are. You are not wiser. ... Do not pretend that you are a beloved singer with a vast loyal audience which has followed the ups and downs of your life to this very moment. The bombs, flame-throwers, and all the shit have destroyed more than just the trees and villages. They have also destroyed the stage. Did you think that your profession would escape the general destruction? There is no more stage. There are no more footlights. You are among the people. Then be modest. Speak the words, convey the data, step aside. Be by yourself. Be in your own room. Do not put yourself on....

Speak the words with the exact precision with which you would check out a laundry list. Do not become emotional about the lace blouse. Do not get a hard on when you say panties. Do not get all shivery just because of the towel. The sheets should not provoke a dreamy expression about the eyes. There is no need to weep into the handkerchief. The socks are not there to remind you of strange and distant voyages. It is just your laundry. It is just your clothes. Don't peep through them. Just wear them.... Think of the words as science, not as art. They are a report. You are speaking before a meeting of the Explorers' Club or the National Geographic Society. These people know all the risks of mountain climbing. They honour you by taking this for granted. If you rub their faces in it that is an insult to their hospitality. Tell them about the height of the mountain, the equipment you used, be specific about the surfaces and the time it took to scale it. Do not work the audience for gasps and sighs. If you are worthy of gasps and sighs it will not be from your appreciation of the event, but from theirs. It will be in the statistics and not the trembling of the voice or the cutting of the air with your hands. It will be in the data and the quiet organization of your presence.

Avoid the flourish. Do not be afraid to be weak. Do not be ashamed to be tired. You look good when you're tired. You look like you could go on forever. Now come into my arms. You are the image of my beauty.

Cohen's passage serves me a profound caution as I enter the classroom. First of all it gives me a respect for my students--they have felt things deeply. Secondly, it makes me re-examine my material. Sometimes I find myself working too hard--I am leaping about the stage because I feel I have to make up for the deficiencies of my material. Or I find myself posturing, a sure sign that my material is not up to scratch. Good magic is simple and uncluttered. Here is the empty hat--here is the rabbit. A simple flourish appropriate to the trick--that's all that is required. If the trick will not stand on its own, I have no business on the stage; my blood will not flow for them if it does not already flow in the material. That is why I insist on poetry in the mathematics classroom. But, you say to me, I am stuck with my material; I have no choice. I know that we have many different freedoms, but it is my experience that we all have far more choices than we are usually prepared to face up to.

In sleep, on the other hand, it is not the material but the teacher that has to be in place. Sleep is a folding of your wings about yourself, a grounding of your being from which you can support your student. Come into my arms, you are the image of my beauty. I believe in you. Maybe in the end that's what counts--simply to say that:
 "I believe in you--you can do whatever you want. Now here are my finger tips--go and dance upon the lake."

References

1. Northrop Frye, "The great code: the Bible and literature," Academic Press, Toronto, 1982, page xv.
2. Thomas Moore, "Soul Mates," Harper Collins, New York, 1994, p. 186.
3. Joanne Page, "The River and the Lake," Quarry Press, Kingston, p 72.
4. Helen Luke, "Kaleidoscope: The way of woman and other essays," Chapter 12, Parabola Books, New York, 1992.
5. Kim Chernin, "A different kind of listening," Harper Collins, 1995, p. 26.
6. These are the names of the annual high school math contests of the Canadian Mathematics Competition, Waterloo Mathematics Foundation, Waterloo, Ontario, N2L 3G1.

7. IDIS 303 (Interdisciplinary Studies). This course has been taught at Queen's University since 1980. Until his death in 1992, Bill Barnes and I taught it together, and now I teach it with Maggie Berg of the English Dept. In each class, there is a poem (or two related poems) and a math problem, and we spend an hour or so on each. There is no set curriculum, so we can use the best poems and math problems we can find. It has some 60 students, who come from a mixture of disciplines in arts, science, engineering and education.

8. Thomas Moore, "Soul Mates," Harper Collins, New York, 1994, p. 141.

9. Eugen Herrigel, "Zen in the art of archery," Vintage, Random House, Toronto, 1971.

10. "Address to the Graduating Class," (Rothsaway College School, New Brunswick, 1959) in "George Whalley: Remembrances,," Michael D. Moore, Ed., Kingston: Quarry Press, 1989, p. 68.

11. J. Paul Hunter, "The Norton introduction to poetry," 3rd ed. Norton, New York, 1986, p 436.

12. Carolyn Heilbrun, "Writing a woman's life," Ballantine, New York, 1989 p. 86.

13. I found this poem in the anthology "Deep down: the new sensual writing by women," Laura Chester, Ed. Faber & Faber, Boston, 1989, p. 258.

14. Bill's collected works have appeared in "Complex Variables, poems and music by William John Barnes," David Helwig and Peter Taylor, Eds., Quarry Press, Kingston, 1994, p. 77.

15. I found this "poem" in the anthology "15 Canadian Poets X2," Gary Geddes, Ed. Oxford University Press, Toronto, 1990. p. 339.