

## **EARTH'S SHAPE**

In 1735, the French Academy of Sciences launched two expeditions to determine the true shape of the earth. Advances in surveying and navigational techniques made it seem likely that variances within meridians could at last be accounted for.

An expedition under the direction of Monsieur Maupertius traveled to Lapland to measure within the Arctic Circle; a second expedition, under the co-direction of M. de la Condamine and M. Bouguer, based itself at the headwaters of the Amazon to measure along the Equator.

The two expeditions settled once and for all a long-standing debate between Sir Isaac Newton and the Cassini family, outstanding cartographers of Paris. Newton's model of the globe--bulging at the Equator and flattened at the poles from the effects of centrifugal force--was proved to be correct.

Certain references should be explained. Triangulation was the principal surveying method. It used trigonometrical calculations based on physical and optical measurements. The Golden Lake was the mythical object of the earliest Spanish explorations in the Amazon region; its waters had the power of conferring eternal youth. The wind rose was a crude navigational device that helped ship's captains plot along prevailing winds.

I.

*Don Antonio de Ulloa, a Spanish naval captain, accompanied the expedition during the year 1737. His participation was directed by the King of Spain as a gesture of courtesy.*

**MOUNTAINS WEST OF QUITO, 1737**

This afternoon, just when the muffled sun  
threatened to slide behind far Pinchincha,  
the owner of this shed, a kind old Indian,  
pressed me feebly to the cow-wide door.  
Beneath his delicate thin nose, his dark  
lank hair, he grinned--grinned and jabbed his hand  
at the horizon, bright finally after weeks.  
I squinted with fever through the sudden light  
where white walls clustered on the farthest heights.  
Ah, Quito! I laughed, and hurt my swollen throat,  
then laughed again. For a time, we watched  
in silence, the sun spangling on old Quito,  
until the clouds rolled down and would not move.

Down how many miles of narrow paths,  
mere worn footholds on hard-packed roots,  
did I come to fall sick upon this mountainside?  
Back there, my room, my bed, my several trunks  
filled with foolscap scrawled on by my hand.  
But illness, though unfair, may have its uses.  
It has slowed me a little and made to rest  
a body run to rags on jungle paths.  
So here I lie, among cows, a common cowhouse  
for my quarters--strangely, more hospitable  
than our expedition's ever-flapping tents.  
The air, still for a change, sweet with cows' breath,  
and I've several feet square of softened earth  
to couch my intractable military spine.

A naval man 12,000 feet above the sea!  
Who would have known? Fate places me abreast--  
in forests, among savages, among mosquitos--  
of the best of Europe's scientific minds!  
They have pressed on to the nearby peaks  
to build their signals, plumb their lines, and stuff  
their books with mathematic madness,  
while I have time to calm myself and be  
a ruminator among ruminants.

Not always so, no, rarely so reflective.  
Meticulous de la Condamine and even more  
meticulous Bouguer--both men a score of times  
squatting behind encumbering instruments,  
interminably awaiting fifteen minutes  
in a month when clouds fail and, blessedly,  
a perfect transparency in air appears  
between the sighter and his distant signal--  
then wait again to reconfirm the mark!  
And these two thorough men, they praise my eye,  
how I absorb and reputedly retain  
(as well, it seems, the land's diseases.)  
I must admit to a foreboding of  
dull notoriety. Proliferating at  
my feet, pages bundled into hasty packs  
attempt to hold the gushing novelty  
of pagan empires and scant, hidden tribes.

Gentlemen, I was dazzled into fever!  
One hundred years ago, Orellana, afloat  
on vicious waters and ambushed from the shore  
by warrior ranks composed of either sex,  
lived to name the River of the Amazons.  
My papers hold this land as Orellana's name  
the inestimable volume of that flow.  
In symbols only, by sleight, by shadow show--  
no matter how keen my eye with silly hunger  
nor how drained my strength to get all down.

Captain Ulloa, late of the bleeding bowels,  
now leaning on an aged cackling Indian,  
you are mad to be here. But then recall  
the first split chirimoya offered you,  
a fruit like custard served in its leather skin,  
the tangy grenadilla, scooped from bags  
by puzzling Mestizos--that late-born race  
of brilliant mimics, both of tongue and craft,  
forever lolling in villages of sleep.  
Recall the comic pageantry of priests  
wringing their hands at simple Indians:  
that one, lashed for Sunday drinking, begs  
five more for what he plans to drink that night;  
this one, confessing with confusion--  
How can his every natural sport be wrong?--  
mumbles while the priest dictates his sins.  
The indolent natives! Yet, they'll hack for days  
on nothing but a little sack of cornmeal.

I've things to tell. When this, my rest enforced,  
passes from me, I'll return to the task--  
for I hunger for the details of a land,  
mosquito-mad, mist-driven land,  
where Pizarro trudged in rusting armor,  
and noble Urfoa fell to Aguirre's sword.  
They left their marks but not a single word,  
Too crazed for plunder and the Golden Lake:  
They thought they'd have eternal lives to write!

I sailed from Naples, from its shining bay,  
with youth and duty and a set of quills,  
to a cloud-bound city thrown down like  
an afterthought upon volcanic peaks.  
I wept with loneliness, as any would,  
my eyes too fogged by ignorance to pierce  
more than mere linear distances into  
the hearts and lands that now comprise my fate.  
Then this within a week of my arrival:  
I felt a mountain tremble, its mantle fall,  
displace a lake entirely at once,  
and drown a thousand helpless souls in mud.  
The lightning dropped in bright, snapping ropes  
and the wind reared terribly and raked  
the propped-up, trellised, gulley-spanning streets.  
Mesmerized within these elements, I cried  
"Here, one lives very close to God!"--  
and from that moment never ceased to write.

## II.

*M. Bouguer, one of the leading French geographers of the time, was next in authority to the expedition leader, M. de la Condamine. The two of them came to disagree on important matters and resolved to split the team into separate working parties. Bouguer returned to Paris first to report the expedition's findings; Condamine, by way of the Amazon, which he successfully mapped.*

### PARIS, 1742

"Creation, mark this stony stare,  
The granite gravestone of Bouguer."  
I've been fiddling with an epitaph  
With gravity enough to make me laugh  
With scorn for those who would make giants  
Of simple, honest men of Science,  
Make more of a fastened appetite  
For cause or property, mass and height--  
Or other than an honest fascination  
With every riddle in Creation.  
It would please me to leave this final joke  
Because it seems that every word I spoke  
in seeking truth was misunderstood  
To place my own before the common good.

Dear Condamine, you go another way  
Because I could not help myself but say  
Just once for every error that you made  
The part that illness in you played.  
I left it to your true disinterestedness  
How weaknesses are furthered by duress.  
Was I the more ambitious? Understand,  
You left a Paris sickbed to take command.

What did you know, Sir, of my deepest soul,  
Of how I finally saw my portioned role  
As we dragged ourselves through endless weeks  
Triangulating upon mountain peaks?  
I jabbered--spewed, perhaps--a bit too much,  
Gone giddy was I with the dizzy touch  
Of truth, so nakedly primordial,  
Direct as death, but maddeningly alterable:  
The true shape of the globe we scratched  
To prove the heady notion Newton hatched.

As our resourcefulness and strong resolve  
Tumbled every obstacle, there evolved--

Slowly, then beyond my ability to obey--  
An elation I cannot, as then, convey.  
Colleague, we dragged iron rods over root  
And rock, over ditches, foot by foot,  
Butt-ending to compensate expansion,  
Two parallel parties of determined men,  
And after seven weeks, had measurements  
Of only twenty inches' difference!

Forgive me, Sir, but that was history.  
On that sure base we built our webbery  
Of belled tripoints and star-based arch.  
Maupertius's arctic hell was more a lark  
Compared to all the hardships we endured  
To trace conclusions finally inured  
To the leisurely and jealous scrutinies  
Of fat minds lashed to universities.

Nothing was impossible with us; yes, I strayed  
Into the hills alone for twenty days--  
Because the pendulae proved variable,  
Because we needed them invariable--  
And did I not discover that the earth  
Is denser in the valleys? Was that not of worth?  
In short, I was convinced that we were blessed  
And from that moment forewent any rest  
Fearful that our proven powers might pass.  
I made of any inquiry a pressing task--  
The barometric vagaries of air,  
Refractive qualities within each layer,  
Moisture content, by density and weight,  
Often jotted hurriedly on bits of slate.  
At Coracon de Barioneuvo,  
So high that lightning lit the clouds below us,  
We sampled air too thin to safely breathe,  
Rasping numbers while our hurt lungs heaved.  
At Chinbargo's deadly pass, we raced the cold  
While ice grew on us like a sparkling mold.  
We wept together, tossing precious tools  
To rust among the bones of perished mules.  
We lived. And the chilling news came down  
That Maupertius in Lapland had found  
What we could not for five more years confirm.  
Sir, what does it say of us that we were firm  
To complete our mission when each day the flame  
Of glory dimmed to merely academic fame?  
We stayed, we finished--seven grueling years.

Some still forgo the company of peers.  
They've settled where their lives' intensest part  
Expired beneath the rigors of our art.

Colleague, as you plot the river that you live,  
Consider Faust and other standard fools  
Who lose their souls to glimpse the cosmic rules.  
Consider us--and, if you can, forgive.

### III.

*M. de la Condamine, having concluded his scientific mission, attempted a mapping of the Amazon river enroute home to Paris. In ill health for the last ten years of his life, he was not certain he would complete the voyage. As it happened, he out-lived most of the other members of the expedition.*

#### **AMAZON RIVER, 1741**

Great river, take me home  
slowly.

Through the liana-hung canopies of grey-green leaves,  
the crude, curtained darkneses and apportioned moisture  
that you as well as I  
breathe and expire  
as we course forward with not dissimilar purpose,  
together we go.

I have cut whole months through wrist-thick vines  
while my ears roared with the commotion of parrots.  
I have eaten mouthfuls of insects  
that blackened instantly the upturned sides of roasting meat.  
I watched Seniergues--genius, enthusiast,  
master with a scalpel--  
murdered for no reason in a feuding village.  
River, take me home.

Do you recall the carved jades of the sly Tapayo?  
The clever figures shatter if you work them further,  
so how then were they carved?  
The Tapayo smile and say the jade is soft  
when first fished from your waters,  
then hardens as its worked.  
Where are the stones found?  
Oh, here and there. Many places.

Seven years your waters worked to soften my resolve,  
and leave me now so brittle and liable to break.  
Seven years ago, fresh from Paris,  
ill but hopeful, I plunged my full life  
into a single thought: earth's shape.  
Two diametric questions vied for confirmation--  
oblate and flattened at the poles,  
or oblong and flattened at the center.  
While the answer stayed away for years,  
we sometimes wondered at our purpose.



How nature fought to keep the truth obscured!  
We moved within the elements of an ancient myth  
where gods are fond of punishing proud men.  
The earth would not stay flat for measuring,  
the air, so heavy that it rained beneath  
the leafy canopies.

To your waters, Amazon, we first consigned  
Couplet, youngest and most robust,  
nephew of a fellow academician,  
taken ill immediately in Quito,  
dead of fever.

Morainville, master draftsman,  
thought to make his mark here  
where he had passed years of his life--  
only to topple ignominiously from a scaffold.  
Morainville, Couplet, you died for knowledge.

As I roll upon these dangerous waters  
lashed to a simple raft,  
as I sight and measure and record  
while wrapped in gauze to prevail  
against the ravages of countless insects,  
as I bake and blister, lose teeth,  
and rattle like a dead man in my skin,  
I must recall the challenge of Maupertius:  
when once and for all our geodetic mastery  
declares the true shape of the earth  
fewer men will perish on hostile shoals  
or drop to dust in forgotten deserts.

Knowledge is like light:  
it illuminates this shadowed globe.  
Mad Harry, Prince of Portugal, kept a stable of adventurers.  
He swept up every traveler, merchant, mercenary  
who'd had the luck to stumble from a desert  
or flounder to a shore with a breath of life.  
He made of them luxuriant prisoners  
and picked their minds for geographic lore.  
He tamed the Niger and the Congo  
and penetrated deep into the darkest lands.  
The Jewish cartographers of Majorca  
pieced bits of truth to ignorant schemes  
and the fat stores of the world  
burst and poured into the four corners.

Let Bouguer pretend  
that ignorance has an end.  
I am only an old man  
who talks to rivers.

I have not the genius of a Ptolemy,  
cannot dicker with wells and shadows  
as Eratosthenes and come away with fine results.  
What's more, those days are gone:  
Now we must go out,  
in ships like Dias and da Gama,  
must die as Magellan under ignorant attack,  
must march across nations like the Cassinis,  
or crawl as Norwood did,  
inch-worming miles with a length of chain.

Where the task requires  
a body to be punished  
and a caste of curiosity  
that can forestall its satisfaction,  
I am well suited.

Now we must go out  
for that is where the knowledge is found.  
The once-straight radiants of the wind rose  
now curve and buckle in mysterious ways,  
and the mystery leaves good men dead.

On your errant, blood-thick waters,  
on mist-enshrouded mountains that surround you,  
and deep in the dark mind of the sky,  
knowledge lurks like bits of shimmering jade.

Great river, take me home  
slowly.

#### IV.

*Madame des Odinais was the daughter of an official of the Spanish colony in Quito. She met her future husband when the French geodetic party first reached Quito in 1735. They were married when the survey was completed seven years later.*

#### **PARIS, 1762**

My dear Godil has asked me to attempt  
this record of our fourteen years apart.  
Although we were betrayed by unfortunate men,  
and I and my family left alone to die,  
I have no other purpose but to edify  
and finally close a long and troubling chapter.  
The thorny jungle, where I flailed to live,  
damaged the fingers of my writing hand,  
so my crabbed words require a patient eye  
but neither a vengeful nor a pitying heart.  
The first I leave to God, and for the other  
I am with Godil again. My story, then.

The expedition clattered into town,  
Frenchmen in funny clothes, leading mules  
laden with impossible machines  
and puzzled Indians running all about,  
raising dust. Attired officially, my father  
deposited me upon the porch and read  
aloud from documents with shining seals.  
All listened, few understood. Permission was,  
it seemed, secured, and so the funny French  
were billeted among us. One of their party,  
Godil des Odinais by name, took me away  
from the stiff, pretty talk of dinner.

I was seven then, my mother dead a year.  
My father, always at a loss with me,  
had got me dressed in seven petticoats,  
a lacey sheath, and earrings of golden wire.  
I rushed and rustled up and down the table  
like a giant shuttlecock--until  
Godil secured my hand and lead me off,  
my short arm upthrust like a stiff salute,  
to his guest room balcony, and there for hours,  
in darkness, whispering like conspirators,  
we took turns squinting through his telescope  
into the brilliant, spilled out points of heaven.

He had a moustache like a cleaning whisk,  
and hard cracked hands, and smelled of lavender.  
He brought me to my worried nurse quite late.  
Too wrought to sleep, I lay upon my bed and thought  
These are the things that wife and husband do.

Throughout the seven years that followed,  
we slowly built a love upon bright points  
in time, mapped out on moments during his returns--  
whether exhilarated by Mantas, where Incas worshipped  
immense emeralds, or defeated by Pinchincha and  
its never-moving mists, or shaken from Cuenca,  
where Siniergues met his futile death.

He had a great capacity for delight.  
We made a song from silly Indian words,  
like "pettarraro rincouroal,"  
which translates simply to the number three.  
He brought me sketches of the hidden tribes  
that stretch their earlobes into rubbery loops.  
A blowgun from the Yameos taller than I.  
He read me frightening chapters from the accounts:  
of high storms in the Dordeliers, the passage  
through Chinbarayo where he nearly froze,  
of fording the fierce Ojiva--three men, chest-deep,  
holding a twelve-foot telescope aloft.

The expedition finally closed, and I,  
fourteen, had reached my magic age. We married.  
We made a home together on a little street  
beside a flowing well. Each evening  
the farmers brought their tiny herds to drink,  
shuffling with a plink-a-plunk of copper bells.  
I made lace, fell asleep in the sun,  
but when my father's fortunes changed,  
I learned to cook, raise manageable animals,  
and grow enough food from a modest plot  
to keep a lively table for a happy wife,  
her tender husband, and a guest or two.

This happy union needed only natural issue...  
But though our children came so fast you'd guess  
that we were blessed, each died soon after birth.  
There is no greater grief than to recall  
those small fists balled against the hard breast  
of approaching death, another tender infant  
sucked to nothing in a week. While each loss meant,

to me at least, a soul sent straight to God,  
my poor Godil suffered without comfort.  
What were his Newton and his Ptolemy  
if not peepholes into final knowledge?

He resolved that we would go to France, and flee  
the mixed diseases of the colonies.

Alas, I was with child again! He went on first  
To take upon himself the shocks of passage  
through vast colonies of uncertain claim.  
He'd smooth the way past petty viceroys,  
pay the fees, secure the precious papers,  
and place the finest guides along my way.  
Lord, had I known when I bid him goodbye  
that I'd pass fourteen cruel years without him.

I lost the child. Without regret, I set out  
in two canoes; a guide, my father, three  
dear brothers and my little nephew, and  
a slave to whom my life was dearer than  
his own. All fell to pieces soon.

We were betrayed by all my husband's guides,  
absconding with their fees. Our own took ill,  
poor man, and one day tumbled from the boat,  
slipped into the thickened flow without a trace.  
We spent long years in plague-ridden towns  
waiting for someone whole to lead us on.  
Then, a bold physician begged a passage,  
boasting of his piloting. Too eagerly,  
we listened. One night he steered us into rocks  
and both boats shattered into staves. I grabbed  
my nephew's hair as roaring waters pulled  
us down. Somehow, we all reached shore.  
The doctor, with my Negro, went for help  
and took my jewels along to purchase aid.

Must I believe that we were left behind  
to die? Weeks passed in the delirious heat.  
Blistered and bitten, bowels moiling with fruit,  
we struck out desperately into the jungle  
and wandered, whimpering like dogs, till death  
seemed sweet. And so resolved, we settled down  
to die. In a circle we sat and prayed,  
then, one by one, my loves expired around me.  
My brothers, strapping once, now thin as sticks,  
guttered like flames. My father rasped then stilled.

A shallowest breath released my nephew's soul,  
while I lay dully dreaming of Godil.

I would have died, drifting toward release  
from a life where hell can only seem improved.  
But I recalled I was no single soul;  
my life was joined, and I was duty-bound  
to live the full half of my distant union.  
Before me, I envisioned Godil's stricken face,  
felt grief in him that I ached terribly to heal.  
With this new strength, I rose, impossibly.  
Oh God, forgive me that I crawled among  
my dead and stripped their last rags from them.  
I fashioned sandals and a heavy smock  
and wandered off, moving like a dreamed-of thing  
pressing its half-dead body through a world  
of cruel screens that rose and fell forever.

How many layers of agony had I to penetrate  
to find my husband and my life again?  
Eight days it was before I found the river,  
and two old Indians fishing from a rock.  
To think that I recoiled at first, as if  
an animal of the wild! My wits returned,  
and I cried feebly to my would-be saviors.  
Bless them for their courage, they did not flee  
this vision of a ravaged, white-haired crone,  
but brought me far, far down the river,  
muttering over me in our nightly camps  
where I lay still as a heap of sticks.  
And then, at last, I was delivered to  
an honest man. Bless you, Viceroy of Andoas!  
While I recuperated in your home,  
my Negro thrashed the bushes for my corpse  
and Jesuits took the rings I gave my saviors.

My days in Andoas are filled with long,  
soft memories of rest--the feel of linen,  
the taste of sweet well-water and sharp, fresh limes,  
of healing slowly while the curtains swayed.  
The Indian girls who nursed me burned my smock  
and sang together as they sewed a dress  
of heavy cotton just in from Mayacare--  
where sea and river meet, and where I'd sail  
the day my health allowed. That day arrived,  
years later, and with some ceremony I  
was sent off on a sturdy cruiser,

healed, but all my youth scoured from me.  
The river thickened as we neared its mouth.  
We lazed into the docks of little towns,  
and one held rumor that Godil had sailed  
from France. At Mayacare, the ocean fell  
upon my eye a vast unfolding of new hopes.  
And, yes, there was a ship, its white sails flared,  
and France's bright flag snapping from its mast.  
It came alongside, and a party came aboard.  
Among them was a man who used to sing  
with me, and one night showed me all the stars.  
He crossed the distance of one deck, and then  
I had my husband in my arms again.