The background is a dark, marbled texture with swirling patterns of grey and black. On the left side, there is a white silhouette of a creature's head and neck, facing right. The creature has a long, pointed snout with small teeth along its edge, and its neck is thick and tapers slightly towards the head.

*Explorations*



Photo by Hilde Maingay

*The dimensions of time and space explored in the two articles in this section are, as always, various. Bill McLarney's writing is on the subject of "The Future of Development in Latin America." Through his experiences and his work there over the past seven years, characteristically, he has acquired strong opinions, considerable insight and some very workable and humane theories as to how development might proceed equably. His perspective is not that of the casual visitor. He lives and works on the N.A.I.S.A. farm in Gandoca in Costa Rica for several months each year and is deeply involved with and committed to the community there. Unlike so many theorists he does not embrace a single strategy to allay worsening conditions by concentrating exclusively on immediate human needs at the expense of the environment or of peoples to come, nor does he, in a rush of ecological enthusiasm, advocate sweeping land reforms that would displace populations. His respect for indigenous peoples is perhaps the most compelling quality of his article and accounts in part for the quality of his relationship with his own community.*

*Turning from Latin America in the final quarter of this century, the article by Meredith Fuller Luyten looks backward to Provence in the last. As she explains, her interest in the French naturalist, Jean Henri Casimer Fabre, has been a long one. One of his attributes that occupied her was the quality of his perception, his ability to watch and become absorbed, even a part of the creatures he observed and loved — to internalize his environment. As have many other naturalists, Fabre added incalculable riches to our knowledge and understanding of the world. His strong sense of place is echoed in contemporary writers like Wendell Berry and Annie Dillard. It was the uniqueness of his perception, his intuitive grasp of what Gregory Bateson calls "the pattern that connects", as Meredith describes it, that made her article so well suited to this issue of the Journal.*

*Meredith's poems have appeared in the second, third and fourth Journals. She lives near New Alchemy on the Cape and currently is working on a novel.*

— NJT

# Future of Latin America

— William O. McLarney

With due deference to Stewart Brand's dictum about the "talk-do ratio" and having, as I start to write, just finished several months of heavy duty doing in Costa Rica (see Page 18), I intend to talk a little about "development" in the future of Costa Rica and Latin America. There is, in Costa Rica at least, no shortage of foreign and national agencies, institutes and individuals dedicated to one or another activity intended to help "develop" the country. For purposes of this essay, we shall consider only those whose interest is sincere, excluding those for whom "development" is just a cloak to veil political or profit-oriented activities. I further intend to confine my thoughts to the rural situation.

Even with the exclusion of all the charlatans and urban workers, the "development" and "aid" people sometimes seem to outnumber the ordinary citizens. To forestall any charges of caricature, let me affirm that each of these people is an individual with his or her own blend of wisdom and folly. I never seem to run into anyone I totally agree or disagree with about the future of rural Latin America. For the sake of argument, though, I think it is not unreasonable to place the various groups and individuals working in the area in two categories — the "people-first" wing and the "ecology-first" wing. I find myself partially at odds with both factions, but let me begin by admitting my areas of broad agreement with each.

The "people-first" folk are usually concerned with some aspect of food. They are absolutely right in pointing out the folly of Latin American nations giving economic priority to export crops when many of them do not begin to produce enough food for their own people. They see poverty and the disparity between Latin American and North American standards of living. They see a malnourished child as a cry for action — and so it is. Their concern with land is usually focused on land reform. The child cannot be nourished by the coffee, sugar, bananas or beef grown in Latin America and shipped to the overdeveloped countries. "People-firsters" work to bring food, land and employment to the people.

The "ecology-first" people have read history. They know our species' deplorable record as a despoiler of soils and ecosystems. They see the malnourished child as the symptom of bad land use, perhaps by its own parents. They act from a love of the natural environment which, if professed and practiced by every landowner, would *be* the solution. They work as conservationists, trying to save watersheds from drying up, hillsides from eroding, forests from burning.

The ecology people, in some of their more extreme manifestations, seem to view the campesino as a mad-

man with a gun in one hand and an axe in the other, bent on destroying every wild creature in sight. The more land they can fence him out of, the more secure they feel.

The people-first wing, on the other hand, has a tendency to forget about future generations in its rush to aid those who are here now. Their romanticized view of campesinos as peasant revolutionaries who will somehow set everything right if just given enough land to work is as unrealistic and unfair as its opposite.

It is a political, economic and social fact that there is a dire need for land reform in much of Latin America; too much land in the hands of too few people is always a bad situation. It is also a fact that much of campesino agriculture, as practiced today, is deplorably shortsighted and ecologically abominable.

Are we then faced with a true dilemma? It is socially and humanly unacceptable to force the rural people of Latin America into permanent dependence on export crops, peon labor and "La Compania." It is ecologically unacceptable to allow the last forests of the region to be burned, the topsoil to be washed into the sea and the watersheds to be dried up. Yet it might seem that these are the alternatives.

I can already hear the clamor of voices of the development and aid folk, along with the businessmen and government people, offering opinions, solutions and defenses. We shall listen to their opinions — some of them have something to teach. Somewhat more space will be devoted to my own strongly held opinions. But one should keep a grain of salt handy, for all of these estimable folk, whatever their experience and wisdom, manage to survive without recourse to axe, gun or plow.

So, I shall spice the stew with yet another set of opinions — those of campesinos. Whatever they have to say, it should prove interesting, for they are seldom asked their opinions about the future of rural Latin America. They just live there.

Lest anyone think it is simple to get a grasp of the situation, let me begin by offering a few informational items of recent vintage about Costa Rica.

ITEM: Costa Rica has 19,650 square miles of land and 1,921,000 people, according to the 1974 census, for a population density of 97.7 per square mile, second in mainland Latin America only to El Salvador's 473.8 inhabitants per square mile. Land distribution, while certainly a problem, is generally more equitable than elsewhere in the region. The standard of living is among the highest in Latin America and, by such other conventional indices of well-being as health, education and literacy, the country rates high.

Until very recently Costa Rica had the second highest population growth rate in the world, but currently a birth control campaign seems to be having an effect. Nevertheless, the population continues to grow, while in recent years the economic and nutritional well-being of the country has declined.

It is probably fruitless to debate the precise nature and importance of the relationship between population growth and national well-being. Nevertheless, I was appalled last year to hear a North American friend, resident for many years in Costa Rica, assert to a group of campesinos that, with land reform, Costa Rica would support fifty million people.

Perhaps, given certain conditions, such a feat could be shown to be biologically and economically "feasible", but what of the quality and diversity of the natural environment and the traditional rural lifestyle? Would anyone believe land reform *and* population control?

ITEM: Costa Rica has the best national park system in Central America. At a meeting in Puerto Limón in 1976, attended by campesinos from all over Limón province (the least densely populated of Costa Rica's seven provinces) there was open discussion of the best tactics for invading and colonizing Tortuguero National Park.

ITEM: Costa Rica's highest mountain is Chirripo (elevation 3819 meters) which lies in the wilderness of the Talamanca Range. Chirripo forms a large part of the watershed of the Sixaola, General and Matina drainage basins, major sources of the nation's water and electrical power. For this reason, the slopes and environs of Chirripo were declared a forest preserve, with all clearing and cutting forbidden. In 1976, part of the forest was deliberately set afire and many acres destroyed.

Costa Rican campesinos traditionally have had the right to homestead public land. The motive for setting the fire would appear to be as a protest against losing the area to colonization. (And, of course, once cleared by fire, it makes little sense to call the area a forest preserve.)

ITEM: A disproportionate number of acres of good agricultural land in Costa Rica are held by multinational companies such as United Brands, Standard Fruit, Hershey Chocolate, etc. Some of their land is in production, some has never been touched. There are also extensive holdings, which, though cleared, have not been worked for up to twenty years. In one such area procedures are now underway to evict "squatters" from their farms. If these people do not choose to become peons for "La Compania" the nearest "available" lands are the forest preserves and Indian reservations of the Talamanca.

ITEM: Some of the agricultural companies do all they can to discourage their workers from planting crops of their own. They have been known on occasion to go so far as to buy land for the sole purpose

of suppressing production of indigenous food and cash crops. In the town of Siquirres, Standard Fruit fosters yet further dependency. There, many tons of bananas are thrown in the river every year because of blemishes and/or to keep the price up. Every precaution is taken to ensure that the local people do not take advantage of any free bananas.

ITEM: A friend of ours, a young and ambitious Gringo, who considers himself ecologically concerned and informed, has a small and very well managed farm in a coastal region of Costa Rica. He has learned tropical agriculture the hard way — by doing it. His income is certainly beyond that of the average campesino farmer but, feeling the need to supplement it, he recently landed a job as a consultant for one of the major agricultural companies. He is working on a project involving 20,000 acres of virgin forest near a settled area which the company recently purchased from the Costa Rican government. Our friend explained that the company got the land just in time before squatters moved in and "ruined" it. The land is to be clearcut and planted to monocrops which will not be consumed by Costa Ricans.

The primary "use" of land is to sustain people; people are to sustain land. For me, the common thread which runs through the confusing series of anecdotes I have just related is that, in each case, this seemingly simple relationship has been confused, perverted or lost sight of altogether. But modern Costa Rica affords at least one more spectacular example of flagrant disregard of the people/land relationship. I refer to the plains of Guanacaste

Guanacaste Province comprises the northwest corner of the country. Much of it consisted originally of a fairly fertile plain favored with spring-fed rivers and moderate rainfall. With settlement, the plain became a patchwork of forests and farms and a major producer of food for Costa Rica. Then came cotton, a notorious consumer of soils. Following the boom and bust of cotton, the entirety of the lowlands of Guanacaste was converted into cattle pasture to help satisfy the insane appetite of North Americans for cheap, tasteless hamburgers. Between 1970 and 1972, over one and one-half million acres of Guanacaste land were sold to North Americans, primarily for conversion to cattle pasture.

What has this meant to Costa Rica? From being one of the country's greatest assets, the Guanacaste plain has become a drain on its economy. During the 60's, Costa Rican beef production increased by 92% while per capita meat consumption declined by 26%. The nation has had to increase imports of beans, rice and corn as a result of the removal of Guanacaste cropland from production. The plains of Guanacaste have been depopulated, as small farmers have sold out to the cattle interests. A few families stay behind to work as

peons. Others contribute to the growth of urban slums. Many move on to clear and settle land far less suited for traditional campesino agriculture than the plains they left.

Today Guanacaste has the poorest nutrition, the highest infant mortality, the greatest incidence of alcoholism, etc., etc., of the seven provinces. Even those individuals, Costa Rican and foreign, who profited initially are beginning to suffer. The wholesale clearing of forests and conversion of land to pasture has altered the climate. The dry season, which previously lasted three or four months, now goes on for eight or nine, maybe more. In the drought of 1975-76, cattlemen were selling their animals at a loss. Cattle dying by the roadside were commonplace.

Perhaps a quarter of the lowlands have been transformed into a true desert and the whole region is in trouble. The ecological destruction is virtually complete.

Who is to blame? In a small way, one can fault the campesinos, or at least the first few, who, shortsightedly, sold their fertile lands before the drought years. But the ecologically stupid policies which led to the final destruction of the Guanacaste plains were created and promoted by people who sit in offices in San José and abroad.

This is not to say that campesinos never contribute to the physical destruction of resources. One such case was narrowly averted last year when the former president, Daniel Oduber, had the foresight to exercise his powers in a rather controversial manner by declaring a large part of the Osa Peninsula a "disaster area" before the actual occurrence of the disaster. The Osa Peninsula, in the southwest corner of Costa Rica, is the last wilderness on the Pacific slope of Central America. Its western half is characterized by steep slopes, dense forest and heavy rainfall. It is simply not agricultural land. Stripped of its forest, it *might* yield crops and profits for five years or so, after which erosion, leaching, landslides, etc., would render it virtually sterile, as has already happened in similar areas in Panama. As of a few years ago, homesteaders were beginning to chop their way into the hills of the Osa. It is to the credit of President Oduber, Alvaro Ugalde, head of Costa Rica's National Park Service, and their ecologist advisers that they blew the whistle, bought out those squatters who had already moved in, and created the 72,000 acre Parque Nacional Corcovado.

Two episodes in the ecological history of Costa Rica: It may be instructive to ask why the ecologists were powerless against the destruction of the Guanacaste plain by business interests seeking a few years' profits, but succeeded in preventing the destruction of Osa by campesinos hoping to earn a subsistence.

While thinking about that, it may also be instructive to try to view both events through campesino eyes.

(Be assured that some of the people who tried to settle the Osa were the same ones who had left Guanacaste.) (It may seem unfair to lump ecologists and assorted cattlemen and business people together just because of economic class. But to a campesino we are pretty much the same — upper class "outsiders" who tell him what to do.) We seem to have kicked the campesinos up into the hills and then kicked them off because they threatened to knock a little dirt down on us.

It would be tragic if campesinos were to become totally alienated from the ecology movement, but there is a tendency to regard ecology and resource conservation as the playthings of those who can afford to buy all their food. This is exacerbated by the ecological tokenism practiced by some large commercial interests. The beaches of the Nicoya Peninsula will serve as an example. The coast of Nicoya is among the most beautiful parts of Costa Rica. The clean, clear blue Pacific breaks on pockets of white sand artfully tucked away between steep rocky cliffs. The vegetation and water temperature are tropical, but otherwise it is reminiscent of northern California. The beaches are, of course, being "developed", principally for foreigners. In some places, Costa Ricans have been denied access to their own beaches, in defiance of Costa Rican law.

Some of the "better" developments include, as part of the package, a reserve, set up, studied and certified by professional ecologists. There the landowner may see native Costa Rican wildlife and not be bothered by any pesty Costa Rican people. Encroaching desert behind, Gringos ahead, what is a person to do but go to San José and help make a slum?

Costa Rica and Latin America will not be saved by making National Parks and forest preserves alone, important though that is. Much less will they be saved by making token reserves, from which "natives" are excluded, as part of a plan to woo investment dollars, nor by relegating the "natives" to the least fertile and most fragile lands. If the region is not to become a patchwork of ruined lands dotted with overcrowded cities and agribusiness farms, relieved only by a few sacrosanct reserves of greenery, then the various governments, the campesinos and outside aid and development workers must all look to the concept of land husbandry, in which the human need for sustenance and the ecological need for maintenance are wedded. Such a concept has not prevailed in Latin America.

How to develop this attitude? It would not hurt to open better channels of communication between ecologists and campesinos; to share what ecologists have learned with the people, starting in the grammar schools, rather than to make rules and let the people guess why. Hopefully this step can be implemented rapidly, since some traditional campesino behavior patterns must change — soon.

I have described how one tragedy was narrowly averted on the Osa Peninsula, and I could cite examples of smaller atrocities committed by campesinos in the name of rice and beans. What must be changed is the “frontier mentality”, which is still very much alive in Latin America. While it is true that campesinos are often pushed off their farms by declining soil fertility or lured off with money, it is also true that many of them fancy themselves “pioneers”, pushing on into the bush to homestead more land for the nation. This attitude and the slash and burn agriculture inherited from the aboriginal inhabitants of the Neotropics must die out in many countries for the simple reason that there is precious little frontier left. Pioneer days are already over in El Salvador and Uruguay, the only mainland Latin American countries whose entire land masses are settled, and will very soon be over in Costa Rica. There are presently only three large unsettled areas in Costa Rica — the high Talamancas, the Tortuguero Plain and the Osa Peninsula — and substantial parts of each are already in one sort of reserve or another.

Another job for those of us from abroad who are concerned for Latin America is the introduction of new concepts into rural life. Appropriate technologies, for example, composting and aquaculture, will have to be introduced from outside, since they are not in the Latin American tradition.

But, in addition to sharing our knowledge and skills, there must be confessions forthcoming from the overdeveloped world as well. One root of Latin America’s problems is that “we” have encouraged and cajoled the campesino to sell the farm and work as a peon or move to the city. And when that doesn’t work out, since we have demonstrated our preference for the concept of profit-oriented soil mining to that of nutrition-oriented soil husbandry, he has that much less compunction about homesteading a forest hillside which he may *know* will not sustain his family for long.

We have managed to tarnish seriously the concept of a small farm as something that is passed down in the family and therefore to be husbanded as carefully as possible. But it will not do to write off the campesino of today as being incapable of honoring that concept. And, while it is one of the legitimate functions of those of us who have formal education or training to pass on information and ideas to the campesino, neither will it do to lecture down to him. Rather, what is needed is dialogue and it will not be easily achieved.

Like it or not, we — Gringos — are the world’s chief exporters of cultural influence, for better or for worse. As such, we are likely to be greeted in Latin America, according to the personality of the person we meet, with deferential courtesy (sometimes more than we deserve), or prejudicial hatred or, perhaps, the latter

in the former’s clothes. More balanced relationships come with time, especially if one comes to Latin America with questions, as well as facts and opinions, and acknowledges one’s own ignorance. If, in time, a Gringo has the opportunity to show — not argue — that he or she prefers the country to the city or is more interested in a good diet and ecological stability than in economic development and plastic trinkets, and, if that statement is made without condescending to the campesino and his hard-earned transistor radio, then he or she will sometimes be surprised at the depth of concern for farm, family and future expressed by the campesino. In other words, the concept of husbandry is in trouble, but not dead, in Latin America.

I began this article with a series of depressing and confusing anecdotes of ecological destruction and lack of understanding on all sides, then proceeded by distributing the blame according to my lights. Since I have not allowed that all is already lost, it would be unfair of me to leave the reader in gloom or fury without offering some more positive anecdotes of comprehension and action by campesinos and intelligent cooperation by outsiders.

One hopeful sign emerges from the sad experience of Guanacaste. I first heard the story from Abe Pena, the former Peace Corps director in Costa Rica. He told me, with some surprise, of being lectured by a taxi driver in San José about the deforestation of Guanacaste and the consequent drought. “If they keep cutting the trees and never planting,” said the driver, “the whole country will be a desert.” Since then I have heard the same story, with increasing frequency, from urban and rural Costa Ricans of all classes. Five years ago, only a few ecologists would have professed such a belief. Such is the extent to which at least one sophisticated ecological concept has penetrated the Costa Rican consciousness. (My account would be incomplete if I did not admit that, in some of the rainier parts of the country, I have heard people discuss deforestation as a promising new technique for moderating the weather.)

Another hopeful story comes from Guanacaste. In the coastal village of Jacó, on the border between the Nicoya beach developments and the slightly older Guanacaste desert development, an Italian family has labored for years to develop varieties of grapes uniquely suited to that environment. No fruit enjoys greater prestige in Costa Rica than the grape, but this is the first time that high quality table or wine grapes have been grown in the country. Now the family has set to work making the new varieties available to local farmers and helping them get started. In addition to bringing a sorely needed economic boost to the area, the grape is one of the plants best suited for use in the beginning stages of restoring misused soils.

Another developer of fruit varieties, Don José María Arias R., who was described in the first *Journal of the New Alchemists*, continues to carry on his work. Don José María has won international acclaim for his fruit varieties, but of more interest in the context of this piece is his thesis, directly opposed to the drift of modern agriculture, that a Costa Rican family can live comfortably on a few acres, intensively husbanded. Certainly his own finca, which covers scarcely three acres outside Alajuela, in an area which is succumbing to urban sprawl, supports his thesis. There Don José María, who has steadfastly refused economic assistance throughout his long life, lives well indeed on the basis of fruit trees, gardens and goats. It takes training, patience and a special genius to accomplish what he has in selective breeding, but his fruticultural techniques, as described in his book, *Fruticultura Tropical*, can be applied by anyone with land and the will to husband it.

The NAISA farm is located near the last outpost in Costa Rica of the old-time turtle strikers — the men who stood all day at sea in a canoe with balsa decoys and a harpoon, looking to strike a “hocksbill.” One of our neighbors, Casimiro Dosman, better known as “Penge”, who, to our sorrow, died in August of last year, was born and raised in the area and remembered how “first time” people would harpoon a turtle to eat. Then came the days of good markets for hocksbill shell. Turtles were killed far in excess of need and the meat thrown to the dogs. The persecution was intensified with the advent of a market for turtle eggs. Where before it was customary to take part of a clutch and leave some to hatch, now every egg in most nests is harvested and sold. As a result, turtles are scarce. Penge preached on this in Spanish and Caribbean English: “God made the animal them for we to use. But if you wish to sell, you must cultivate. I see plenty people sell hocksbill shell, trunkie egg. But sha! I don’t see no turtle farm.” People listened. Penge’s widow, Miss Ida, takes it a step further. She explains any and all hardships suffered by the turtle strikers: “God chastise them for kill too much turtle.”

Another of our neighbors, Andres Matute, age fourteen, has been planting selected hardwood trees for four years now — so that when he is older he will have the wood to build his house. He is one of the brightest youngsters in the community, and he wants to stay there, on his father’s farm. He does not want to be a “pioneer”, a peon, or to live in town.

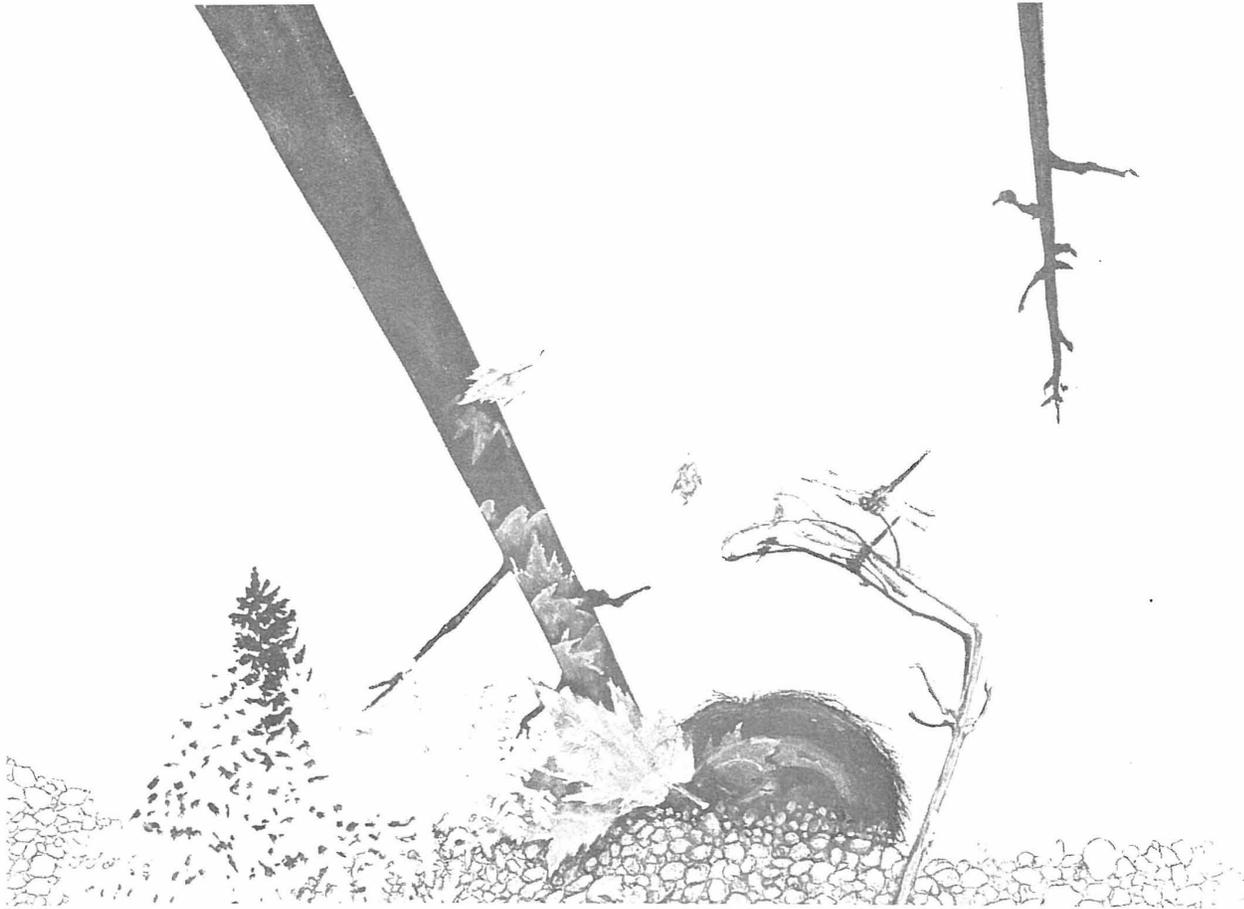
Those of you who received our 1977 calendar have already met Andres’ father, Geronimo Matute, age sixty-one, born in Honduras, never spent one day in

school, fought with Sandino in Nicaragua, worked for United Fruit Company in Panama, a founder of his community, president of the local Junta Directiva, and now a board member of NAISA. Matute says “La planta vale mas que la plata.” (This loses something in translation — “The plant is worth more than the money.”) “Porque la plata termina, pero la planta vive y cosecha y da semillas.” (Because the money comes to an end, but the plant lives and bears fruit and gives seed.”) If there is one person who is influential in the community, it is Matute, and I hear him haranguing community meetings about the need for reforestation — in a part of Costa Rica which cannot yet be termed deforested.

And I say there is hope yet to build a Latin America of people in harmony with nature. This will not happen without the campesino in full participation. Neither is it likely to happen with the campesino alone. We need the insights, skills and knowledge of the ecologist, the agronomist, the nutritionist and the appropriate technologist. We may possibly excuse the ruin of soils and environments in times past — say, the deforestation of ancient Greece — in that perhaps the people were ignorant of the consequences of their acts, or had no alternatives, or because the areas of land involved were relatively small. None of these excuses will serve today in Latin America.

We are favored, these days, with a great deal more knowledge of ecology, especially tropical ecology, than before. We have the whole new (for the Western Hemisphere) discipline of aquaculture, which seems particularly appropriate to most Latin American environments. We know composting and reforestation techniques. We know a great deal more about nutrition than before. We are in a better position to predict the consequences of our acts, and we have previously unequalled technology to propagandize and communicate what we know.

What is needed is to find the Penges and Miss Idas and Matutes in each community and tap their knowledge and abet their influence in their communities. What is needed is the counterparts of the Italian family in Jacó. What is needed is for interested ecologists and researchers and tecnicos in all fields to drop any preconceived notions, pick up the machete and live with and as campesinos. What is needed is for those of us with particular skills or knowledge to bring that knowledge to where it is needed — not just to some government office or university or development agency or company, but to the campesino. Even before that, we must ask the campesino what he knows, what he needs to know, what questions he and the researcher might ask together. It is this task that NAISA has set itself.



## The Life of the Naturalist, Jean Henri Casimer Fabre, 1823-1915

— Meredith Fuller Luyten

*Peace the love of the process of our lives.*  
—Muriel Rukeyser

*In a word, all those vague, unconscious, rudimentary  
and almost nameless little lives which surround us on  
every side and which we contemplate with eyes that  
are amused, but already thinking of other things.....*

— Maurice Maeterlinck

There is a street in Cambridge, Massachusetts, named for the botanist who established a system of nomenclature for the natural sciences. Eight years ago, I was sitting in a library on one side of Linnaean Street, attempting to re-establish a writer's routine. On the other side of the street was an apartment where my first baby was being cared for. I was excited and anxious, unable to think wholly of the child or my work. Restive from conflicting stimulations, I turned to the stacks behind

me and pulled out a book with the interesting title, *The Life Of The Spider*. I glanced at the chapters. Chapter III, "The Narbonne Lycosa", began, "The Epeira, who displays such astonishing industry to give her eggs a dwelling-house of incomparable perfection, becomes, after that, careless of her family."

Thus I first met Jean Henri Fabre, the French entomologist whom Charles Darwin called "the incomparable observer." Who was this man who wrote so compellingly of the insect and of himself that I felt I had

studied by his side in the dusty fields of Provence? His style was anecdotal, discursive and his vivid descriptions of insects were often anthropomorphic. Biology flowed into philosophy without shame. Who was more attractive — the writer, the entomological teacher or the struggling paterfamilias? Fabre was a teller of stories. Instinctively, he wove the events of his life together with his scientific observations to form a cloth that was whole but distinct in detail. It did not occur to me at the time that this is a characteristic of all great naturalists.

Fabre was one of the first great behavioral scientists. Edwin Way Teale says of him, "He produced some of the basic studies of the nature of instinct. All students of insect behavior, of comparative psychology, of experimental biology are indebted to Fabre." His observations provided overwhelming evidence for the complex sequences of instinctive behavior in insects. His intuitive powers made him suspect biological mechanisms that could only be isolated a hundred years later by molecular biology. When I first heard of pheromone communication, in which chemicals secreted by an animal operate at great distances to stimulate a response in another animal, I remembered a passage from Fabre on the courtship of moths: "but what are we to say of the Great Peacock and the Banded Monk, making their way to the female..... they hasten from the ends of horizon. What do they perceive at that distance? Is it really an odor, as our physiology understands the word?..... It would be tantamount to reddening a lake with an atom of carmine, to filling immensity with nothing." This is an excellent analogy for the dispersion of potent pheromone molecules. Fabre's experiments convinced him that there was "an unknown sense" mechanism in operation, and he guessed accurately that the moths' antennae were the "scent" receptors.

Throughout his life, Fabre was interested in mechanisms of perception. How, he asked, do creatures know their worlds? "Inclined as we are — and it could not well be otherwise — to judge all things by our standard, the only one in any way known to us, we attribute to animals our own means of perception and do not dream that they might easily possess others..... Cannot certain properties of matter, which have no perceptible action upon us, find a receptive echo in animals, which are differently equipped?"

How do we as human beings know our world? Konrad Lorenz has made this observation about behavioral studies of animals, or the field of ethology: "*it is essential to conduct an extensive period of general observation, which must precede the performance of experiments.* He who maintains that he has no time for such observation, which is at first not directed at a particular goal, should leave animal

psychology well alone." The italics are Lorenz's own.

Like Lorenz, Fabre confessed that often his most important observations were fortuitous, his best experiments accidentally conceived. He called this experience his "method of ignorance", by which he meant that observations made without prior expectation or hypothesis are particularly trustworthy in behavioral studies. Long before the advent of ethology Fabre knew that only patient field observations of long duration can establish the normative relationships of animals within their ecosystem.

Descriptive observation is still essential in many sciences. But observation, more than experiment perhaps, is inherently subjective and impossible to duplicate. Although journals of behavioral science read as if method and terminology can remove the subjective element from observation this is only an unwieldy linguistic illusion. Fabre's writing offers another response to language. He leans into the subjective life of his mind, revealing his person. He would have agreed with Lorenz's statement that observations can only be evaluated when the observers know each other and know how and what each other tends to perceive. There are styles of perception which are mirrored in styles of communication. But how *can* observers know each other? How can personality and its style become a vehicle for accurate communication?

In a recent article in *Science* magazine, called, "Hubris in Science", Lewis Thomas describes a new response to the modern problem of sheer quantity of scientific research:

"So, communication has become a serious problem not only between the scientists and the public, but among the scientists themselves. How do the investigators cope with the problem? Not, I think, by relying on computerized library services, although increasingly clever systems for retrieving more or less current information have come into existence in recent years. Nor are the journals themselves used as extensively as they used to be as sources of new information.

"What is happening is that there is much more reliance on word of mouth for the transmission of scientific data than ever before in my memory..... There is a new system at work, which I do not understand. I have the impression that a great body of information is getting around by a mechanism that can only be termed gossip."

Thomas is talking about the telephone, but he is also talking about the rediscovery of person-to-person "gossip", and the odd reliability which dealing directly with the person of the investigator seems to have for us.

Were the discursive, autobiographical, anecdotal and anthropomorphic elements of Fabre's writing naive and outdated as techniques for scientific

writers of today? Could it be that, on the contrary, these are essential characteristics of his contribution to science? A look at Fabre's life and writing might provide an answer to these questions.

Beginning an autobiographical essay, Fabre said, "Since Darwin bestowed upon me the title of 'incomparable observer', the epithet has often come back to me, from this side and from that, without my yet understanding what particular merit I have shown. It seems to me so natural, so much within everybody's scope, so absorbing to interest one's self in everything that swarms around us! However, let us pass on and admit that the compliment is not unfounded.

"My hesitation ceases if it is a question of admitting my curiosity in matters that concern the insect.... yes, I confess that I am an enthusiastic observer of the animal. How was this characteristic propensity, at once the torment and delight of my life, developed?"

J. Henri Fabre was born on December 22, 1823, in the village of Saint-Léons in Provence. He remembered his parents as stern and harassed people, but not as unkind ones. They were so poor that they sent the young child, known as Henri, to live with his paternal grandparents, on their farm near Malaval. In Fabre's words, "They were people of the soil, whose quarrel with the alphabet was so great that they had never opened a book in their lives; and they kept a lean farm on the cold granite ridge of the Rouerge table-land. The house, standing alone among the heath and broom, with no neighbour for many a mile around and visited at intervals by wolves, was to them the hub of the universe..... In this wild solitude, the mossy fens, with their quagmires oozing with iridescent pools, supplied the cows, the principal source of wealth, with rich, wet grass. In summer, on the short swards of the slopes, the sheep were penned day and night, protected from beasts of prey by a fence of hurdles propped up with pitchforks.... In the centre was the shepherd's rolling hut, a straw cabin. Two watch-dogs, equipped with spiked collars, were answerable for the tranquillity if the thieving wolf appeared in the night from out the neighbouring woods.

"Padded with a perpetual layer of cow-dung, in which I sank to my knees, broken up with shimmering puddles of dark-brown liquid manure, the farm-yard also boasted a numerous population. Here the lambs skipped, the geese trumpeted, the fowls scratched the ground and the sow grunted with her swarm of little pigs hanging to her dugs."

This is the setting of Fabre's earliest memories. He identified with these grandparents, especially his grandmother, more than with his own parents. He remembered his grandmother's warmth, her abundant meals, good humor and her capable strength as a

farmer's wife. She was of a practical temperament, but, to the small intense domain of the farmyard, she added her gifts as a story-teller. Her stories were often of wolves, as heroic and fantastic as dragons. "I should very much have liked to see this wolf," Fabre wrote, "but the shepherd always refused to take me into his straw hut, in the middle of the fold, at night." Added to Fabre's sharp observations of real animals were the exploits of fantastic animals. His first books were to be an ABC bestiary and La Fontaine's *Fables*.

Often alone, the young Henri had time for reflection and observation. He soon learned that his curiosity about animals was met with amusement or impatience, because it went beyond the practical needs of his grandparents as farmers. Early in his childhood, natural history became a pleasure which Fabre's secrecy protected from ridicule. He had to put his questions directly to his animals. He began to search and experiment and he gives us this extraordinary account of one of his earliest memories — a test of perception:

"I was five or six years old.... I can see myself plainly, clad in a soiled frieze frock flapping against my bare heels; I remember the handkerchief hanging from my waist by a bit of string....

"There I stand one day, a pensive urchin, with my hands behind my back and my face turned to the sun. The dazzling splendour fascinates me. I am the Moth attracted by the light of the lamp. With what am I enjoying the glorious radiance: with my mouth or my eyes? That is the question put by my budding scientific curiosity.... I open my mouth wide and close my eyes: the glory disappears. I open my eyes and shut my mouth: the glory reappears. I repeat the performance, with the same result. The question's solved: I have learnt by deduction that I see the sun with my eyes. Oh, what a discovery! That evening I told the whole house all about it. Grandmother smiled fondly at my simplicity; the others laughed at it."

In childhood, Fabre's only teachers of natural history were other children. Inherited superstitions coupled or clashed with his private observations and stimulated his curiosity further. Children, not adults, valued gratuitous bits of information — such as methods for hypnotizing a goose, where to find bird eggs, or that the grasshopper's hind leg has a "pleasant shrumpy flavor."

When Fabre was eight years old, he was returned to his parents. To help the family income he was given the job of raising a flock of ducklings. He herded them down the stony paths of the village, beyond the houses, to a pond where they could find food. Here he spent hours exploring the shores of the pond. He found gold-dust, diamonds and a tiny ram's horn turned to stone. Coming home with bulging pockets,

he was scolded for ruining his clothes and was told to throw his treasures away. Was it fortunate or regrettable that there was no one to tell him that what he really had found was mica, rock crystals and a fossilized snail, common to that area? As with most children, Fabre's fantasies only whetted his appetite for more experience of the actual world. This paradox would one day enrich his writings as a naturalist.

As an old man, Fabre remembered this pond of his childhood and a succession of ponds connecting a child's and a scientist's sense of wonder:

"I will return to the pond, but not that of the small ducks, a pond aflower with illusions. Those ponds do not occur twice in a lifetime. For luck like that, you must be in all the new glory of your first breeches and your first ideas.

"Many another have I come upon since that distant time, ponds very much richer and, moreover, explored with the ripened eye of experience. Enthusiastically I searched them with the net, stirred up their mud, ransacked their trailing weeds. None in my memories comes up to the first, magnified in its delights and mortifications by the marvellous perspective of the years.

"Nor would any of them suit my plans of today. Their world is too vast. I should lose myself in their immensities, where life swarms freely in the sun. Like the ocean, they are infinite in their fruitfulness..... What I want is a pond on an extremely reduced scale, sparingly stocked in my own fashion, an artificial pond standing permanently on my study table."

This is more than a prologue to experimentation. These ponds become a metaphor for changing perception. As the observer becomes more skilled, the world becomes more complex. The pond of this passage is the evolving human eye.

Until adolescence, when Fabre assumed responsibility for his own education, his formal schooling was haphazard. From the age of seven to ten, he studied in his godfather's village school, which was also his godfather's bedroom and kitchen. The room was warm only because a fire was maintained to cook the pigs' mash. Piglets and chickens wandered in and out. His godfather was benignly inattentive. Study was readily interrupted so that the doves could be cleaned or snails crushed by the children in the estate gardens. For Fabre's grandfather "managed the property of an absentee landowner..... He had under his care an old castle with four towers", and he also worked as the village barber, bell-ringer, choir-singer and the winder of the village clock. "This was his proudest function," Fabre writes. "Giving a glance at the sun, to ascertain the time more or less nearly, he would climb to the top of the steeple, open a huge cage of rafters and find himself in a maze of

wheels and springs whereof the secret was known to him alone." This picture suggests the medieval quality of Saint-Léons in Fabre's childhood, a town in which the small rounds of life were as self-contained and unquestioned as the inner workings of his grandfather's clock.

Fabre's family moved to the larger town of Rodez. His education here was erratic, interrupted by the financial needs of his family. Eventually he won a scholarship at the École Normale Primaire in Avignon. Fabre trained to become a teacher, concentrating on math and physics. He could foresee no post as a teacher of natural science, and he relegated his natural history books "to the bottom of a trunk." But during his adolescence Fabre gained confidence in his ability to teach himself and to learn by teaching others. When a chemistry lesson ended in a disastrous explosion, Fabre was stimulated to repeat the experiment correctly a year later. He remarked with good humor that teaching is, after all, only "the fulminate awakening the slumbering explosives."

Fabre acquired a teaching position in Corsica. Here at last he met two naturalists who could encourage his study of plants and insects. Moquin-Tandon especially encouraged Fabre to study the living animal, and he restored Fabre's ambition to pursue a career as a teacher of natural history.

In 1852 Fabre became a teacher at the lycée of Avignon. He meanwhile was laying his plans toward a university professorship, not knowing that he would hold this teaching position at the lycée for eighteen years. He prepared his thesis for "doctorat es sciences naturelles," which he defended in Paris. In 1854 he was galvanized by his discovery of the entomological work of Léon Dufour. Dufour was publishing behavioral observations of insects and Fabre realized that he himself was capable of making a contribution to Dufour's work on wasps. He began to publish his findings and in 1856 he received an award from the Institut de France for his work in experimental physiology. By now Fabre had a large family. He was never free from financial worry. Although he had attracted the attention of such famous men as Darwin and Pasteur, he was unable to accept a position on the faculty of Poitiers University simply because he lacked the necessary private income. This was a bitter lesson in the inequities of an educational system. How was he to work and still have the time for his entomological studies? For a while, he turned all his attention to gaining economic independence. After much work, he developed a cheap method for the production of madder dye, a dye which was very important to the textile industry of his region. He received an award from Napoleon III for this work, but then the development of artificial alizarin destroyed his dye's market.

In yet another area, success was to be followed by mishap and thwarted ambition. Fabre's gifts as a teacher had long been recognized by Victor Duruy, Napoleon's enlightened minister of education. During official tours of the provinces, Duruy had encouraged Fabre to enlarge his goals and offer his liberal ideas in education to the community of Avignon. In the 1860's, Fabre gave free public lectures in natural history at the old Abbey of Saint Martial, the abbey in which he had long ago witnessed the disastrous explosion of chemicals in a badly managed experiment. In the Abbey of Saint Martial, he at last had a forum for his ideas and, perhaps, a broader forum than a university professorship could have given him. His lectures provided an open university system, free to all. He was making education available to any age and economic background; he was providing secondary education for girls; he was giving natural history a central place in the curriculum of country school children. Fabre attracted large audiences and, in so doing, he also caused alarm in this provincial town. He made enemies, particularly among the clergy. In 1870, he lost his job at the lyc ee and at the same time he was evicted from his house, for which he held no lease. John Stuart Mill, who then resided in Avignon, gave Fabre generous financial help that enabled him to establish a new household in Orange.

Fabre seemed to have lost his teaching career, but instead he now began a new, more important stage of it. He turned to the writing of popular scientific books as a means of support. Some of these books, which Fabre made more acceptable to clerics through the inclusion of frequent pious sentiments, became texts for school children. Others were intended to provide adult education to farming communities, offering principles of household hygiene and practical information on animal husbandry and the life-cycles of pesty and helpful insects. Through this period of prodigious writing, Fabre gained the experience as a stylist which he brought to his later volumes of entomology. He continued his work in the fields with insects, but he felt increasingly harassed by his dependency on public byways and lands that were not his own. It became his ambition to acquire a piece of land where his experiments and observations would be undisturbed by passers-by.

In 1879 Fabre had enough royalties from his books to purchase a little less than three acres of land in S erignan, Provence. Poor, untilled land, suitable only for occasional grazing, such a piece was known as a *barmas*. On this *barmas* there was a house, a small pond, and dry, thistly fields abounding with insects.

Fabre reached his *barmas* in a state of exhaustion and grief. His promising son and working companion, Jules, had just died at the age of fifteen. Fabre himself had almost died in a bout with pneumonia.

He had four young children and an aged father to care for. Shortly after the move, his wife, Marie, died. Fierce pride had carried him through misfortunes and lonely struggles to this hard-bitten piece of land. He recognized his own life in the solitude of the *barmas*. In an impassioned essay of that title, he defended his life's choices and his purpose in taking refuge on this bit of land:

"Come here, one and all of you — you, the sting-bearers, and you, the wing-cased armour-clads — take up my defence and bear witness in my favour. Tell of the intimate terms on which I live with you, of the patience with which I observe you, of the care with which I record your actions. Your evidence is unanimous: yes, my pages, though they bristle not with hollow formulas nor learned smatterings, are the exact narrative of facts observed..... and whoso cares to question you in his turn will obtain the same replies.

"And, then, my dear insects, if you cannot convince those good people, because you do not carry the weight of tedium, I, in my turn, will say to them:

'You rip up the animal and I study it alive; you turn it into an object of horror and pity, whereas I cause it to be loved..... natural history, youth's glorious study, has, by dint of cellular improvements, become a hateful and repulsive thing. Well, if I write for men of learning, for philosophers, who, one day, will try to some extent to unravel the tough problem of instinct, I write also, I write above all things for the young.'

"When shall we have an entomological laboratory for the study not of the dead insect, steeped in alcohol, but of the living insect; a laboratory having for its object the instinct, the habits, the manner of living, the work, the struggles, the propagation of that little world, with which agriculture and philosophy have most seriously to reckon?..... While waiting for the fashion to change, I open my *barmas* laboratory of living entomology; and this laboratory shall not cost the ratepayers one farthing."

Though Fabre became known as "the hermit of S erignan", this picture of him must be balanced by recollections of Fabre's friends and passages of Fabre's own reminiscences which reveal a personality of considerable charm and warmth.

Fabre was a devoted father and husband. He married a second time and eventually had seven children. His desire to improve the quality of education for girls arose naturally from the equality with which he treated his children, most of whom were daughters. His collector's walks were also spirited family outings. His wife and children often shared his excitement or patience in making a new observation in the fields. Or late at night they would rush to his laboratory, summoned by his elation with a new discovery. One

biographer and friend said, "It was not with Fabre as with some intellectuals, whose thoughts and life remain almost strangers to the home which they establish one day as though in a moment of distraction, and who divide their lives into two parts."

Fabre made innumerable farmers and their wives, village urchins, servants and shopkeepers into enthusiastic as well as invaluable collectors of cocoons and insects for his laboratory. The pleasure which he found in his work was infectious and still is infectious to us today as we find it in his writing. On one occasion, Fabre invited his family and friends to join him in testing the edibility of the oak caterpillar. He had read in Pliny that these were considered by the Romans to be a delicacy. With characteristic wit, he set the experiment for a Shrove Tuesday meal, since Shrove Tuesday is a "reminiscence of the ancient Saturnalia" of the Romans. He gives us the following portrait of his guests:

"One of these is the schoolmaster. Since he permits it and does not fear the comments of the foolish, if by chance the secret of our feast should be divulged, we will call him by his name, Julian. A man of broad views and reared upon science, his mind is open to truth of every kind.

"The second, Marius Guigne, is a blind man who, a carpenter by profession, handles his plane and saw in the blackest darkness with the same sureness of hand as that of a skillful sighted person in broad daylight. He lost his sight in his youth, after he had known the joys of light and the wonders of colour. As a compensation for perpetual darkness he has acquired a gentle philosophy, always smiling; and ardent desire to fill, as far as possible, the gaps in his meagre primary education; a sensitiveness of hearing able to seize the subtle delicacies of music; and a fineness of touch most extraordinary in fingers calloused by the labours of the workshop. During our conversations, if he wishes to be informed as to this or that geometrical property, he holds out his widely-opened hand. This is our blackboard. With the tip of my forefinger, I trace on it the figure to be constructed; accompanying my light touches with a brief explanation. This is enough; the idea is grasped, and the saw, plane and lathe will translate it into reality.

"On Sunday afternoons, in winter especially, when three logs flaming on the hearth form a delicious contrast to the brutalities of the Mistral, they meet in my house. The three of us form the village Athenaeum, the Rural Institute, where we speak of everything....."

In this description of Marius, the blind carpenter, I am again struck by Fabre's interest in matters of perception. With people as well as with insects, as a teacher and as a behavioralist, he always asks himself how a being with endowments different from his own experiences the world. What common ground, he wonders, might we have? In recording his own investigations, he frequently uses imagery that evokes the world of the blind, a world of darkness in which he gropes and moves forward hesitantly; and a world in which each creature's domain is finally private:

"I sally forth in the night, with a lantern, to spy out the land. Around me, a circle of faint light enables me to recognize the broad masses fairly well, but leaves the fine details unperceived. At a few paces' distance, the modest illumination disperses, dies away. Farther off still, everything is pitch-dark. The lantern shows me — and but very indistinctly — just one of the innumerable pieces that compose the mosaic of the ground.....

"The domain of this Weevil is... a slender thistle, not devoid of elegance, harsh-looking though it be. Its heads, with their tough, yellow-varnished spokes, expand into a fleshy mass, a genuine heart, like an artichoke's, which is defended by a hedge of savage folioles broadly welded at the base. It is at the centre of this palatable heart that the larva is established, always singly.

"Each has its exclusive demesne, its inviolable ration....."

The vivid strength of such a passage evokes Fabre's own lifetime identification with the solitary struggles of common people, the strong weeds who "have no history," but whose individual efforts contain great drama nevertheless. Again and again, in the teeming instinctual world of insects, he creates vivid portraits of individual effort. And these portraits derive energy from and lend support to the struggles of his own life.

Between 1879 and 1910, the ten volumes of Fabre's *Souvenirs Entomologiques* were published. They did not attract great attention. Then in the last five years of his life Fabre was officially discovered. The French government and scientific institutions of France and other countries honored him with a jubilee in Sérignan, in 1910. He received Stockholm's Linnæan Medal and he was nominated for the Nobel Prize. But Fabre found this fame that came so late to be exhausting and ironic. When his eyesight was failing, he was deluged with expensive microscope and laboratory equipment which he had never had the benefit of before. Again he was to find himself surprised and bemused by differences of perception. Shortly before his death in 1915, he learned that a statue of himself was to be erected in his village.

He said to a friend, "I shall see myself, but shall I recognize myself? I've had so little time for looking at myself!"

A friend and biographer of Fabre gives this description of the aged naturalist, confined by old age to his chair and almost totally blind:

"To see him in the twilight of his diningroom where he silently finished his life, majestically leaning back in his arm-chair, with his best shirt and old-fashioned necktie, his eyes still bright in his emaciated face, his lips fine and still mobile, but thin with age and at moments trembling with emotion, or moved by a sudden inspiration — to see him thus, would you not say that he was still observing?"

Fabre may not have had much time for looking at himself, but in his writing he gave us his life as a vehicle with which we join him in observation of the world. He made his life into an epic journey, emblematic of the life journeys of all creatures. Maeterlinck called Fabre the Homer of insects, a poet of science. The opening lines of *The Odyssey* could serve as an invocation for Fabre's own epic, the *Souvenirs*. It might indeed be an invocation from all of Fabre's personable insects:

Sing in me, Muse, and through me tell the story  
of that man skilled in all ways of contending,  
the wanderer, harried for years on end.....

\* \* \* \* \*

If there is a persistent quality to be found in Fabre's work it is the quality of empathy. Empathy is much more of a discipline than that related emotion, sympathy. Empathy enables a person to identify with another life without confusion, without ceasing to respect the separateness of lives. It is a response very similar to generous love. If this sounds a bit far from the pragmatic routines of a student of animal behavior, consider the following words of Konrad Lorenz from his book, *Studies in Animal and Human Behavior*:

"Ethology is the *comparative* study of behavior.... [to become an expert in this field] it is necessary to become thoroughly familiar with a group of related animal species. Such familiarity is not easily achieved. In fact, it seems necessary to become emotionally involved to the point of 'falling in love' with such a group in the way many bird-lovers and.... other kinds of 'amateurs' do. Without this emotional motivation, no thorough knowledge of the comparable behavioral traits of any group of animals could ever be gained. Were it not for the unaccountable gloating pleasure some of us take in watching 'our' animals, not even a person endowed with the supernatural patience of a yogi could bring himself to stare at a fish, a bird or an ape with

the unremitting perseverance which is necessary in order to perceive the governing principles prevailing in the behavior of an animal."

Fabre was a great writer and naturalist because he had what one biographer called "the gift of correspondence." A truly great naturalist brings some aspect of nature into sharper focus *not by isolating it but by clarifying its relationships*, its place in nature. This is really an unromantic view of naturalists, because it makes their function that of go-betweens. Like a translator or a diplomat, a naturalist can reduce the barriers between intelligent systems of life that speak somewhat different languages.

Niko Tinbergen, in arguing for the eventual partnership of psychology and biology, wrote in 1951, "introspection brings us into contact with an aspect of behaviour that is out of reach of objective study. We know that both aspects belong to one reality, but somehow the scientist's mind is unable to synthesize them into one harmonious picture." Fabre's writing intuitively conveys this harmony. And in the 1970's we have more scientific evidence, which may simply mean more scientific willingness, with which to understand this harmony.

Lewis Thomas and Edwin Land are two scientists of different disciplines who recently have written about the partnership of inner and outer orders which forms human experience. As a medical researcher, Lewis Thomas provides us with a new paradigm for understanding disease. Disease has been understood as the invasion of an organism by another foreign organism. It might better be understood as a biological misunderstanding or misinterpretation of boundaries between organisms that *can* understand or misunderstand one another only because they have a long evolutionary association. To even *see* one another, let alone interact with one another, different organisms must share some order or language.

Research into mechanisms of visual perception has enabled Edwin Land of the Polaroid Corporation to draw a related conclusion about the interaction of the human eye and the 'outer world' it sees. Land's research provides a synthesis for our ideas of subjective and objective perception that Tinbergen hoped for. And since his study of the eye illuminates the complimentary skills of observation and communication that a good naturalist possesses, I will let Land speak for himself. Compare his reminiscence from childhood with Fabre's childhood experiment with perception:

"In my hometown library, the chief delight of the younger patrons was not the books but the Brewster stereoscope. Through its lenses, children saw boats and bridges and canals and mountains, and the best of all three-dimensional subjects, grottoes. The stereoscope transport-

ed the child through the interplay of stalagmites and stalactites into the distant depths of the caves, having converted two slightly faded sepia, flat, dull photographs into a vivid reality. You could hear the dripping water, smell the dampness, fear the darkness as you sat with your legs crossed under you..... *Where did this new reality exist? In your eyes, or rather did you exist in it? A toy? Or the most powerful metaphysical clue to emerge in three thousand years? .....* the child and the three-dimensional space he rejoined in seeing comprised one single union of mind and matter..... In this particular pre-Darwinian period [when the stereoscope was invented], no one could have had the courage to imagine what, in the next two hundred years, would become the scientific basis of an unpartitioned reality.”

We have evolved, Land says, “in a polar partnership with the world.” He continues:

“there really is no outside world and no inside world. There is just one world. It is, perhaps, a little bit like moss growing on a rock, clinging to it, the tendrils penetrating the crevices in the rock and the cavities of the rock, where the rock/moss combination is the object and not the rock or the moss separately.”

It is, then, as Fabre said, “so much within everyone’s scope” to be observers of the world. Perception is an act of unification available to us all every time we open our eyes. A naturalist is exceptional in raising this endowment to an art, to an act of celebration.

The interests of a naturalist are usually understood by their own time to be interdisciplinary, unifying separate fields of study. In its own time, Fabre’s behavioral approach to the insect was a radical integration of psychology and morphology. Great naturalists provide data for the “unpartitioned reality” of nature. But few scientists would consider a narrative style to be an integral part of scientific contribution. Fabre’s writing is not just a ‘means’ of conveying data. It is itself data, and some of the very best data, for the unity of mind and nature.

It is not fortuitous that Lorenz, Tinbergen, Thomas and Land are all good writers. Between people, between species, between our minds and the world around us there can be a rigid or a supple interface. Our language can emphasize isolation or relationship. In general, the best naturalists are also specialists in some scientific field. However, they are specialists who have the ability as writers or artists to overcome the alien associations of inaccessibility and loneliness which the word specialist has come to have. A good scientist has entered strange and possibly frightening territory. A good writer provides us with the necessary empathy, the necessary relationship, to follow on that journey. A good writer sustains our participation in his or her

world. When Land begins an article with a childhood reminiscence he is giving us a way in. And when he begins to talk about rock and moss he is turning to a writer’s most powerful tool: metaphoric language.

Metaphoric language is one of the ultimate human expressions of trust in the unpartitioned reality of mind and matter. Metaphor is “language that implies a relationship.” An ordinary metaphor is merely illustrative, but a great metaphor is organic and forms “a fresh relationship.” The formation of metaphor in the human mind is analogous to the increasing complexity of an ecosystem in nature: definitions of lives arise more and more from their relationships. The filling of specific ecological ‘niches’ also might be compared to the development of more precise language with which to express our commonality.

Journals of science reveal a fear and distrust of the richness of language. Language is indeed hazardous. Words with the briefest of histories are subject to alchemical transformations, mutations and emotional colorations. Language seems to insist on its right to cross-pollination if it is to remain fertile. It has a life of its own. Yet it is the tendency of scientific writing to coin new technical words and attempt to fix the usage of old ones, for ambiguity is felt to be a disability in sharing scientific investigations. Consistent usage and rigid definition are shibboleths to protect against misreading. Of course, this fixity of language has genuine uses. Essentially it replaces what Lorenz pointed out to be the necessary first-hand relationship between observers that makes them able to understand each other’s findings. It is interesting to note how the usefulness of a fixed vocabulary is analogous to the usefulness of instinctive behavior: It requires no imaginative interpretation, but it is easily made obsolescent by a change of environment. The paranoia of many behavioral scientists about verbal ambiguity seems to be a self-defeating tendency, and certainly a quixotic one. Lovers of language value its hazardous nuances and would no more discard a word’s layers of association than an antique dealer would scrub the patina off an old brass pot. The treacherous fluidity of language ultimately cannot be avoided by a scientist any more than it can by a poet. It offers a precision in communication which is of a different order. Metaphor is a precise and subtle tool for describing reality.

Fabre once said that “in the world of creatures, as in the world of men, the story precedes and outlives history.” He developed the ability of a fabulist to make an animal expressive and to turn the behavior of animals into narrative. But he realized that for fabulists such as Aesop and LaFontaine the animal was “little more than a pretext for comparisons and moral narratives.” It became merely illustrative of human foibles. This is unabashed anthropomor-

phism in its most manipulative form. But consider this passage in which Fabre describes the encounter of a Praying Mantis and a hunting wasp, or Sphex, returning to her burrow with a paralyzed grasshopper:

“When entering her shelter under the rock, where she has made her burrow, the Sphex finds, perched on a blade of grass, a Praying Mantis, a carnivorous insect which hides cannibal habits under a pious appearance. The danger threatened by this robber ambushed on her path must be known to the Sphex, for she lets go her game and pluckily rushes upon the Mantis, to inflict some heavy blows and dislodge her, or at all events frighten her and inspire her with respect. The robber does not move, but closes her lethal machinery, the two terrible saws of the arm and fore-arm. The Sphex goes back to her capture, harnesses herself to the antennae and boldly passes under the blade of grass whereon the other sits perched. By the direction of her head we can see that she is on guard and that she holds the enemy rooted, motionless, under the menace of her eyes. Her courage meets with the reward which it deserves: the prey is stored away without further mishap.

“A word more on the Praying Mantis, or, as they say in Provence, *lou Prégo Diéou*, the Pray-to-God. Her long, pale-green wings, like spreading veils, her head raised heavenwards, her folded arms, crossed upon her breast, are in fact a sort of travesty of a nun in ecstasy. And yet she is a ferocious creature, loving carnage. Though not her favourite spots, the work-yards of the various Digger-wasps receive her visits pretty frequently. Posted near the burrows, on some bramble or other, she waits for chance to bring within her reach some of the arrivals, forming a double capture for her, as she seizes both the huntress and her prey. Her patience is long put to the test: the Wasp suspects something and is on her guard; still, from time to time, a rash one gets caught. With a sudden rustle of wings half-unfurled as by the violent release of a clutch, the Mantis terrifies the newcomer, who hesitates for a moment, in her fright. Then, with the sharpness of a spring, the toothed fore-arm folds back on the toothed upper arm; and the insect is caught between the blades of the double saw. It is as though the jaws of a Wolf-trap were closing on the animal that had nibbled at its bait. Thereupon without unloosing the cruel machine, the Mantis gnaws her victim by small mouthfuls. Such are the ecstasies, the prayers, the mystic meditations of the *Prégo Diéou*.”

Fabre is not crediting the Mantis with the human faculty of hypocrisy; nor is the Mantis a vehicle for anticlerical diatribe. Fabre is using a wide number of common associations to stimulate our perception of this moment, and to form a relationship between the insects and ourselves. The words “robber”, “lethal machinery”, “enemy”, “reward”, “nun”, “patience”, and the marvelous use of “clutch” and “Wolf-trap” do not make this scene a human drama, but they do make it comprehensible to us through our dramatic faculties as human beings. This is an important distinction. Fabre is not making value judgments that *deflect* attention from the insects; he is establishing some correspondence in order to focus our attention and empathy. Rather than being naive, he is deftly prodding us when he asks, “Why is the Sisyphus Beetle a hard-working paterfamilias and the Sacred Beetle an idle vagabond?” Wit, not morality, defines his narratives.

For communication to occur between species, an innate distrust of the strange must be overcome. For us this is particularly true in the case of insects. Fabre makes sophisticated use of the close relationship between fear and fascination, repulsion and attraction, to arrive at our underlying identification with insects. His fluid use of language expresses a courageous, vigorous encounter with the strange:

“To emerge from underground after the perfect insect is hatched, the Bluebottle’s device consists in disjuncting her head into two movable halves, which, each distended with its great red eye, by turns separate and reunite. In the intervening space, a large, glassy hernia rises and disappears, disappears and rises. When the two move asunder, with one eye forced back to the right, the other to the left, it is as though the insect were splitting its brain-pan in order to expel the contents. Then the hernia rises, blunt at the end and swollen into a great knob. Next, the forehead closes and the hernia retreats, leaving visible only a kind of shapeless muzzle. In short, a frontal pouch, with deep pulsations momentarily renewed, becomes the instrument of deliverance, the pestle wherewith the newly-hatched Bluebottle bruises the sand and causes it to crumble.”

Fabre has magnified the scale of the insect so that we can feel the power and precision of the fly’s minute head and experience its emergence as a herculean effort. It is this image of effort, as well as the sexual quality of the description, in human terms, that holds us. Fabre stimulates feelings in us, rather than crediting the insect with these feelings. He is giving us the necessary interest for close attention. If this is trickery

it is sublime trickery. Who is receiving Fabre's attention and lavish description? Ourselves or the insect? As a scientist, Fabre had the intuition to see this as one and the same process. It is essential for an observer to risk identification, and his language tells us that.

Empathy, true knowledge, requires the participation of all levels of our minds. Fabre is bold enough to engage the power of the unconscious, which expresses itself through imagery. His imagery strikes the mind with the force that only archetypal imagery can have. Rational and irrational elements join in Fabre's most inspired descriptions. This is particularly fascinating in a writer who is a student of instinctive behavior. Because a compelling image in the human mind is analogous to the power of instinct in its ability to trigger a response. This relationship between imagery and the conscious mind has been explored by Jungians, and particularly by Erich Neumann. It is succinctly stated in the following passage by him:

"The function of the image symbol in the psyche is always to produce a compelling effect on consciousness. Thus, for example, a psychic image whose purpose it is to attract the attention of consciousness, in order, let us say, to provoke flight, must be so striking that it cannot possibly fail to make an impression. The archetypal image symbol corresponds, then, in its expressiveness, significance, energetic charge, and numinosity, to the original importance of instinct for man's existence."

Before retiring to bed one night, Fabre put a newly-hatched female Noctuid moth under a screen bell-jar. In the light of Neumann's words, consider the charged mystery in Fabre's description of the events which ensued:

"It was a memorable night! I will name it the Night of the Great Peacock. Who does not know this superb moth, the largest of all our European butterflies, with its livery of chestnut velvet and its collar of white fur? The greys and browns of the wings are crossed by a paler zig-zag, and bordered with smokey white; and in the centre of each wing is a round spot, a great eye with a black pupil and variegated iris, resolving into concentric arcs of black, white, chestnut and purplish red....

"I was richly rewarded. About nine o'clock that evening, when the household was going to bed, there was a sudden hubbub in the room next to mine. Little Paul, half undressed, was rushing to and fro, running, jumping, stamping, and overturning the chairs as if possessed. I heard him call me. "Come quick!" he shrieked; "come and see

these butterflies! Big as birds! The room's full of them!"

"I ran. There was that which justified the child's enthusiasm and his hardly hyperbolic exclamation. It was an invasion of giant butterflies; an invasion hitherto unexampled in our house.....

"Candle in hand, we entered the room. What we saw is unforgettable. With a soft *flic-flac* the great night-moths were flying around the wire-gauze cover, alighting, taking flight, returning, mounting to the ceiling, re-descending. They rushed at the candle and extinguished it with a flap of the wing; they fluttered on our shoulders, clung to our clothing, grazed our faces. My study had become a cave of the necromancer, the darkness alive with creatures of the night! Little Paul, to reassure himself, held my hand much tighter than usual."

In this passage, Fabre has interwoven the sexual excitement of the arriving male moths and the excitement of Fabre's son, Paul, so that the evening becomes the combined discovery of insect, child, and ourselves.

Frequently Fabre's essays open with this quality of urgency or immediacy. We are invited to join him on some epic journey and we are quickly introduced to the protagonists of the adventure:

"The month of March comes to an end; and the departure of the youngsters begins, in glorious weather, during the hottest hours of the morning. Laden with her swarming burden, the mother *Lycosa* is outside her burrow, squatting on the parapet at the entrance."  
(from *The Narbonne Lycosa: The Climbing Instinct*)

or to take another passage:

"It happened like this. There were five or six of us: myself, the oldest, officially their master but even more their friend and comrade; they, lads with warm hearts and joyous imaginations, overflowing with that youthful vitality which makes us so enthusiastic and so eager for knowledge. We started off one morning down a path fringed with elder and hawthorn, whose clustering blossoms were already a paradise for the Rosechafer ecstatically drinking in their bitter perfumes. We talked as we went. We were going to see whether the Sacred Beetle had yet made his appearance in the sandy plateau of Les Angles, whether he was rolling that pellet of dung in which ancient Egypt beheld an image of the world."

Fabre has a strong element of play and pleasure in his observations which suggests a trustful awareness of the world. His style has a feminine sensuality, diffuse as well as specific, always fertile in associations, bountiful in details. It is exciting for us today, on a new wave of feminism, to see that the traditionally feminine strengths are essential to a good naturalist: a receptive and inclusive eye, an intuitive perception of relationships between living things, an ability to conserve and use all experience. And Fabre's writing about the insect world constantly evokes the age-old mythic polarities of nature: the nurturing mother and the devouring mother.

Whether he is uncovering the dark or the luminous aspects of nature, he speaks in the voice of the psalmist, inviting and celebratory. He says of a young shepherd who has led him to the nest of Scarab Beetle, "he laughed in response to my smile and was happy in my gladness." Fabre says to us, across a hundred years, "Pass the tip of your finger over the Moth's head. You will feel a few very rough wrinkles," and we do feel those wrinkles; like the carpenter, Marius, who was Fabre's friend, we touch the moth blindly but sensitively.

When we are reading about Fabre's insects, we are entering the connective tissue of the naturalist's life, a very human life, in which the harsh exigencies of conflicting roles and conflicting stimulations are conserved and made workable. Human and insect lives have their myriad characters, playing different ecological roles that jostle and define one another. Living things translate each other. The paradox of Fabre's anthropomorphism is, as he says, that "no one can sound an existence outside his own." So he gives us his whole experience as an intelligible vehicle for the journey he wishes us to make. We are sustained by the design of his perceptions, which is the natural design of his life. We read him and for a while we ourselves become incomparable observers. Maybe we even can carry a little of his gift with us into our own time, our own science. His language is a reminder that scientific models are based on analogies, and those analogies are always human.

*I celebrate myself, and sing myself,  
And what I assume you shall assume.  
For every atom belonging to me as good belongs to you.*

—Walt Whitman

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*the light is still*  
*At the still point of the turning world.*

-T. S. Eliot  
*Four Quartets*





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