Almost everyone, perhaps everyone, innately resents it when he finds himself being stuffed into some categorical pigeonhole. A label has an imprisoning effect - we see a pacing lion behind an iron-barred door, and an iridescent dragonfly neatly pinned on a plastic tray beside a label giving the genus and species, as if that were all that should be said. We are not ready for someone else's taxonomic judgement of ourselves, however well-meaning that judge may be.

We feel that the label tells us more about our would-be label-giver than about ourselves. The University administration defines me as a member of the tenured staff and my laboratory associates consider me to be a virologist. Other folks I know have no idea what a member of the tenured staff may be, or what a virologist does or looks like, and feel little need to know. It does not matter, for they also have me identified. Nels believes I am a cog in the bureaucratic apparatus and fellow passengers on the Northwest flight to Washington may suspect that too. There is one biographical indexer and several presses that think that I am an author.

There are other concepts. To Marvin, I am the one who calls him when one of his heifers has dropped a calf in the pasture that he rents from me. And Pete knows me as the guy who comes into the mill to have alfalfa ground. My list, like yours, could go on and on. We each know, that we are, in part, all these contradictory things, so how could anyone put us in a neat catagorical box?

Benjamin Franklin succeeded as have few others in frustrating the many labelers. One thinks of him as being at once; printer, writer, inventor, scientist, diplomat, administrator, patriot and humanist - not any one of these things alone, but all of them. Yet, he remains in the minds of most

of us a approachable man, an individual with whom one could go to dinner, engage in small talk and in deep and challenging conversation. It is intriguing that a many-sided genius is viewed as quite normal and comfortable and that an individual who has exceptional talents to which he subjects his entire life like Fischer, the chess wizard, is viewed as odd and most of us would feel quite ill at ease if we were to find ourselves beside him. I suspect that we clearly understand our own complexity, and consider it to be the norm. It is not genius that we find peculiar, however brilliant, but the individual who rejects his own diversity to perfect a single talent. Such dedication fascinates us in a morbid way. We become more interested in the story that the ballerina practices 14 hours a day and the list of things that she denies herself than in the grace of her performance; we become more interested in the pre-occupation of the mathematician who fails to recognize his broth on the street than in the elegance of his equation. We make such one-track individuals into objects and drain them of their humanity.

There are other ways of dehumanizing man. All individuals on first meeting are an apparation of the moment, creatures without a past--in a city they appear and vanish among its streets and corridors passing images about which we can not care. We know that we have a past that conditions what we are and waht we do, but we judge these faces of the moment in the context of the moment.

I am sitting with a group of bankers and government officials, a group of faces around a heavy walnut table that is elegantly carved and oiled. My feet press into the deep pile of the carpeting and momentarily the scene fades back to a bibboveralled boy rubbing his toes in the tall grass as he gives

directions to a well-dressed man at the wheel of a 1930 Buick. The boy knows that well-dressed people are rich, possibly bankers, and wonders what that is like - this world of theirs populated by another kind of people. Now years later sitting at the walnut table the boy remains inside, still wondering about himself and the other kinds of people. What sorts of boys are hidden in these bankers. Does a boy sit behind each of the man-costumes now deciding things that control other peoples' lives and sometimes sub-consciously trying to fulfill boyhood wants and to right boyhood hurts?

Should we care about images and labels? Early in my graduate training Carl Brandly, my advisor, argued against using the word scientist to refer to oneself. To his thinking it was an accolade to be given by ones peers, if at all. One used for oneself a more precise and descriptive term. An individual who studied bacteria was a bacteriologist, one who studied viruses was a virologist. Therefore, I was to be and became a virologist. Because of my affiliation and associations I have received two other titles that are variously defined. By virtue of the fact that I spend much of my professional time with veterinarians, I am often addressed as Doctor. But I find the word "doctor" is used more frequently, and, perhaps, precisely to keep the proper professional distance between the physician or veterinarian and his client. In Europe, my title becomes professor, never Doctor, since the former has a higher social connotation than the latter and to give one less than his due is a rather serious matter. Yet in many circles in this country such titles are apt to have a negative value like a cold draft in a warm room.

Taxanomists are the people who not only label things but also classify things into a hierarchy of categories. Hugh Iltis, a plant taxonomist,

assures me that taxonomists are by necessity a bit crazy, and I must admit that some of them whom I have known to exhibit certain eccentricities of behavior. I believe, however, that what he was really telling me is that taxonomists possess the irrationality that is characteristic of the human race and therefore must be considered human. The taxonomist that concerns me is not the one who classifies things but the one who classifies people and, particularily, the one who separates the learned community into two categories - one for scientists and one for humanists, a scientist being the individual who is concerned about things and the humanist, the one who is concerned about values. To some thinkers this means two philosophical approaches to life and two views of the world which would make ours a schizophrenic civilization.

This, like all classifications, has reality only in the mind of the classifier. In other minds there may exist scientific humanists and humanistic scientists and unscientific scientists or unhumanistic humanists. To those of us less taxonomically inclined, human kind consists of individuals who live and who deal more or less imperfectly with things and with values.

As one who has been pushed forcefully into the box called scientist in what often appears to be an effort to limit the scope of ones interests, I would like to tell a story that, I hope, will help you to understand my belief in the unity of learning and my concern about the restrictiveness of labels. It is a story of two individuals of very different origins. Somsak Pantawatana of Thailand and Douglas Watts of Kentucky, who spent several years together acquiring the tools and learning the methods of science. Steps in our educational process are readily described, but the academic record has no place in which to document the awakening that sometimes takes place in students--an awakening

that can not be predicted. Yet it is this event that creates the excitement the ferment of a university, and in this event lies the kinship among the sciences, arts and letters.

The method of science, about which one hears, is simply a system of asking questions that can be tested in a satisfactory way. I suspect that humanists have another system for asking questions and of evaluating the answers. More important than these systems is the recognition, by both scientists and humanists, that the art of asking of significant questions is the basis of our civilization and that our future lies in how relevant to our needs we find answers by any system that we use.

Before I can introduce my two subjects, I must sketch the background for their studies, and that will require a rather lengthy digression. The account starts with a 3-year old girl who lived in a little valley branching from the Mississippi River a short distance above its confluence with the Wisconsin. One August day almost two decades ago she became feverish and fretful and then was seized by intermittant convulsions. Rushed to a LaCrosse hospital, she received supportive care but her condition worsened and she lapsed into coma and died. The physician told her parents that she had died of viral encephalitis of unknown etiology.

Unknown things that reach from out of nowhere to snuff out lives, particularly those that do it suddenly and violently have filled man with dread for centuries and since the rise of modern medicine they have been subject of systematic and intensive search.

In time investigators from the University of Wisconsin isolated a virus now known as LaCrosse encephalitis from the child. Viruses are the ultimate

form of parasites. Unlike lice that infect unkept scalps and round-worms that wander in uneasy human bowels, submicroscopic viruses live hidden inside selected cells somewhere in the body and subvert those cells to their exclusive use. LaCrosse encephalitis virus lives in the critically important cells of the brain and destroys them. In the laboratory, it remains equally fastidious, growing only in brain cells of suckling mice or in special gardens of cells that can be cultured in small glass dishes.

The isolation of the disease agent was an important step. But more important questions remained. How did the little girl become infected and could other children become infected in the same way? Where did the virus hide when it was not infecting children? Can the disease be prevented? The answers to those questions took more than 15 years; it challenged staff and students and stimulated the writing of a series of scientific papers and theses.

The first thing that was done was to set down guesses or scientific hypothesis as to what might be happening that would account for the appearance of the disease and then to devise ways of testing which of the several guesses was correct or most nearly correct. Wrong guesses are much more frequent than right ones and one does not complain if only one guess in ten or one if fifty is correct.

Since LaCrosse encephalitis virus was soon discovered to be related taxinomically to a group of mosquito transmitted viruses, it was guessed that a mosquito must have infected the little girl. But which mosquito? There are many kinds, each differing in behavior and often requiring a different breeding place. To control a mosquito one must know how it lives.

There were many other questions. Were other children or adults being infected? Did death often occur, did some children recover from the acute

illness only to remain paralyzed or mentally retarded, or did most children recover without any lasting effects? How widespread was the disease? Was it limited to places near LaCrosse? Was it present throughout Wisconsin or the entire midwest?

Rather quickly it became clear that there were many cases of illness, and that they occurred almost exclusively in children and were limited to children from the southwestern region of Wisconsin and the adjoining areas of Minnesota and Iowa. Death was rare and occurred in only the youngest children. Older siblings recovered, some with impairment but most often without permanent ill effects. Adults when infected appeared to be free of any clinical illness.

The establishment of this information took some sleuthing as well as experimental tests of hypotheses. Rather odd things were discovered. The affected children were from families at the two ends of the socioeconimic scale, those of tenant farmers and professional people. Affected boys outnumber affected girls more than 5 to 1.

Fascinating to me was the dearth of information in the literature of the kind that an ethologist is first to seek about wild creatures like the white-tailed deer - its home range and behavior patterns. What is the home range of a 6-year old boy? How do boys and girls differ? In what ways do the circaidin rhythms of children change within the span of a year? It was vitally important foruus to know where the afflicted and non-afflicted children played. Neither child experts or parents were of much help. Fortunately, the children had no preconceived notions of what we were ultimately seeking nor pretenses about life that they had to hide so they showed us where they

played and how they came and went. All children were at the stage when forts and tree houses, simple or elaborate, were their retreats from parental authority, secret places of which they were shyly proud. The children from elegant suburban houses and dilapidated rural dwellings had found identical playgrounds on the wooded hillsides.

The children led us to the mosquito. It's name - Aedes triseriatus, a very close cousin of the notorious yellow fever mosquito Aedes aegypti. The culprit mosquito lives on the dry, oak-clad hillsides where the hot afternoon sun is partially filtered and where tree houses and forts are easy to build. There, in July and August, in the late afternoon and on into the evening after supper as the shadows lengthened, the mosquito fed and fed again until the children had to leave for bed. At that point feeding stopped for Aedes triseriatus, unlike most mosquitoes, prefers to feed in day light.

In July and August the hillsides are almost always dry, the nearest creeks have long since ceased to run and the pools in the creek bed have dried. Since the immature stages of all mosquitoes must live in water and the adults of most mosquitoes survive for only a few weeks after hatching, the source of these asult mosquitoes puzzled us.

The answer was on the hillside, although we failed at first to see it. At the base of some of the oaks, particularily those having several trunks, were depressions formed by the rotting away of wood where a long dead trunk had been, and now encircled by buttresses of sister trunks the cavity could hold a cup or a gallon water shed by the bark above. These minature pools contained water even in August and each teemed with microscopic life. Preying upon them was the tiger-like larvae of Aedes triseriatus, safe here from the

larger predators in streams and ponds.

We found LaCrosse encephalitis virus in these mosquitoes and we learned that the mosquito fed on people and upon chipmunks and squirrels. Tests soon revealed that the chipmunks and squirrels also became infected and that the virus increased in their blood until it was sifficient to infect susceptible mosquitoes that fed upon the blood. The chipmunks and squirrels always survived the infection, became immune, eliminated the virus and showed no ill effects.

A student from Equador learned that the first mosquito larvae hatched in April from eggs laid the autumn before. At first the larvae grew slowly in the cold water of the tree hole, then as the weather became warmer, they pupated and finally the male and female mosquitoes emerged from the pupae about the middle of June. Within hours they mated and the male flew off to feed on flower nectar. The female now driven by a need to provide sustanence for her developing eggs sought warm blood. In late afternoon the need drove her to seek chipmunks, squirrels and children, to land, to probe and to draw blood. A female lives on for 3 to 5 weeks. alternatively feeding and laying eggs, and then feeding and laying again and again. Once infected with the virus she would transmit it for the rest of her life.

Studies showed that Aedes triseriatus was the mosquito that transmitted the virus to children; that it lived on the hillsides of the many small valleys branching from the Ohio and upper Mississippi rivers. Hundreds of cases in children were discovered and additional deaths were recorded.

The seasonal sequence, from emerging of the mosquito to subsequent appearance of the infection, the disappearance of mosquitoes and the subsequent

disappearance of infection fitted nicely. Each part of the story became a study for a student and he sought to establish its essential subcomponents.

A major gap remained - where did the virus come from each spring? All infected female mosquitoes died in the fall. All chipmunks and squirrels had become immune even before the first snow had fallen. The disappearances of many other arboviruses each fall and their reappearances next spring had puzzled investigators since their discovery. It did not appear likely that an inexperienced student working on LaCrosse virus would find the answers.

Somsak Pantuwatana, like all Thais, was a quiet young man, respectful of his elders, rather solemn in appearance but not without a low-keyed sense of humor. His thesis problem concerned the growth of the virus in chipmunks and, particularly, the effect of winter hibernation upon the antibody and virus. He came in one afternoon with some agitation evident in his passive features. His request was simple and I did not get the full implication at first or an American student would not have asked it, or even thought of asking it. Somsak was asking permission to disagree with authority, with the text books, with his other professors and with me. He had decided to go against Thai tradition and the Oriental culture of his forefathers that had taught him respect for his elders.

He merely asked permission to test mosquito larvae from the tree hole for virus, knowing that virus would be there if it had passed from the mother mosquito through the egg to the larvae by transovarian transmission. The text books were unanimous in saying that arboviruses were not transmitted through the egg of the mosquito. His lecturers had all said the same thing. He knew this and he had come to doubt it. Somsak had become an experimentalist; like

the avant guard in art and the revolutionary in politics, he had decided to test his ideas against the world.

I told him that his chances were poor. That he was probably asking to do a lot of unproductive work, but I carefully did not say no. So he went off happy. And he isolated the virus from a mosquito larvae. The first isolate came easy. Then he slaved all summer long to repeat his feat, as doubters called him a Don Quiote. In the fall he did repeat it and in doing so he convinced Doug Watts, another student, of the validity of his hypothesis.

Doug grew up in the moutains of Kentucky where the boys only sometimes go to high school and never go on to college. Doug went to Berea, the college that expects students to support themselves at work while they study, to run the college farm and to operate the college hotel in order to pay their way. He graduated but his grades were not impressive. From Berea he went into the army and chance placed him in a laboratory working for an officer who later saw that he got an opportunity to go to graduate school. Able to put more time on books, the mountain boy fulfilled the promises of his sponsor.

He had a natural methodological approach to problems that fitted with Somsak's tenacity and visionary ideas. Before they were done Somsak and Doug convinced the doubters. Doug grew the mosquitoes in the laboratory, induced them to feed and to lay eggs. He hatched the eggs, carried the mosquito through cycle after cycle. He fed the virus to the female mosquito, found the virus in the eggs she laid after he had carefully washed and disinfected them, and in the larvae that hatched from the eggs, then in the pupae that developed from the larvae and finally in the adults that emerged from the pupae.

Before the task was complete, Somsak had returned to Thailand and it fell to Doug to go to the national meeting of the Society of Tropical Medicine and

Hygiene and present their findings. His paper was a highlight of the meeting. The acknowledged Dean of arbovirology from the School of Public Health at Berkerley congratulated him for an outstanding paper. For a graduate student, an acknowledgement of this kind is close to a Nobel Prize and he was pleased. While Somsak would have enjoyed being there, he now knew that the most important tenet of science was real--that the authorities could be challenged--that questions properly asked by people like himself could change the course of events and rewrite the books.

By describing the process of scientific awakening in a boy from southeast Asia, and a boy from southeast Kentucky as they jointly solved a biological problem, I have hoped to show that scientific inovation involves an increased awareness of self, and a testing of self against all human kind. It is a contest with excitement, with keen disappointment and high elation. There is nothing cold or impersonal in the search or the discovery, whether the individual is labeled scientist or artist.

I am not claiming that science, arts and letters are alike. Science is demonstrably different from art in one key aspect. It's truths are verifiable and may be discovered simultaneously by several individuals, or if not discovered now, will be discovered later. If Somsak and Doug had not discovered that arboviruses can be transmitted through the eggs of mosquito, someone, somewhere else would have found it eventually. But no painting or peom has ever been reported to have been created by two painters or by two poets. I know of no one who claims that another individual, in another place or at later time would have written Shakespeare's plays.

The creative process in Science, arts and letters, however, has one rather disconcerting similarity that is seldom recognized. This is, that

the creative process is, itself, amoral. New insights are neither good or bad. By asking the right questions we discovered the cause of a frightening disease of children. We learned how it is transmitted. Even how it persists in nature. We can use that knowledge to prevent the disease. We could use that same knowledge to spread LaCrosse encephalitis to human populations and some people have used scientific knowledge to the detriment of mankind and will continue to use it in that way. Rather than evil science there is evil use of science as there is evil use of art and evil use of history and philosphy.

Most creators are aware that any creation, like any child, can be kidnapped or subverted and by evil design be used to bring untold misery to the world. Is infanticide the way to prevent kidnapping, or prohibition of research the way to prevent the misuse of science? I doubt that answers can be that simple. Individuals will always appear with a new idea saying "this is good, let me lead you". Some of them are true prophets and some are false. The responsiblity for choice between them lies with the followers, and the responsiblity for the evil or good that results is also shared by all followers. We need all kinds of leaders, people who have thought new thoughts, who will enable us to hear and see in new ways, who will enable us to experience new and delightful things, who will permit us to escape from dangers that have beset us in the past. We know that not all the visions they show us are real nor all that they tell is us true. But it has been such leaders choosen by our forefather who created the good and bad of our civilization. It is difficult to accept the concept that every individual shares a responsiblity for making decisions which will affect the future of man and that he or she

shares responsiblility for seeking the information and gaining the understanding of values needed to make those decisions.

Perhaps, it is trivial but in giving and accepting labels we abdicate some of that responsiblity. We say that it was the soulless scientist, the pornographic artist, the grasping banker, who did what we deplore and we hope this way to escape the blame. We can no longer afford scientists who do not accept the logic of love and humanists that do not recognize the laws that govern their body chemistry if we are to avoid the fire in which a schizophrenic world would surely end.