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OUR NEGLECTED PLANET

INCREASINGLY, as the years go by, the serious journalists of the modern world are giving attention to events and trends of world-wide importance. A good example is the article by Lester R. Brown in the bimonthly, *WorldWatch* for September-October on "The Growing Grain Gap." At issue is world food supply. He begins:

> The drought that gripped North America this summer is being compared with the Dust Bowl of the thirties—and with good reason. The news that the Mississippi River had reached its lowest level since record-keeping began over a century ago is probably the most startling single measure of how dry the continent's agricultural heartland was. This lack of rainfall is contributing to what will almost certainly become the steepest one-year drop in world grain stocks ever recorded.
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> The drought will reduce the 1988 U.S. grain harvest by an estimated 78 million metric tons from last year. Large though this drop may seem, it is conservative compared with the estimates of several private forecasters and with the one that is expected to appear in the U.S. Department of Agriculture's (USDA) mid-August crop report. With the damage to Canada's crop, North American grain production is likely to be down by some 91 million tons—one-fourth.
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> In China, which ranks a close second to the United States as a food producer, severe drought conditions could easily reduce the harvest by one-tenth, or 30 million tons. *China Daily* describes the drought in one province as the worst in 20 years, in another as the worst in a century.

While not every country suffered crop losses, this year's world harvest, Lester Brown says, could fall some 76 million tons below that of 1987, which was itself down 85 million tons from the preceding year. He also says that these accumulating losses in the world's carryover stocks "will lower stocks to 54 days of consumption—three days below the level that mote than doubled grain prices in 1973." All food importing countries will be affected by this decline, and these countries already have external debts that are unmanageable.

Droughts, it may be said, come and go, but there is a serious slowing down in the growth of world food output. Brown writes:

> After nearly four decades of satisfying record growth in food demand, the world's farmers are beginning to fall off the pace. Global grain output multiplied a phenomenal 2.6 times between 1950 and 1984, but since then its growth has slowed markedly. In part, depressed prices are responsible. So, too, are limits imposed on farmers by soil and water resources. And in some countries, the lack of new agricultural technologies is slowing output growth. The higher prices that accompany the reduced grain stocks will remove the first constraint to rapid growth in grain production, but the last two remain. . . . This overall loss of momentum in world output, exacerbated by the monsoon failure in India in 1987, the North American and Chinese droughts this year, and larger areas of cropland idled under U.S. grain supply management programs in 1987 and 1988, has depressed the world grain harvest by nearly 10 per cent in two years. Record declines two years in a row have interrupted nearly four decades of steady growth, which had been one of the most predictable global economic trends since World War II.

One reason for the expansion of production in the U.S. has been the plowing of land that is highly erodible, in order to meet increased demand. But as Lester Brown says:

> That the world's cropland area would expand when food demand was growing rapidly, as it did between 1950 and 1981, is not surprising. What is surprising is that it would decline so abruptly since then. Much of the new cropland brought under the plow during the seventies has been abandoned as millions of farmers learn this lesson about nature s limits the hard way. Also contributing to the decline is the diversion of cropland to nonfarm uses, such as housing and industry.

While there are still some countries, such as Brazil, that can expand cropping onto land that

will sustain cultivation, they are only few. "The overwhelming experience over the last few decades," Brown says, "has been one of overextension of agriculture onto erodible land, followed by degradation and abandonment." This use of marginal land has led to overpumping and the reduction of water tables almost everywhere.

> Water tables are falling either because the pumping exceeds the aquifer recharge or because the water is being drawn from nonrenewable reserves, such as the Ogallala aquifer, which is essentially a fossil reserve beneath the' southern Great Plains.

Toward the end of his article, Lester Brown says:

> For most Americans, the prospect of higher food prices in the supermarket is disquieting. But for millions of those on the lowest rung of the global economic ladder, it may be a matter of survival. Rising world grain prices could push the food intake of millions below the subsistence level. . . .
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> If farmers had unlimited resources of soil and water, they could easily meet . . . increases in population, but the reality is that they will begin the next decade with a cropland base that is no longer expanding, a scarcity of fresh water, and no major new technologies to help them boost output. . . . Future improvements in the world food situation depend heavily on reversing land degradation and braking population growth. Without a massive reordering of priorities that will restore soils and slow the population growth that is already outstripping food production on two continents, food scarcity and higher food prices may well dominate the nineties. . . .
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> Unfortunately, the pressure of population on resources has reached a point in many countries where only difficult choices remain. Procrastination has taken away the easy options. The choices are either to slam on the demographic brakes by pushing for one-child families, as China has done, or face the prospect of recurrent famines, as Ethiopia has done.
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> The government of Ethiopia has consciously neglected family planning and permitted population to outrun food supplies, with the result that its population growth is sporadically checked by famine. Without massive food relief from abroad, the loss of life would be greater still. As the number of poor, debt-ridden countries facing hunger increases, the capacity of the international community to provide enough food will be tested.

An editorial statement in the September-October *WorldWatch* begins:

> Few magazines seek to change the course of history. This one does. Our goal is to help reverse the environmental trends that are undermining the human prospect.
>
> The earth's physical condition is deteriorating year by year. It's forests are shrinking, its deserts expanding, its soils eroding—all at record rates. Each year thousands of plant and animal species disappear, many before they are named and cataloged.
>
> The ozone layer that protects us from dangerous ultraviolet radiation is thinning. The very temperature of the earth appears to be rising, posing a threat of unknown dimensions to virtually all the life-support systems on which humanity depends.
>
> Our goal is to raise public awareness of these threats to the point where it will support an effective political response.

But isn't the editorial effort behind this magazine reaching for far more than a "political" response? As we practice it today, politics *is* the struggle for power—the power to get what we want and do what we want to do. That can no longer be our goal. As Arthur Morgan said in *The Long Road:*

> The time has come when enlightened selfishness fails when we can no longer exercise enough shrewdness to protect ourselves from the maze of interests, powers, influences propaganda, and other forces which surround us. Another kind of foundation very different from self-interest, must be provided if modern society is to survive and advance. . . .
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> For perhaps the next half century or more the burden of our attention and of our loyalties, and the full drive of our aspirations, should be given to bringing about a revolution in the personal character of the American people. . . . the great need of the coming years . . . is the building of great character, the defining and clarifying of purposes and motives, the development of integrity and open-dealing, the increase of self-discipline, the tempering of body and spirit to endure hardship, the growth of courage, the practice of tolerance, the habit of acting for the general good, and the growth of human understanding and of neighborly affection and regard.

It is easy to see the relevance of Morgan's program. The editorial in *WorldWatch* continues:

> A decline in the human condition is no longer entirely hypothetical. Africa and Latin America will end this decade with lower living standards than with which they started. For both continents, a combination of rapid population growth, environmental decline and rising external debt is undermining progress.
>
> Many changes are needed in population, energy and food policies if the world is to return to a path of sustainable progress. These adjustments will not occur in a vacuum; they will occur only as new information is brought to light and the cost of failing to adjust becomes clear. Changed policies are a product of changed perceptions.

We should add that *WorldWatch* articles are being widely reprinted. Subscription is $20 a year. The address is 1776 Massachusetts Ave., NW, Washington, DC 20036.

One thing called for, worldwide, is the planting of trees. The need for more trees is discussed by Sandra Postel, vice president for research at the Worldwatch Institute. She says:

> Over the last century—a mere instant of geologic time—the activities of the human species have caused unprecedented changes in the atmosphere. A continuing buildup of certain chemical compounds—most importantly, carbon dioxide—is propelling the environment toward another potentially catastrophic shift. The earth's climate may change more during our children's lives than it has in the last 15,000 years.
>
> While some climatic change is already inevitable, societies can gain precious time to adapt if action is taken now to dampen its ultimate magnitude and slow its pace. The first step requires curbing the use of coal, oil and natural gas, now the leading cause of the carbon dioxide buildup.
>
> But there is another step crucial to restoring atmospheric balance: protecting our remaining forests and planting more trees. Forests and woodlands are vast storehouses of carbon, so clearing and burning them—as is now happening on a large scale in the tropics—contributes to carbon dioxide-induced climate change. Because trees remove carbon dioxide from the air through photosynthesis, planting more of them can be part of the remedy. Therein lies an opportunity to capitalize on that enduring link between earthly life and the atmosphere—by reforesting the earth.

While carbon dioxide is only a tiny portion of the earth's atmosphere—just .03 per cent of the total volume—compared with 78 per cent for nitrogen and 21 per cent for oxygen, it nonetheless serves a function necessary to the earth's habitability. Its presence in the air "lets energy from the sun pass through it but traps the longer wave-length radiation emitted back from the earth's surface." This is called "the green-house effect" and helps to regulate the planet's temperature. Without this effect "the earth would be covered with ice."

> Besides the atmospheric pool of carbon dioxide, carbon is stored on land in living, dead and fossilized organic matter, and in great quantities in the oceans. Carbon naturally flows between the land, air and sea through various biological and chemical processes, but its distribution between these reservoirs is now changing in a major way.
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> Since the middle of the last century, human activities have markedly accelerated the transfer of carbon from the land to the atmosphere. Fossil fuel combustion has spewed 150 to 190 billion tons of carbon into the air, and forest clearing for cropland and fuelwood has contributed an additional 90 to 180 billion tons.
>
> Although the oceans have absorbed some of this excess, the atmospheric CO_2 level has continued to creep upward. From 280 parts per million prior to 1860, it had climbed to 348 parts per million by 1987, an increase of about one-fourth. Just since 1958, when scientists began routinely to monitor CO_2 concentration, it has risen 10 per cent.

While the resulting increase in the average temperature of the earth has been only 3 to 9 degrees Fahrenheit, which does not seem like very much, we should remember that the average temperature during the last Ice Age was only about 9 degrees colder than it is today. It should be said here that some regions would benefit by being warmer while others would encounter disaster. However, a NASA expert told a Senate Committee that "present global temperatures are the highest in the period of instrumental records."

If the warming continues, scientists anticipate that the polar ice cap will begin to melt and seriously raise the level of the oceans. Yet experts are uncertain as to the long-term effects of warming. George Woodwell, director of the Woods Hole Research Institute, maintains that a widespread forest die-off could release enormous amounts of carbon to the atmosphere—perhaps hundreds of billions of tons—depending upon the speed of the warming.

> He warns that "the sudden destruction of forests by air pollution, now being experienced in northern and central Europe . . . is but a sample of the destruction that appears to be in store."
>
> Woodwell's scenario might never come to pass. Ecologists do not yet agree on how forests will respond to a warmer climate, or even on whether that response will add CO_2 to the atmosphere or remove it. . . . How forests will actually respond looms large in the climate change picture, since the potential for a strong feedback—positive or negative—clearly exists.

Meanwhile the wave of deforestation has produced a severe energy crisis in the Third World.

> Wood provides the primary source of energy for more than two-thirds of the people in developing countries. It cooks their meals and heats their homes. As forests and woodlands shrink, fuelwood becomes increasingly hard to find for those who gather it and expensive for those who buy it.
>
> The human costs of wood scarcity already are high. In rural parts of the Himalayas and sub-Saharan Africa, women and children spend between 100 and 300 days a year gathering fuelwood, which pulls them away from farming, education and other productive activities. The U.N. Food and Agriculture Organization projects that half the developing world could lack a sustainable supply of firewood by the year 2000.
>
> Woody plants also play a vital ecological role. They secure soils, especially on steep slopes and in wind-prone regions, and help the land absorb and retain moisture by adding organic matter and structure to soils. With the loss of forest cover, the ecological integrity of many areas has disintegrated, causing land productivity to drop, droughts and floods to worsen, and rural livelihoods to become threatened. . . .
>
> Countries are unlikely to invest substantial resources in tree planting solely to ward off global warming. But, in much of the Third World, satisfying fuelwood needs and restoring productivity to degraded ecosystems provide a sound—even urgent—rationale. . . .

The concluding portion of Sandra Postel's article is devoted to present efforts at reforestation.

> Many European countries have in recent decades abandoned substantial areas of cropland and allowed forests to regrow. France, once 80 per cent forested, had trees covering only 14 per cent of its territory by the late 18th century. Today, roughly 25 per cent of the country is in forest. Continued damage from air pollution and acid rain on the continent, however, could reverse this positive trend. . . .
>
> Both Japan and South Korea have purposely planted large areas in trees . . . Here and there, people are working diligently to reforest the earth with the aim of stabilizing not the earth's climate, but their own livelihoods. . . .
>
> Can the community of nations plant trees on the scale required to improve prospects in the Third World and simultaneously help balance the global carbon cycle? There's reason for optimism. . . .
>
> Reforestation's potential to help avert climatic change barely gets mentioned in reports or plans that sketch out forestry's future. But as the consequences of global warming become clearer, and their magnitude and cost hit home tree planting solely for the purpose of stabilizing climate could appear in the international agenda.

Finally, a review section in *World Watch* calls attention to books of the sort that MANAS finds especially valuable. The September-October issue reviews Wes Jackson's *Altars of Unhewn Stone.* Jackson, the reviewer says, "writes with the genuine wisdom of one who, the more he learns, the more he realizes he has yet to learn." And in this sense, as Jackson puts it, "the true discovery of America lies before us. So far we have mostly only colonized it."

REVIEW
BASIC JOURNALISM

THE *New Alchemy Quarterly* for the summer of 1988 is entirely devoted to Biodiversity—which means the variety of living organisms and the ecological associations in which they occur. Major concern today is with the loss of diversity through extinction, which may result through monocropping, which tends to eliminate the wild ancestors to make way for domestic crops. The first article in this issue of the *Quarterly,* by Walter Rosen, says:

> The protection, restoration and benign exploitation of biodiversity can be seen at the heart of virtually every NAI (New Alchemy Institute) activity: integrated aquaculture and agriculture, solar algae ponds, integrated pest management, organic alternatives to chemical fertilizers and synthetic pesticides, recycling, fruit tree cultivation, solar-based energy systems.

The New Alchemy Institute was founded in 1969 by John and Nancy Todd and William McLarney (now of ANAI) and is located on 12 acres on Cape Cod. It pursues research in gardening and small-scale farming, focusing on food production, energy, water, and waste treatment systems. Rosen continues:

> John Todd long ago characterized all of these as components of what he termed an "ecosystem strategy" that models food production on the flows of materials and the inter-relations of organisms found in natural ecosystems: solar radiation—direct wherever possible—as the energy source; maximum recycling of organic matter, polyculture rather than monoculture. The justification for this strategy, long evident to the founders of the NAI and to a few others with deep insights into the workings of nature at a holistic, ecological level, is now becoming evident to an ever-widening segment of the population.

The language of the foregoing paragraph is probably unfamiliar to the typical reader for the reason that only in the past twenty years or so have pioneer thinkers realized how ignorant the modern world is of the relations human beings have with the ecology of the planet and how needful it is for us to begin to repair the damage we have done and continue to do. With the growth of population and the advance of technology, the policies of centuries have become destructive for mankind, and what we have regarded as "normal life" has become a threat to our survival. Slowly, through the work of organizations like the New Alchemy Institute, *healthful* life is being redefined, and little by little more and more people are hearing the warnings. Increasing numbers are making response. The health of the planet is now being recognized as the key to human well-being. Walter Rosen says:

> Air, soil and water pollution; soil erosion, the solid waste disposal crisis, the failure of nuclear energy technology, global warming and ozone depletion are a litany of problems caused by our booming global population, reliance on nonrenewable fuel and other resources, constant striving to maximize energy- and materials-intensive industrial and agricultural technologies and practices, constant choice of monoculture over polyculture, and reliance on a petrochemical industrial base. In short, we dominate and simplify nature, extracting and exploiting her riches without regard to long-range consequences, and without appreciation of our support system, the biosphere. With each passing day it becomes more apparent that we must mend our ways.
>
> That NAI has survived and modestly prospered indicates that its philosophies are coming of age. The introduction in Congress of the National Biodiversity Act should gladden the hearts of New Alchemists; it is a vindication of their respect and affection for biodiversity.

Awareness is growing, but action lies far behind. Writing in the summer of a presidential election year, Walter Rosen says:

> Indeed, as we approach the decisive phase . . . the almost total neglect of environmental issues is a cause of deep concern. Every day we are confronted with new environmental horror stories; natural resources disappear, biodiversity is diminished, globally and locally our support systems malfunction. Yet the debate is over who is softer on crime and drugs, and who went to the most elite college. Candidates fiddle while the biosphere burns.

Who is Walter Rosen? He is listed as a senior program officer on the Board of the National Research Council/ National Academy of Sciences, but the important thing to note is that he says: "John Todd and the New Alchemy Institute have inspired me and helped shape my world outlook and personal value system for a long time."

The second article in the summer *New Alchemy Quarterly*, on "Genetic Diversity and Prairie Agriculture," is by Dana Jackson, co-director of the Land Institute, in Salina, Kansas, and editor of *The Land Report.* She begins:

> When white settlers began to move into the middle of this country, they found it covered with thousands of acres of prairie. From Indiana to Colorado and from Manitoba to Texas, covering 250 million acres, tallgrass, midgrass and shortgrass waved across the landscape. The settlers marveled at the deep, black, fertile soils under the grasses, and they knew abundant crops could be grown there. They turned the tallgrass prairie into corn sorghum. Iowa became the center of corn production; Kansas, "the bread basket.". . .
>
> Now only small islands remain on that original inland sea of grass. Illinois, which had 22 million acres of prairie, was called the prairie state; now it has less than 500 acres of native prairie, and most of this is found in unplowed cemeteries. Small prairie remnants are all that remain in Wisconsin, Minnesota and Missouri. Unable to plow the shallow rocky soils of the Flint Hills in Kansas, settlers used this tallgrass prairie for cattle grazing, as they did further south in the Osage Hills of Oklahoma. The largest areas of prairie still in existence are those found on large ranches in Kansas and Oklahoma.
>
> The Land Institute recognizes the prairie ecosystem as, literally and figuratively, the ground of our agriculture and culture in the Prairie states. The deep-rooted grasses and fortes created the rich soil that is the basis of agriculture today. These same plants may well hold the information needed for agriculture in the future.

Wes Jackson, in his book *New Roots for Agriculture*, explained that growing annual plants in a monoculture inevitably results in soil erosion. The crops commonly planted on the prairie are annuals—wheat, corn, oats, and grain sorghum—which must be replanted each year. The farmers need to till the soil before planting, which exposes it to the erosive forces of wind and water. This is in contrast with the original prairie ecosystem which kept the ground covered all year round with a thick vegetative mat. The humus, formed from decayed roots, leaves and stems, absorbed water and built more soil.

> The other main feature of the prairie was its diversity. When the farmer broke the prairie, he plowed under the prairie vegetation and replaced them with a single species. . . . Even on soil saved from cultivation because it was too shallow to plow, cattle have grazed selectively, choosing a somewhat different menu than the original grazers. The migrating buffalo herds mowed down an area and then moved on, giving it time to recover before they returned The buffalo were replaced with fenced-in cattle that grazed in one area for months, returning frequently to munch favorite plants until they disappeared. Herbicides, sprayed in pastures to eliminate weeds competing with native grasses, have taken their toll also. . . .
>
> The Land Institute studies the prairie and celebrates it. We teach the significance of this ecosystem that built the soil in which we grow our major grain crops. . . . Because The Land Institute is devoted to the development of a sustainable agriculture, we see two very pragmatic reasons to preserve prairies. First, the prairie represents a successful natural system which thrived until humans plowed it under. It is a standard against which to judge our present-day agriculture, a model from which to learn. Second, we need the genetic diversity represented in the prairie to develop new cropping systems which will prevent soil erosion, decrease our dependence on chemical fertilizers and pesticides and use less energy in production. Our mission at The Land Institute is to develop mixtures of perennial grain crops which would be grown in a pattern mimicking the prairie. The seed yield of the perennial plants must be high enough that they can be economical to grow, so the Land Institute has a plant breeding program to increase yield. One promising crop candidate is Eastern gamagrass, a wild perennial prairie grass. We need to draw upon the genetic diversity found in wild populations spread across the prairie states to develop the crop potential of Eastern gamagrass. Second, in conventional agriculture, fields are monocultures, we envision the fields in a sustainable agriculture to be polycultures. In addition to yielding seed, each plant of the several different

> kinds growing together would contribute to the health of the whole system by capturing nitrogen, repelling insect pests or attracting pollinators, controlling weeds, or performing other functions we do not yet understand. . . .
>
> The world will always need grain, and we should be developing ecological cropping systems for erodible land which feature mixtures of perennial grains. We need the prairie, with its genetic diversity, to develop a sustainable prairie agriculture.

The address of the Land Institute is Route 3, Salina, Kansas 67401.

One article particularly worth mentioning in the *New Alchemy Quarterly* is Gary Nabhan's discussion of genetic erosion and vulnerability. His main point is that this is a subject not well understood. Reading him is likely to make people less careless in their assumptions. He begins:

> Since the early 1970s, the spread of disease and pest epidemics through production agriculture has been touted as genetic vulnerability—the reduction of the gene pool resulting in *genetic uniformity* of any given crop. Yet this problem is just as much due to the increased *ecological uniformity* of modern agricultural systems. The loss of Hedgerows, the consolidation of field patches into large tracts, the reduction in structural diversity inherent in intercrops and polycultures all ease the spread of diseases and pests. We must work to reduce genetic vulnerability by increasing complexity in our sustainable agriculture experiments.

He illustrates these processes at some length, showing how complex they are and how difficult the remedies may be. The best suggestion for the reader would be to read his article in full in the *Quarterly*, and also to look up his books, such as *The Desert Looks Like Rain.* He is an engaging writer.

COMMENTARY
THE TASK BEFORE US

WHAT we have staring us in the face in Lester Brown's account of "the Growing Grain Gap" in *WorldWatch* is the prospect of worldwide starvation. There is no escape from this conclusion. The reason for it is the transfer of the world's subsistence economy to a cash economy. The people who run the cash economy don't really care about the needs of the world. All they want is to make money. As a result they have adopted policies which squeeze out of existence the people whose lives are not adaptable to the cash economy. That is the reason why we look forward to an epoch of hunger and starvation for a large part of the world.

The only remedy for this situation is for more and more people to start recognizing that the business of human life is to meet human needs, not to make more money. This is a realization which comes as a shock and a surprise to all but a few. We are now forced to think in terms of world need, but this obligation has been upon us for only about twenty-five years. During those twenty-five years we in the so-called "advanced" countries have begun to learn about conditions in the rest of the world. The cash economy, we are discovering, is virtually destroying the rest of the world. It is not a matter of teaching the rest of the world how to succeed in living under the cash economy. The people can't do it. The circumstances of their lives won't permit it. But how can we combine practical subsistence farming with agribusiness? We don't know how, and meanwhile the methods of agribusiness, as skillful farmers such as Wes Jackson and Wendell Berry, along with others of like mind keep telling and showing us, are destroying the fertility of our soil and shriveling the future of farming as a natural undertaking. We cannot go on, they point out, with our present practices without making their deadly predictions come true. They have worked out a series of reforms that agriculture must adopt simply in order to survive.

These are the facts of the matter. They present us with problems that until now have had virtually no attention. Sooner or later we shall meet these problems because we must. Hunger will force us to meet them, or our children to meet them if we go on avoiding them.

For those who want to understand this situation, there is the question: Do human beings have a natural role on the planet that has been neglected for centuries? Can we now begin to take seriously what all the great spiritual teachers of mankind have taught—that altruism is the fundamental task of our lives?

CHILDREN
. . . and Ourselves
COOPERATIVE LEARNING

ACCORDING to an article in *Psychology Today* (for October, 1987—sent to us by a reader) by Alfie Kohn, two brothers, David and Roger Johnson, have collaborated in teaching education on the faculty of the University of Minnesota's College of Education. The aim which they have together, says Roger, who is 49, is to show the advantages of cooperation. "We're trying to change American schools from predominantly competitive places to predominantly cooperative places." His brother, David, says: "Cooperation is the basic phenomenon that distinguishes our species. It's the underpinning for everything." Summarizing, Alfie Kohn remarks:

> Any society, even one obsessed with competition, is predicated on people cooperating with one another. However, most schools don't reflect this reality of adult life. They pit students against each other in a contest for attention, approval and achievement. Or as an "innovative" alternative, they separate students from each other and individualize their lessons. Neither arrangement gives students a chance to learn the skills of working together.

The Johnsons specialize in teaching those skills.

> Cooperative learning . . . means more than putting a bunch of students together and telling them to get to work. It means creating "positive interdependence": structuring students' interactions so that each depends and is accountable to the others. A group identity is the goal; students must realize that they will sink or swim together.
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> This can be done in several ways, the Johnsons explain. By requiring a single product from a group of students, a teacher guarantees that group members share a goal. Giving a group grade makes everyone responsible for each other. Dividing a lesson into segments and having each student specialize in one part creates a situation in which every group member has something that everyone else needs. And finally, by assigning interconnected roles—making one person responsible for recording the group's ideas and another for checking to see that proper collaboration takes place—the teacher helps the group to work together even more smoothly.
>
> To make sure no one in the group sits back and lets the others do all the work, the system requires "individual accountability." A teacher may randomly pick one student in each group to explain answers or take a test on the material. Since every person is responsible for understanding it, no one can get away with less than active participation. And no one is finished until everyone in the group has mastered the lesson. . . .
>
> But does it really work? "None of us is as smart as all of us," the Johnsons are fond of saying. Working out of a small cluster of offices on campus known collectively as the Cooperative Learning Center, David, Roger and their graduate students have matched cooperative learning against the competitive and individualistic models of instruction in 26 controlled studies. Of these, 21 found cooperation clearly led to higher achievement, two had mixed results and three yielded no significant differences. The cooperative approach was superior regardless of subject matter or age group.

These studies showed that the more complex the learning task, the better cooperation fared. The Johnsons say: "The discussion process in cooperative groups promotes the discovery and development of higher-quality cognitive strategies for learning than does the individual reasoning found in competitive and individualistic learning situations." But in no type of task is any approach more effective than cooperation. Speaking of their research, David says: "There's almost nothing that American education has seen with this level of empirical support."

> "It shouldn't be a big surprise that achievement goes up," Roger adds. "Cooperation means students share their talents and skills in a way that benefits everyone. The very act of orally reviewing the lesson reinforces knowledge; explaining a concept to someone else is at least as useful to the tutor as to the tutored. And students appear to have so much more fun learning together that they may be more receptive to the material and thus quicker to pick it up.". . .
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> In 35 of 37 studies on interpersonal attraction, the Johnsons found that students tended to like each other more when they worked together cooperatively in the classroom. (Results in the other two studies were mixed.) More impressively, this mutual attraction was observed in 25 studies of first-through ninth graders in which some of the children were handicapped. And when students of different ethnic backgrounds learn cooperatively, prejudice declines and ridicule practically disappears. Kids who are

different from one another start to enjoy being around each other, and they continue to socialize during their free time. This, the Johnsons say, is the real beauty of cooperative learning groups.

Cooperative learning has other benefic al effects as well, the Johnsons have shown. Students who work together tend to have higher regard for school, for the subject they are studying (including the way girls feel about science) and for their teachers. They also develop more confidence in themselves.

The way in which the Johnsons were led to take up this sort of work is of interest. After graduating from Ball State University, Roger taught elementary school in California, then in Colorado. In 1966 he went back to school and earned a doctorate from the University of California in Berkeley, with an emphasis on science education. David, who had concentrated on English, went east to study social psychology at Columbia University. There he was taught by Morton Deutsch, whom he recognized as "the greatest social psychologist alive." Much of the later work of the Johnsons was based on Deutsch's teaching.

Deutsch, in turn, had been a graduate student of Kurt Lewin, whose "field theory" had been key to Deutsch's investigations of cooperation and competition. "I am just the most recent link in this progression," David says: Lewin to Deutsch, Deutsch to the Johnsons, the Johnsons to their graduate students.

Fresh from work in the civil-rights movement and doctoral research an education of minority students. David accepted an appointment at the University of Minnesota. In 1969, Roger, whose dissertation examined conceptual reasoning in kindergartners, came to visit David for a few days. He is still there. "Without a younger brother to pick on, his life was missing something," David jokes.

Both were interested in conflict resolution and how children learn to take the perspective of other people. He said "Let's start with just looking at how students perceive and interact with each other, do that for a while and then go on to other things," Roger recalls. "Of course, we've never gone on to other things."

What is the best size for a learning group? Alfie Kohn answers:

That depends on the difficulty of the assignment and how experienced students are at working cooperatively. A more complex task may be better suited to a larger group up to a maximum of six but it takes experience to make these larger groups run smoothly. In most situations, groups of two or three are a safer bet.

* * *

A book that is likely to fill the parents of new babies with great respect is *Babies Remember Birth* by David Chamberlain, a psychologist who maintains he has "relived the birth process hundreds of times" with his clients. (The publisher is Jeremy Tarcher, the price $16.95.) The best way to convey the contents of this book is to quote from a chapter reporting childhood memories. Dr. Chamberlain says:

Birth memories, if not entirely explainable, have a way of forcing themselves on us. They come in a variety of disguises such as those discovered by therapists treating nightmare, headaches, breathing problems, and phobias related to birth. Most disarming of all birth memories are those expressed by very young children.

He draws on a collection of such memories collected by a Seattle woman. He says:

Usually appearing between the ages of two and three when children begin to talk, such reports can be startling and persuasive. Put yourself in this family vignette, for example. Your two-year-old son is lounging in the bathtub. All of a sudden he says there were many things he did not understand about his birth. Why were the lights so bright when he was new, he asks. Why was the light circular and intense where he was dim elsewhere?

He poses one probing question after another. Why was the bottom half of people's faces covered by a green patch? Why did someone feel his anus with a finger, and why did they insert into his nose a tube that made a loud sucking noise? His questions turned to complaints. He didn't like the liquid put in his eyes that made it impossible for him to see, and he didn't like being put in a plastic box and taken somewhere.

This child does not know what green surgical masks, suctioning devices, surgery lights, or silver nitrate solution are. The only time he has seen these were at his own birth.

He did not find out until he had learned to talk! You start reading this book armed with strong skepticism, but you finish it filled with wonder.

FRONTIERS

Help for Costa Rica

WE have received recently the annual appeal for funds of ANAI, Inc. (asoc. de los nuevos alquimistas), the nonprofit group working in Costa Rica in behalf of the farmers and fishing undertakings in the southeast part of the country. In last year's appeal, Bill McLarney spoke of ANAI's part in helping to establish and manage the Gandoca/Manzanillo National Wildlife Refuge of Costa Rica. This year's appeal begins with an account of what the help given last year made it possible for ANAI to accomplish.

> General support funding, much of it in the form of personal contributions, enabled us to send out a mailing soliciting letters to Costa Rican officials about the ongoing destruction of the country's Atlantic coral reefs. The contributions and letters helped create a climate of urgency which in turn assisted us to attract the support of the prestigious International Union for the Conservation of Nature and Natural Resources. Not only has IUCN committed to help in the negotiations with agribusiness which are sure to come, they have also funded a scientific study of the problem which will "fingerprint" the source of sediments and chemicals harming the reefs. There is a long process ahead before we can say the reefs are "saved," but it could not have been begun without your help.

Preliminary investigations by Steve Robinson had shown that the coral reefs, extending about nine miles from Puerto Viejo to Punta Mona, were about 80 per cent dead due to silt deposition and agricultural chemicals, with much of these deposits coming from agribusiness banana plantations not in the immediate area but bracketing the region of the reefs. The issue of this sedimentation was raised by the then-president of Costa Rica. but the banana company simply defied the country's chief executive. It required an expert like Steve Robinson to diagnose the condition of the reef, as the divers were all young men who did not know what a healthy coral reef looks like. Now the struggle will be renewed. The report continues:

> Our community tree nursery program, which now reaches 1,500 farmers in 26 communities, hit a funding "valley" in 1987. Your contributions helped us keep serving these farmers, who are now organizing to build community processing plants and marketing facilities for the new crops ANAI has helped them establish.
>
> When major funding agencies were only able to provide half our projected budget for the iguana farming project, your contributions helped trainee Julio Barquero, newly returned from an iguana culture course at the Smithsonian Institute in Panama, make ends meet in the two project communities. As I write, the farmers of Kékoldi (located in the Cocles Indian Reservation) have just produced their first crop of baby iguanas.
>
> In last year's letter we mentioned the Gandoca community's desire to purchase a farm to be used as a wildlife refuge headquarters site, to focus ecological tourism and for community agricultural projects. ANAI took a risk by making a down payment on that farm. Your gifts not only helped us recover that down payment, but supported the fund-raising effort which found a donor to finish buying the farm for the community.

Now comes a particularly appealing statement—a good reason for telling about the work of ANAI:

> Those of you who have been on our list for a year or more know that ANAI is not a "membership" organization—glossy publications you won't get from us. If these tidbits have whetted your appetite for more information, we can send you our Annual Report for $5.00—or request it with your contribution. Or write for specific information on individual projects—one of our goals is to remain small enough to respond to individuals, be they Costa Rican campesinos or generous people like yourselves.
>
> We are aware as you that you cannot support every good cause that comes your way. Perhaps you are weighing a contribution to ANAI against some of the larger conservation and development charities. As we evolve, we are beginning to see that our committedly small organization, in addition to doing the things that only a small group can do, is beginning to have effect outside Talamanca. . . . within the last year we have been made aware of efforts drawing on our experience in other parts of Costa Rica, and in Honduras, Belize and Panama.

> Rather than continue to "blow our own horn," let us quote a few observations on our work. . . .
>
> Perhaps the most significant compliment we have received . . . was our nomination last year for a Right Livelihood Award. While we did not win the award, the honor was compounded when we made it onto the "short list" from which the awardees were chosen. The Right Livelihood Award, sometimes referred to as "the alternative Nobel Prize," was founded by the Swedish-German writer Jacob von Uexkull to honor "practical, replicable projects dealing with the challenges facing us . . . the corner stones of a new world which we can enjoy living in." Past w nners include High Chief Ibedul Gibbons of Palau; Petra Kelly, cofounder of the West German Greens; Dr. Wangara Maathai of the Green Belt reforestation movement in Kenya; Permaculture pioneer Bill Mollison, and Helena Norberg-Hodge of the Ladakh Ecological Development Group. The 1987 awardees were the Chipko Movement, Hans-Peter Durr, Frances Moore-Lappé and Mordechai Vanunu. It is an honor to lose to people like these. It is also something to live up to. With your help, we shall try.

Among other compliments was the statement in *Grassroots Development* that "The ANAI case clearly demonstrates the value of relatively simple technological innovations carefully tailored to specific microenvironments, a task that international centers cannot themselves do and that few national agencies achieve."

The Costa Rican Vice-Minister of Natural Resources, Carlos Quesada, has said: "There is only one serious project providing a model in Costa Rica, and that is ANAI."

Two writers, giving an evaluation of World Wildlife Fund's "Wildlands and Human Needs." said: "The fact that ANAI has courageously—and so far successfully—tackled what is a major social problem in the area and the whole Latin American region, namely land titling, deserves recognition."

The current appeal from ANAI concludes:

> This year there is a particular need for general support funds. For the last several years one of the main supporters of our agroforestry work has been the Costa Rican agency ACORDE (formerly CINDE). We are proud of this vote of confidence from a local agency, and they have been pleased with our work. However, ACORDE is prevented by internal regulations from continuing to support our work after three years. We have been told by one international agency that there are funds available to take up the slack—but they have rules, too. One of them states that we have to be registered as a Private Voluntary Organization (PVO) with the U.S. Agency for International Development USAID). Two years ago we attempted registration and were turned down because of insufficient "unrestricted funds." Put bluntly, USAID doesn't want to register a group which may go out of business next year. We can't blame them for that, even though we know we will continue to make the effort, no matter the scarcity of funds.

For more information about ANAI and its projects, write to William McLarney, 1176 Bryson City Road, Franklin, North Carolina 28734.