



AP Seminar Performance Task: Individual Research-Based Essay and Presentation

Directions and Sources Packet

January 2016

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60	Credits

Introduction

This performance task, highlighted in bold below, is one of three parts of the overall assessment for AP Seminar and one of two performance tasks. The assessment for this course is comprised of:

Team Project and Presentation

- › Component 1: Individual Research Report
- › Component 2: Written Team Report
- › Component 3: Team Multimedia Presentation and Oral Defense

Individual Research-Based Essay and Presentation

- › **Component 1: Individual Written Argument**
- › **Component 2: Individual Multimedia Presentation**
- › **Component 3: Oral Defense**

End-of-Course Exam

- › Section I, Part A: Three Short-Answer Questions (based on one source)
- › Section I, Part B: One Essay Question (based on two sources)
- › Section II: One Essay Question (based on four sources)

The attached pages include a high-level view of this performance task; information about the weighting of the task within the overall assessment and the timeline during which the task should be completed; and detailed information as to the expected quantity and quality of student work.

Also included are the stimulus materials for the task. These materials are theme-based and broadly span the academic curriculum. After reading the materials, develop a research question that suits your individual interest. Your research question must be rich enough to allow you to engage in meaningful exploration and write and present a substantive, defensible argument.

Directions

Student Version

Weight: 35% of the AP Seminar score

Task Overview

This packet includes stimulus materials for the AP Seminar Performance Assessment Task 2: Individual Research-Based Essay and Presentation. This essay should be in the form of an argument.

You must identify a research question prompted by the provided stimulus materials, gather additional information from outside sources, develop and refine an argument, write and revise your argument, and create a presentation that you will be expected to defend. Your teacher will give you a deadline for when you need to submit your written argument and presentation media. Your teacher will also give you a date on which you will give your presentation.

Task Components	Length	Date Due (fill in)
Individual Written Argument	Approximately 2000 words	
Individual Multimedia Presentation	6–8 minutes	
Oral Defense	Respond to 2 questions	

In all written work, you must:

- ▶ Acknowledge, attribute, and/or cite sources using in-text citations, endnotes, or footnotes, as well as a bibliography. You must avoid plagiarizing (see attached AP Capstone Policy on Plagiarism and Falsification or Fabrication of Information).
- ▶ Adhere to established conventions of grammar, usage, style, and mechanics.

Task Directions

1. Individual Written Argument (approximately 2000 words)

- › Read, analyze, and discuss the provided stimulus materials to identify areas for inquiry.
- › Compose a research question of your own prompted by the stimulus materials.
- › Gather additional information from outside sources through research.
- › Analyze, evaluate, and select evidence to develop a well-reasoned and well-written argument that answers the research question and conveys your perspective.

- ♦ Your research question must be inspired by one or more of the stimulus materials. Your essay must refer to and incorporate at least one of these documents.
- ♦ As part of your research, you must find outside sources, including peer-reviewed academic work, that will supply the evidence for your argument. You must locate these sources independently.
- ♦ During your research process, revisit your original research question. Ensure that the evidence you gather addresses your original purpose and focus. Refine your research process, or your research question, as needed to make sure that your evidence aligns with your research question and supports your argument.
- ♦ Your written argument must identify opposing or alternate views and consider their implications and/or limitations as well as the consequences and implications of one or more resolutions, conclusions, or solutions that you suggest.

2. Individual Multimedia Presentation (6–8 minutes)

Develop a presentation that conveys your key findings and deliver it to an audience of your peers. The presentation and the media used to enhance the presentation should consider audience, context, and purpose. The presentation should reflect the major components of your written argument. Engage your audience using appropriate strategies (e.g., eye contact, vocal variety, expressive gestures, movement).

- › Use effective visual design elements to engage your audience and illustrate your points.
- › Use appropriate communication strategies. Do not read directly from your paper, slides, or a script. Instead, interact with visuals or other supporting elements. Rehearse your commentary in advance and prepare notecards or an outline that you can quickly reference as you are speaking.
- › Make explicit connections between the evidence you choose and claims about your key findings.
- › Situate your perspective within a larger context.

3. Individual Oral Defense (two questions)

Defend your research process, use of evidence, and conclusion(s), solution(s), or recommendation(s) through oral answers to two questions asked by your teacher. (See list of sample defense questions on the following page.)

Sample Oral Defense Questions

Here are some examples of the types of questions your teacher might ask you during your oral defense. These are *examples only*; your teacher may ask you different questions, but there will still be one question that relates to each of the two categories below.

1. Source selection and use

- › How did the stimulus materials inspire your original research? Which stimulus material(s) prompted your research question?
- › What information did you need before you began your research, and how did that information shape your research?
- › What evidence did you gather that you didn't use? Why did you choose not to use it?
- › How valid and reliable are the sources you used? How do you know? Which sources didn't work?
- › How did you select the strategies you used to gather information or conduct research? Were they effective?
- › How did your research question evolve as you moved through the research process? Did your research go in a different direction than you originally planned/hypothesized?
- › What information did you need that you weren't able to find or locate? How did you go about trying to find that information?
- › How did you handle differing perspectives in order to reach a conclusion?

2. Extending argumentation through effective questioning and inquiry

- › What additional questions emerged from your research? Why are these questions important?
- › What advice would you have for other researchers who consider this topic?
- › What might be the real-world implications or consequences (influence on others' behaviors or decision-making processes) of your findings? What are the implications to your community?
- › If you had more time, what additional research would you conduct related to this issue?
- › Explain the level of certainty you have about your conclusion, solution, or recommendation.
- › How does your conclusion respond to any of the other research or sources you examined?
- › How did you use the conclusions and questions of others to advance your own research?

AP Capstone Policy on Plagiarism and Falsification or Fabrication of Information

Participating teachers shall inform students of the consequences of plagiarism and instruct students to ethically use and acknowledge the ideas and work of others throughout their course work. The student's individual voice should be clearly evident, and the ideas of others must be acknowledged, attributed, and/or cited.

A student who fails to acknowledge the source or author of any and all information or evidence taken from the work of someone else through citation, attribution, or reference in the body of the work, or through a bibliographic entry, will receive a score of 0 on that particular component of the AP Seminar and/or AP Research Performance Assessment Task. In AP Seminar, a team of students that fails to properly acknowledge sources or authors on the Written Team Report will receive a group score of 0 for that component of the Team Project and Presentation.

A student who incorporates falsified or fabricated information (e.g., evidence, data, sources, and/or authors) will receive a score of 0 on that particular component of the AP Seminar and/or AP Research Performance Assessment Task. In AP Seminar, a team of students that incorporates falsified or fabricated information in the Written Team Report will receive a group score of 0 for that component of the Team Project and Presentation.

Vanishing Voices

By Russ Rymer

Photographs by Lynn Johnson

From *National Geographic*, July 2012

One language dies every 14 days. By the next century nearly half of the roughly 7,000 languages spoken on Earth will likely disappear, as communities abandon native tongues in favor of English, Mandarin, or Spanish. What is lost when a language goes silent?



Johnny Hill, Jr., of Parker, Arizona, is one of the last speakers of Chemehuevi, an endangered Native American language: "It's like a bird losing feathers. You see one float by, and there it goes—another word gone."

TUVAN

THE COMPASSION OF KHOJ ÖZEERI



ONE MORNING in early fall Andrei Mongush and his parents began preparations for supper, selecting a black-faced, fat-tailed sheep from their flock and rolling it onto its back on a tarp outside their livestock paddock. The Mongush family's home is on the Siberian taiga, at the edge of the endless steppes, just over the horizon from Kyzyl, the capital of the Republic of Tuva, in the Russian Federation. They live near the geographic center of Asia, but linguistically and personally, the family inhabits a borderland, the frontier between progress and tradition. Tuvans are historically nomadic herders, moving their *aal*—an encampment of yurts—and their sheep and cows and reindeer from pasture to pasture as the seasons progress. The elder Mongushes, who have returned to their rural *aal* after working in the city, speak both Tuvan and Russian. Andrei and his wife also speak English, which they are teaching themselves with pieces of paper labeled in English pasted onto seemingly every object in their modern kitchen in Kyzyl. They work as musicians in the Tuvan National Orchestra, an ensemble that uses traditional Tuvan instruments and melodies in symphonic arrangements. Andrei is a master of the most characteristic Tuvan music form: throat singing, or *khöömei*.

When I ask university students in Kyzyl what Tuvan words are untranslatable into English or Russian, they suggest *khöömei*, because the singing is so connected with the Tuvan environment that only a native can understand it, and also *khøj özeeri*, the Tuvan method of killing a sheep. If slaughtering livestock can be seen as part of humans' closeness to animals, *khøj özeeri* represents an unusually intimate version. Reaching through an incision in the sheep's hide, the slaughterer severs a vital artery with his fingers, allowing the animal to quickly slip away without alarm, so peacefully that one must check its eyes to see if it is dead. In the language of the Tuvan people, *khøj özeeri* means not only slaughter but also kindness, humaneness, a ceremony by which a family can kill, skin, and butcher a sheep, salting its hide and preparing its meat and making sausage with the saved blood and cleansed entrails so neatly that the whole thing can be accomplished in two hours (as the Mongushes did this morning) in one's good clothes without spilling a drop of blood. *Khøj özeeri* implies a relationship to animals that is also a measure of a people's character. As one of the students explained, "If a Tuvan killed an animal the way they do in other places"—by means of a gun or knife—"they'd be arrested for brutality."

Tuvan is one of the many small languages of the world. The Earth's population of seven billion people speaks roughly 7,000 languages, a statistic that would seem to offer each living language a healthy one million speakers, if things were equitable. In language, as in life, things aren't. Seventy-eight percent

of the world's population speaks the 85 largest languages, while the 3,500 smallest languages share a mere 8.25 million speakers. Thus, while English has 328 million first-language speakers, and Mandarin 845 million, Tuvan speakers in Russia number just 235,000. Within the next century, linguists think, nearly half of the world's current stock of languages may disappear. More than a thousand are listed as critically or severely endangered—teetering on the edge of oblivion.

In an increasingly globalized, connected, homogenized age, languages spoken in remote places are no longer protected by national borders or natural boundaries from the languages that dominate world communication and commerce. The reach of Mandarin and English and Russian and Hindi and Spanish and Arabic extends seemingly to every hamlet, where they compete with Tuvan and Yanomami and Altaic in a house-to-house battle. Parents in tribal villages often encourage their children to move away from the insular language of their forebears and toward languages that will permit greater education and success.

Who can blame them? The arrival of television, with its glamorized global materialism, its luxury-consumption proselytizing, is even more irresistible. Prosperity, it seems, speaks English. One linguist, attempting to define what a language is, famously (and humorously) said that a language is a dialect with an army. He failed to note that some armies are better equipped than others. Today any language with a television station and a currency is in a position to obliterate those without, and so residents of Tuva must speak Russian and Chinese if they hope to engage with the surrounding world. The incursion of dominant Russian into Tuva is evident in the speaking competencies of the generation

of Tuvans who grew up in the mid-20th century, when it was the fashion to speak, read, and write in Russian and not their native tongue.

Yet Tuvan is robust relative to its frailest counterparts, some of which are down to a thousand speakers, or a mere handful, or even one individual. Languages like Wintu, a native tongue in California, or Siletz Dee-ni, in Oregon, or Amurdak, an Aboriginal tongue in Australia's Northern Territory, retain only one or two fluent or semifluent speakers. A last speaker with no one to talk to exists in unspeakable solitude.

Increasingly, as linguists recognize the magnitude of the modern language die-off and rush to catalog and decipher the most vulnerable tongues, they are confronting underlying questions about languages' worth and utility. Does each language have boxed up within it some irreplaceable beneficial knowledge? Are there aspects of cultures that won't survive if they are translated into a dominant language? What unexpected insights are being lost to the world with the collapse of its linguistic variety?

Fortunately, Tuvan is not among the world's endangered languages, but it could have been. Since the breakup of the Soviet Union, the language has stabilized. It now has a well-equipped army—not a television station, yet, or a currency, but a newspaper and a respectable 264,000 total speakers (including some in Mongolia and China). Yet Tofa, a neighboring Siberian language, is down to some 30 speakers. Tuvan's importance to our understanding of disappearing languages lies in another question linguists are struggling to answer: What makes one language succeed while another dwindles or dies?

TUVAN Language

Russia

Number of Speakers

235,000



[artyštaar]

To burn juniper | to purify

A Tuvan shaman cleanses the house of a deceased relative's spirit using smoke from burning juniper to chase away darkness. The incense fills the room as the family ask the spirits of hearth and home to protect them.



[songgaar]

go back | the future

[burungaar]

go forward | the past

Tuvans believe the past is ahead of them while the future lies behind. The children who flock to this bungee-cord ride outside the National Museum of Tuva look to the future, but it's behind them, not yet seen.



TUVAN

[ezenggileer]

to stirrup | to sing with the rhythms of riding a horse

The words used to describe styles of throat singing—an art among Tuvan herders—perfectly capture their distinctive sounds. Ezenggileer evokes the pulsing rhythms of galloping on a horse.

**[khei-àt]**

air horse | a spiritual place within

Ai-Xaan Oorzhak throat sings and plays the igil, or horse-head fiddle, with bow techniques like “make horse walk.” Singers use the term “air horse” to describe the spiritual depths they draw from to produce the harmonic sounds.



TUVAN

[anayim]

my little goat

Aidyng Kyrgys caresses his newborn baby girl, whom he refers to using this tender term of endearment. The arrival of an infant is cause for a celebration and feasting for the whole family at their tiny log house.



[ak byzaa]

white calf, less than one year

Raising sheep, yaks, and goats on the Siberian steppe is so central to Tuvan life that the vocabulary for livestock is embedded with detailed information about each animal's age, gender, fertility, coloration.

AKA

THE RESPECT OF MUCROW



I WITNESSED the heartrending cost of broken languages among the Aka people in Palizi, a tiny, rustic hamlet perched on a mountainside in Arunachal Pradesh, India's rugged northeasternmost state. It is reachable by a five-hour drive through palm and hardwood jungles on single-track mountain roads. Its one main street is lined with unpainted board-faced houses set on stilts and roofed with thatch or metal. Villagers grow their own rice, yams, spinach, oranges, and ginger; slaughter their own hogs and goats; and build their own houses. The tribe's isolation has bred a radical self-sufficiency, evidenced in an apparent lack of an Aka word for job, in the sense of salaried labor.

The Aka measure personal wealth in mithan, a breed of Himalayan cattle. A respectable bride price in Palizi, for instance, is expressed as eight mithan. The most cherished Aka possession is the precious *tradzy* necklace—worth two mithan—made from yellow stones from the nearby river, which is passed down to their children. The yellow stones for the *tradzy* necklaces can no longer be found in the river, and so the only way to have a precious necklace is to inherit one.

Speaking Aka—or any language—means immersing oneself in its character and concepts. “I’m seeing the world through

the looking glass of this language,” said Father Vijay D’Souza, who was running the Jesuit school in Palizi at the time of my visit. The Society of Jesus established the school in part because it was concerned about the fragility of the Aka language and culture and wanted to support them (though classes are taught in English). D’Souza is from southern India, and his native language is Konkani. When he came to Palizi in 1999 and began speaking Aka, the language transformed him.

“It alters your thinking, your worldview,” he told me one day in his headmaster’s office, as children raced to classes through the corridor outside. One small example: *mucrow*. A similar word in D’Souza’s native language would be an insult, meaning “old man.” In Aka “mucrow” means something more. It is a term of respect, deference, endearment. The Aka might address a woman as *mucrow* to indicate her wisdom in civic affairs, and, says D’Souza, “an Aka wife will call her husband *mucrow*, even when he’s young,” and do so affectionately.

American linguists David Harrison and Greg Anderson have been coming to Arunachal Pradesh to study its languages since 2008. They are among the scores of linguists worldwide engaged in the study of vanishing languages. Some have academic and institutional affiliations (Harrison and Anderson are both connected with National Geographic’s Enduring Voices Project), while others may work for Bible societies that translate Scripture into new tongues. The authoritative index of world languages is *Ethnologue*, maintained by SIL International, a faith-based organization.

The researchers' intent may be hands-off, to record a grammar and lexicon before a language is lost or contaminated, or it may be interventionist, to develop a written accompaniment for the oral language, compile a dictionary, and teach native speakers to write.

Linguists have identified a host of language hotspots (analogous to biodiversity hotspots) that have both a high level of linguistic diversity and a high number of threatened languages (see map, page 24). Many of these are in the world's least reachable, and often least hospitable, places—like Arunachal Pradesh. Aka and its neighboring languages have been protected because Arunachal Pradesh has long been sealed off to outsiders as a restricted border region. Even other Indians are not allowed to cross into the region without federal permission, and so its fragile microcultures have been spared the intrusion of immigrant labor, modernization—and linguists. It has been described as a black hole of linguistics because its incredible language variety remains so little explored.

Much of public life in Palizi is regulated through the repetition of mythological stories used as forceful fables to prescribe behavior. Thus a money dispute can draw a recitation about a spirit whose daughters are eaten by a crocodile, one by one, as they cross the river to bring him dinner in the field. He kills the crocodile, and a priest promises to bring the last daughter back to life but overcharges so egregiously that the spirit seeks revenge by becoming a piece of ginger that gets stuck in the greedy priest's throat.

Such stories were traditionally told by the elders in a highly formal version of Aka that the young did not yet understand and according to certain rules, among them this: Once an elder begins telling

a story, he cannot stop until the story is finished. As with linguistic literacy, disruption is disaster. Yet Aka's young people no longer follow their elders in learning the formal version of the language and the stories that have governed daily life. Even in this remote region, young people are seduced away from their mother tongue by Hindi on the television and English in the schools. Today Aka's speakers number fewer than 2,000, few enough to put it on the endangered list.

One night in Palizi, Harrison, Anderson, an Indian linguist named Ganesh Murmu, and I sat cross-legged around the cooking fire at the home of Pario Nimasow, a 25-year-old teacher at the Jesuit school. A Palizi native, Nimasow loved his Aka culture even as he longed to join the outside world. In his sleeping room in an adjacent hut was a television waiting for the return of electricity, which had been out for many months thanks to a series of landslides and transformer malfunctions. After dinner Nimasow disappeared for a moment and came back with a soiled white cotton cloth, which he unfolded by the flickering light of the cooking fire. Inside was a small collection of ritual items: a tiger's jaw, a python's jaw, the sharp-toothed mandible of a river fish, a quartz crystal, and other objects of a shaman's sachet. This sachet had belonged to Nimasow's father until his death in 1991.

"My father was a priest," Nimasow said, "and his father was a priest." And now? I asked. Was he next in line? Nimasow stared at the talismans and shook his head. He had the kit, but he didn't know the chants; his father had died before passing them on. Without the words, there was no way to bring the artifacts' power to life.

LINGUISTICS HAS UNDERGONE two great revolutions in the past 60 years, on seemingly opposite ends of the discipline. In the late 1950s Noam Chomsky theorized that all languages were built on an underlying universal grammar embedded in human genes. A second shift in linguistics—an explosion of interest in small and threatened languages—has focused on the variety of linguistic experience. Field linguists like David Harrison are more interested in the idiosyncrasies that make each language unique and the ways that culture can influence a language’s form. As Harrison points out, some 85 percent of languages have yet to be documented. Understanding them can only enrich our comprehension of what is universal to all languages.

Different languages highlight the varieties of human experience, revealing as mutable aspects of life that we tend to think of as settled and universal, such as our experience of time, number, or color. In Tuva, for example, the past is always spoken of as ahead of one, and the future is behind one’s back. “We could never say, I’m looking forward to doing something,” a Tuvan told me. Indeed, he might say, “I’m looking forward to the day before yesterday.” It makes total sense if you think of it in a Tuvan sort of way: If the future were ahead of you, wouldn’t it be in plain view?

Smaller languages often retain remnants of number systems that may predate the adoption of the modern world’s base-ten counting system. The Pirahã, an Amazonian tribe, appear to have no words for any specific numbers at all but instead get by with relative words such as “few” and “many.” The Pirahã’s lack of numerical terms suggests that assigning numbers may be an invention of culture rather than an innate part of human cognition. The interpretation of

color is similarly varied from language to language. What we think of as the natural spectrum of the rainbow is actually divided up differently in different tongues, with many languages having more or fewer color categories than their neighbors.

Language shapes human experience—our very cognition—as it goes about classifying the world to make sense of the circumstances at hand. Those classifications may be broad—Aka divides the animal kingdom into animals that are eaten and those that are not—or exceedingly fine-tuned. The Todzhu reindeer herders of southern Siberia have an elaborate vocabulary for reindeer; an *iyi düktüg myiys*, for example, is a castrated former stud in its fourth year.

If Aka, or any language, is supplanted by a new one that’s bigger and more universally useful, its death shakes the foundations of the tribe. “Aka is our identity,” a villager told me one day as we walked from Palizi down the path that wound past the rice fields to the forests by the river. “Without it, we are the general public.” But should the rest of the world mourn too? The question would not be an easy one to frame in Aka, which seems to lack a single term for world. Aka might suggest an answer, though, one embodied in the concept of *mucrow*—a regard for tradition, for long-standing knowledge, for what has come before, a conviction that the venerable and frail have something to teach the callow and the strong that they would be lost without.

AKA Language

India

Number of Speakers

1,000-2,000



[tradzy]

a necklace of yellow stone beads

The Aka have more than 26 words to describe beads. Beyond being objects of adornment, beads are status symbols and currency. This toddler will get this necklace at her wedding.



[shobotro vyew]

to calculate bride price using twigs

The price for an Aka marriage is negotiated with bamboo sticks. The groom's side lays down a number representing money and gifts, and the bride's family counteroffers. Families can haggle for months using the same sticks.



AKA

[chofe gidego]

is looking at liver

A marriage is not recognized until after the ritual slaughter of a mithan, a type of cattle, when its liver can be read. The verdict: A small spot might signal an accident in the couple's future but otherwise a happy life.



[nichleu-nuggo]

village counselor | wise, compassionate, tolerant

Govardhan Nimasow is a rich man who married eight wives, fathered 26 children, and owns one of the few concrete houses in his village. But his status as a nichleu-nuggo also means he possesses humility and wisdom.

SERI

THE WISDOM OF THE HANT IIHA CÖHACOMXOJ



THE ONGOING collapse of the world's biodiversity is more than just an apt metaphor for the crisis of language extinction. The disappearance of a language deprives us of knowledge no less valuable than some future miracle drug that may be lost when a species goes extinct. Small languages, more than large ones, provide keys to unlock the secrets of nature, because their speakers tend to live in proximity to the animals and plants around them, and their talk reflects the distinctions they observe. When small communities abandon their languages and switch to English or Spanish, there is a massive disruption in the transfer of traditional knowledge across generations—about medicinal plants, food cultivation, irrigation techniques, navigation systems, seasonal calendars.

The Seri people of Mexico were traditionally seminomadic hunter-gatherers living in the western Sonoran Desert near the Gulf of California. Their survival was tied to the traits and behaviors of the species that live in the desert and the sea. An intimate relationship with the plant and animal worlds is a hallmark of the Seris' life and of their language, Cmiique Iitom.

Traditionally the Seris, who refer to themselves as the Comcaac, had no

fixed settlements, so their locale of the moment depended on what part of the desert offered the most food, whether the cactus fruit was ripe on the mountainside or the eelgrass was ready to harvest in the bay. Today they reside in two settlements, Punta Chueca and El Desemboque, each a small covey of concrete-block homes set in the vast red, seemingly empty desert beside the gulf. The homes are surrounded by rows of thorny ocotillo canes stuck into the sand, where they've taken root as living fences.

Each day, Armando Torres Cubillas sits in the corner of his open-air, beachside atelier in El Desemboque, his crippled legs curled under him on the sandy ground, carving sea turtles from dark desert ironwood. Occasionally, if he's in the mood, he gazes out over the gulf and eases the artisanship with a song that relates the operatic story of a conversation between the small beach clam *taijitiquiixaz* and the mole crab. The verse is typical of songs of the Seri tribe: a celebration of nature, tinged with loss.

The Seris see their language as a defining characteristic, a seed of their identity. One Seri told me of a "local expression" that says everyone has a flower inside, and inside the flower is a word. A Seri elder, Efraín Estrella Romero, told me, "If one child is raised speaking Cmiique Iitom and another speaking Spanish, they will be different people."

When American linguists Edward Moser and Mary Beck Moser came to live with the Seris in 1951 in El Desemboque, the group's fortunes were at a low ebb—outbreaks of measles and influenza had reduced their numbers to a couple hundred. It was a propitious time for the

researchers, though, because the group's culture hadn't yet been co-opted by the majority culture surrounding it. Mary Moser served the tribe as nurse and midwife. After many births, per custom, the families gave her a dried piece of their infants' umbilical cords, which Mary kept protected in a "belly button pot." They also gave her their long, eight-plait braids, markers of Indian identity that the men felt compelled to chop off when they traveled to Mexican towns. The braids were like cultural umbilical cords, severed connections between what was old and what was new, evidence of the broken link.

The Mosers had a daughter, Cathy, who grew up among the Seris in El Desemboque and became a graphic artist and ethnographer. She and her husband, Steve Marlett, a linguist with SIL International and the University of North Dakota, have continued the Mosers' study of the Seri language. Today the community has rebounded to somewhere between 650 and 1,000 speakers. They have managed to hang on to their language, thanks in part to their hostility to the majority culture of Mexico. Steve Marlett diplomatically refers to this in one academic paper as "the general lack of cultural empathy between the Seri population and the Spanish-speaking population." In 1773 they killed a priest who tried to establish a mission. The Vatican did not send a follow-up, and the tribe was never Catholicized.

The Seris maintain to this day a proud suspicion of outsiders—and a disdain for unshared individual wealth. "When the Seris become rich, they will cease to exist" is a Seri saying. Having been nomadic, they tend to regard possessions as burdens. Traditionally, when a Seri died, he was buried with his few personal possessions. Nothing was passed down to relatives except stories, songs, legends, instructions.

What modern luxuries the Seris have adopted are imported without their Spanish names. Automobiles, for instance, have provoked a flurry of new words. A Seri car muffler is called *ihúisaxim an hant yaait*, or into which the breathing descends, and the Seri term for distributor cap associates it with an electric ray that swims in the Gulf of California and gives you a shock. Such words are like ocotillo canes stuck into the sand: The Cmiique Iitom lexicon is alive, and as it grows, it creates a living fence around the culture.

Sitting in the shade of an awning in front of his house, René Montaña told me stories of an ancient race of giants who could step over the sea from their home on Tiburon Island to the mainland in a single stride. He told me of *hant iiha cōhacomxoj*, those who have been told about Earth's possessions, all ancient things. "To be told" entails an injunction: Pass it on. Thanks to that, we have all become inheritors of the knowledge enshrined within Cmiique Iitom. Folk sayings and often even single words encase centuries of close observation of species that visiting scientists have only begun to study in recent decades.

Cmiique Iitom has terms for more than 300 desert plants, and its names for animals reveal behaviors that scientists once considered far-fetched. The Seri word for harvesting eelgrass clued scientists in to the sea grass's nutritional merits. (Its protein content is about the same as wheat's.) The Seris call one sea turtle *moosni hant cooit*, or green turtle that descends, for its habit of hibernating on the floor of the sea, where the traditional fishermen used to harpoon it. "We were skeptical when we first learned from the Seri Indians of Sonora, Mexico, that some *Chelonia* are partially buried on the sea floor during the colder months," stated a 1976 paper in *Science* documenting the behavior. "However,

the Seri have proved to be highly reliable informants.” The Seris enjoyed eating sea turtles but not leatherbacks, for a simple reason. Leatherbacks, they say, understand their language and are Seri themselves. In 2005 the Seri name for shark, *hacat*, became the official name for a newly discovered species of smooth-hound shark, *Mustelus hacat*. Newly discovered by modern scientists, that is—the Seris had been aware of them for years.

The Seri language is what linguists call an isolate, though a better term might be “sole survivor.” “The Seris are a window into a lost world of gulf peoples,” Steve Marlett says, referring to the extensive family of potentially linguistically linked groups who once inhabited both coasts of the Gulf of California. “Many others are gone,” he says, and worse, gone before they could be documented. One remaining key to the nearly vanished cultures is Cmique Iitom.

ONE WAY TO PRESERVE a language is to enshrine it in writing and compile a dictionary. Linguists both love and fear the prospect of inventing scripts for languages that are usually verbal only. Fear because the very idea of an alphabet changes the language the alphabet is meant to preserve and converts the linguist from observer to activist. David Harrison and Greg Anderson compiled the first Tuvan-English dictionary and are proud of the excitement the volume elicited from native speakers. Steve and Cathy Marlett worked until 2005 finishing a Cmique Iitom dictionary begun by her parents in 1951. Steve remembers the day René Montaña asked, “Can I show you how I write?” and demonstrated a way of dividing words that had not occurred to the linguist before. The revelation meant revising years of work. But Marlett was delighted, because the project was enlisting native Seri speakers

into diagnosing and defining their own language.

The cataloging of vocabulary and pronunciation and syntax that field linguists do in remote outposts helps keep a language alive. But saving a language is not something linguists can accomplish, because salvation must come from within. The answer may lie in something Harrison and Anderson witnessed in Palizi one day, when a villager in his early 20s came with a friend to perform a song for them. Palizi is far removed from pervasive U.S. culture, so it was something of a surprise to the two linguists when the teenagers launched into a full-bore, L.A.-style rap song complete with gang hand gestures and head bobbing and attitude, a pitch-perfect rendition of an American street art, with one refinement: They were rapping in Aka.

Were the linguists dismayed? I asked. To the contrary, Harrison said. “These kids were fluent in Hindi and English, but they chose to rap in a language they share with only a couple thousand people.” Linguistic co-optation and absorption can work both ways, with the small language sometimes acting as the imperialist. “The one thing that’s necessary for the revival of a language,” Father D’Souza told me one day, “is pride.”

Against the erosion of language stands an ineffable quality that can’t be instilled from without: someone’s insistence on rapping in Aka, on singing in Tuvan, on writing in the recently orthographized Cmique Iitom. The Mosers’ and Marletts’ dictionary initiative has given birth to a new profession in Seriland: scribe. Several booklets have been authored by Seris. The Marletts hope the number of volumes will reach 40, one threshold, it is believed, for enticing people to maintain literacy in a language (though some put the number much higher).

The interest is already there. The Marletts had a regular visitor when they were living in El Desemboque, a young boy who would come each day to pore over a Cmiique Iitom booklet. One day he arrived, and the Marletts explained they'd lent it to someone else. "He just burst into uncontrollable tears," Steve remembers.

The spread of global culture is unstoppable. Kyzyl, a capital city that never had a railroad connect it to the rest of Russia, will get one in the next few years. In El Desemboque power lines have been run through the desert to drive an electric pump for a municipal well. And in Arunachal Pradesh a new hydroelectric dam has been completed, ensuring the village of Palizi better access to electricity, refrigeration, and television.

To be involved in the plight of vanishing languages, even just as a journalist, is to contemplate the fragility of tribal life. Since my visits over the past two years to Palizi and Kyzyl and Seriland, Efraín Estrella died of pancreatitis, and young Pario Nimasow, who unwrapped his father's shaman's kit for me and wondered what its contents might mean, was killed in a landslide. A week after I wrote the paragraph describing Armando Torres's daily singing, I received an email from Cathy Marlett. "Sad news," its subject line read. Torres had died of a heart attack at 67, in his place by the beach in El Desemboque.

Their mortality is a reminder of the mortality of their cultures, an intimation that with each speaker's death another vital artery has been severed. Against that—against the possibility that their language could slip away without alarm or notice—stands a proud perseverance, a reverence for the old, an awareness that in important ways a key to our future lies behind us. That, and an insistence that the tongues least spoken still have much to say.

SERI Language

Mexico

Number of Speakers

650-1,000



[ziix quih haasax haaptxö quih áno cöcacaixaj]

one who strongly greets with joy/peace/harmony

There is no greeting among the Seris akin to a handshake or wave. But Josué Robles Barnett demonstrates a gesture that used to be performed when arriving in a strange community to convey you meant no harm.



[hant iiha cöhacomxoj]

ones who have been told the ancient things

She's blind and nearly deaf, but Isabel Chavela Torres still passes on traditional knowledge. The Seri names for species in the Sonoran Desert and Gulf of California reveal behaviors scientists have only recently begun to discover.



SERI

[hepem cöicooit]

one who dances like the white-tailed deer

Chavela's grandson Jorge Luis Montaña Herrera shakes gourd rattles and assumes the identity of a deer. Just as his grandmother once sang him traditional melodies, he now wants to teach the deer dance to Seri children.



[ziix hacx tij catax]

thing that moves on its own

As modern inventions like cars enter their world, the Seris tend to adapt their language rather than import Spanish words. Erica Barnett uses an abandoned car as a hothouse to grow mangroves to replenish an estuary.



SERI

[atcz | azaac]

daughter of a parent's younger sibling | daughter of
a parent's older sibling

The Seris have more than 50 terms for kinship relationships, such as between these two cousins, many specific to the gender and birth order of the relative. A woman uses a different word for father than a man does.

**[Miixöni quih zó hant ano tiij?]**

Where is your placenta buried?

This is how the Seris ask, Where are you from? Those who were born before hospital births know the exact spot where their afterbirth was placed in the ground, covered in sand and ash, and topped with rocks.

LAST SPEAKERS



EUCHEE Language

Oklahoma

K'asA Henry Washburn, 86, is one of only four fluent speakers of Euchee left. Every day he drives ten miles from his home in West Tulsa to the Euchee Language House, where children are learning their native tongue. As a result, Euchee students sometimes get in trouble again for speaking their ancestral language in school. Richard Grounds, director of the project that is recording Washburn's memories, calls him a "living dictionary."



WINTU Language

California

Caleen Sisk is the spiritual leader and tribal chief of the Winnemem Wintu tribe—and a last speaker of the language that sustains her people's identity. For more than a hundred years tribal members have been fighting with the U.S. government over their territory along the McCloud River, abutting Mount Shasta, which they consider their birthplace. Loss of land and loss of language are connected, says Sisk. "This land is our church."

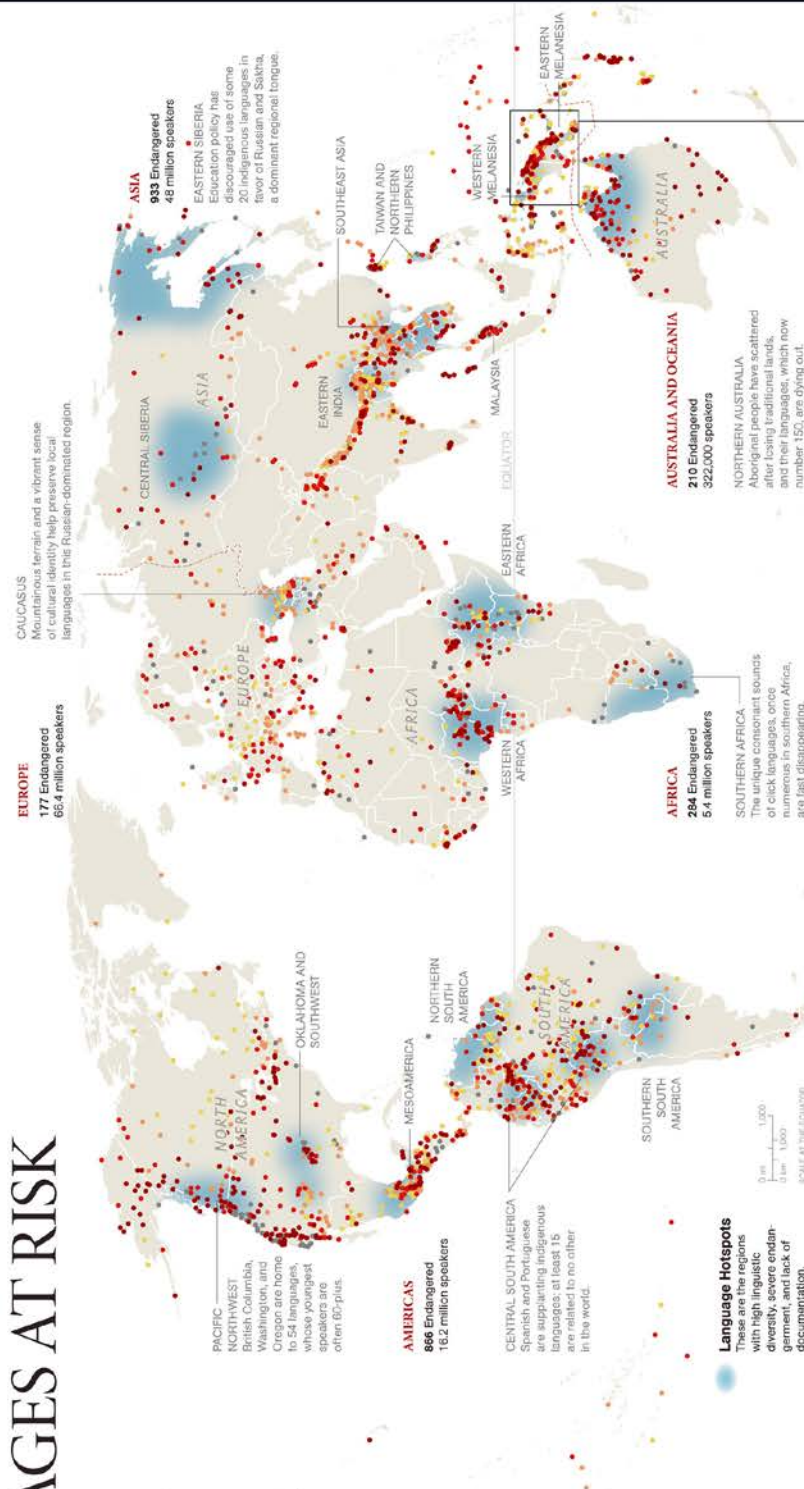
LANGUAGES AT RISK

Language follows power. In an increasingly globalized and homogenized era, languages that dominate world communication and commerce jump geographical borders and push smaller languages toward extinction. Linguists have identified hotspots where revitalization efforts could be targeted, before many native tongues fade away forever.

Threat Level
UNESCO rates the world's languages by degree of intergenerational usage: 2,724 are endangered or extinct.

- **Critical: 607**
Spoken rarely and only by older generations
- **Severe: 554**
Spoken only by older generations
- **Definite: 681**
Replaced as mother tongue by new language
- **Vulnerable: 628**
Spoken by children but rarely outside the home
- **Extinct: 254 languages**
No speakers since 1950

Language Hotspots
These are the regions with high linguistic diversity, severe endangerment, and lack of documentation.



First-Language Speakers (in millions)



Dominant Languages
Nearly half of the world speaks a top-ten language. The smallest 3,524 languages, spoken by fewer than 10,000 people each, are used by just 0.1 percent of the world's population.

VIRGINIA W. MASON, AGU STAFF; MARTY SCHAUER
SOURCES: LIVING TONGUES INSTITUTE
FOR THE ENDANGERED LANGUAGES, UNESCO;
SI, INTERNATIONAL

Highest Diversity

Split between Indonesia and Papua New Guinea, this island is home to nearly a thousand languages, about one-seventh of the world's total. Most are spoken by small populations in isolated pockets.

- Nonendangered, unique spoken language



“Chapter XVI: The Life of the Peasants,” from *Life on a Mediaeval Barony* (Harper & Brothers, 1922)

Chapter XVI: The Life of the Peasants.



THUS have been seen Messire Conon and his familiars in their pleasures, feasts, and wars. The gentle folk seem to monopolize all the life of the barony. Yet at best they number scarce one in a hundred of all the Christians who dwell therein. Assuredly the poor and humble seem much less interesting and command less attention. They have no splendors, no picturesque fêtes or feuds. A life of monotonous poverty seldom detains the chronicler; nevertheless, it is time to visit the village of huts so often seen spreading beyond the bridge to the west of the castle.

The St. Aliquis peasants are told that they have naught whereof to complain. They have a kindly seigneur who “renders justice.” Since the Foretvert feud, no war has ravaged them. The saints of late have sent neither short crops nor pestilence. To repine against their lot is ingratitude toward God.

There is abundant class consciousness in the Feudal Ages. Clerks, knights, peasants—every man knows to which of the three great categories of humanity he belongs, and acts accordingly.

A monkish preacher¹ pictures the world as a vast body whereof the clerics are the eyes, for they show

¹ This cleric, Jacques of Vitry, may have written a few years later than the presumable date of this narrative, but it represents entirely the orthodox viewpoint of A.D. 1220.

Life on a Mediaeval Barony

to all men the way to safety; the noble knights the hands and arms, for God orders them to protect the Church and the weak and to promote peace and justice; finally the common people (*minores*) form the lower parts of the body—it is their business to nourish the eyes and limbs. More bluntly still, as long ago as about A.D. 1000, Bishop Adelberon of Laon had divided mankind into two great divisions—first, the clergy who prayed and the seigneurs who fought; second, the toilers; adding that “to furnish all with gold, food, and raiment—such is the obligation of the servile class.”

Since these classes are clearly ordained of Heaven, to rebel against one's status is manifestly questioning the justice of Providence—a damnable impiety.

Few of the St. Aliquis peasants ever dream of being anything but villeins. They regard gentlefolk somewhat as good Christians regard angels—as beings of another sphere. All they hope for is kindly treatment and modest prosperity within the limits providentially assigned them. Therefore, they are not too unhappy.

If we go up and down France we shall find the rural population decidedly dense.¹ One little village usually follows another closely and every collection of huts swarms with human bipeds. There are, indeed, vast forests and marshes which might with better management be put under the plow, but the extent of arable land is great. Heaven surely loves the peasants, it has made so many of them. Seemingly their number is limited merely by the question of food supply.

¹ It has been estimated that the rural population of France in the thirteenth century was almost as great as in the twentieth. There was probably a decided falling off, in the fourteenth century, thanks to the Black Death (1348) and the ravages of the Hundred Years' War.

Danger of Great Famines

If the condition of the peasantry often seems bad, it is comforting to know that for the last two centuries it has been improving. Not for many years have matters



GROUP OF PEASANTS AND OF SHEPHERDS
(Twelfth century), from a window in the cathedral of Chartres.

in the St. Aliquis region been as they were in some parts of France during the terrible famine of 1030–32. At that time we are told that the poor devoured grass, roots and even white clay. Their faces were pale, their bodies lean, their stomachs bloated, “their voices thin and piping like the voice of birds.” Wolves came out of forests and fed on children. Strangers and travelers were liable to be waylaid in solitary spots and killed simply that they might be eaten. Near Macon a “hermit” at last was seized who had lured wayfarers to share the hospitality of his cell. The skulls of forty-eight victims were there discovered, after which they burned the wretch alive.

You can go on multiplying stories about famines—

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how human flesh at times was sold in markets; how starving children were lured by the offers of a bit of food to places where ghouls could kill and feast on them; how a measure of corn rose to sixty sous in gold; and how even the very rich “lost their color.” These days, thanks be to the saints, seem disappearing; yet the danger of pinching hard times is still a real one, even in fortunate St. Aliquis.¹

The peasants of Messire Conon are free. The serfs of the barony had been manumitted about a hundred years earlier, by a baron who (after an extremely iniquitous life) was admonished on his deathbed by his confessor that he must do something extraordinary for the salvation of his soul.² As a result the St. Aliquis peasants were no longer bound to the soil and could quit the seigneurie—as serfs assuredly could not do. They could also marry any women they wished without asking their lord’s consent or paying him a fee. They could bequeath their goods without having him sequester an outrageous part. All this, of course, improved their status, yet they were still subject to numerous imposts in money and kind, and to various forms of forced labor. Although they had now the legal right to quit the barony, only with the greatest difficulty could they sell their little farms and chattels thereon, so they could take a decent share of their possessions elsewhere; and

¹ By 1220 these wholesale famines were really becoming matters of tradition, thanks to better transportation and better methods of agriculture. Very lean years, almost ruinous to the peasantry, remained, however, as extremely grim possibilities.

² In Brittany, and, somewhat less generally in Normandy, most of the peasants at this time were free. In Champagne and central France there were still so many serfs that very possibly the peasants of St. Aliquis were more fortunate than the majority of the villeins on neighboring baronies. The advantages of the free peasants over the serfs have, however, been somewhat exaggerated.

Exploitation of Villeins

if they wandered to distant parts, the local authorities were likely to call them "masterless men" and assume that if they had forsaken their old lord they must somehow be criminals.

Nevertheless, it is much better to be a free peasant than a serf. The majority of the French lower classes are now becoming free, although in other Christian lands, notably Germany, serfage will prevail for a weary day hereafter.

But even though one becomes free, he is a villein still. The taint of ignoble blood clings like a shirt of pitch, even after achieving prosperity and wealth. Knightly opinion is expressed by that great troubadour, Bertran de Born: "I love to see the rich churl in distress if he dares to strive with nobles. I love to see him beg his bread in nakedness."

Even a well-disposed lord looks on a peasant largely as a source of income. In time of peace the taxes and forced labor squeezed out of him yield that which presently turns into destrers, silvered hauberks, furs, hawks, fair dames' luxuries, dowries, adubbements, tourneys. In time of war he exists to be pillaged and massacred, in order to impoverish his master by ruining the latter's revenues. The burghers of the towns are a little more respected. Their industrial products are needful. They can better protect themselves. But the richest syndic of a commune cannot really hold up his head socially with the unknighthed bachelor who drags out life in a tumble-down manor house.

At every turn the peasant finds himself exploited. He must pay a direct tax supposedly proportioned to the size and yield of his farm. That is only the beginning. When his wife has bread to bake, it must be taken to the lord's oven. One loaf in so many goes as the fee.

Life on a Mediaeval Barony

The flour must be ground up in the lord's mill—again for a fee. The grapes must be pressed out in the lord's winepress. The sheep must be driven into the lord's sheepfold every night, that he may get the manure. Every dispute must be arbitrated before the lord's provost or the great man himself—more fees. In short, the whole régime aims to compel the peasant to go to his seigneur for everything he needs, so that he will have extremely little business to transact away from the seignury. Doubtless it is a convenience often to find things commonly needful always at hand. There is a certain return for many of the exactions. But the seigneur does not act out of benevolence. If the peasants wish, for example, to set up their own ovens, they must pay the seigneur the equivalent of the baker's fees of which he is deprived. If they then wish to bake their own bread, he is now quite indifferent.

Besides the imposts and numerous fees (*banalités*) the peasants owe the *corvées*, payments by labor. A large part of every seignury is "domain land"—for the lord's own personal use. The peasants are obliged to give a certain number of days to keep this plowed and tilled, mow the meadows, bring in the hay, dress the vines. They must also see that the castle has its firewood and fodder; clean out the moat; help keep the fortifications in repair; and assist on many extraordinary occasions.¹ For this they get no pay, although they may be given their rations during the days of labor.

¹ The list of curious *corvées* required of peasants on various seigneuries is a long one. On one fief they were expected to beat the water of the castle moat to stop the noise of the frogs whenever the mistress was sick. Or on certain specified occasions they had to perform some absurd service: to hop on one leg, to kiss the latch of the castle gate, go through some drunken horseplay in the lord's presence, or sing a broad song in the presence of his lady.

Oppressive Seignorial Officers

In time of war they do almost everything from helping to defend the castle to marching on offensive campaigns as part of the ban—serving, as we have seen, as grooms, baggage attendants, diggers, and engineers, and also as the despised, but sometimes useful, infantry pikemen.

Such are the burdens of the St. Aliquis peasants. They burn holy candles of thankfulness, however, that Baron Conon does not multiply their troubles by intrusting the collection of his imposts and the administration of his forced labor to outrageous officers. Sire Macaire, the provost, is harsh toward real offenders and strict in exacting the last *sol* or sheaf in just debts, but he is no blackmailer, as is Foretvert's general factotum. In old Baron Garnier's day, of course, there had been a provost who not merely levied abominable imposts, diverting a share thereof toward his own pocket, but who would accuse poor men falsely of theft and then take bribes for condoning their alleged offenses, all the time that he was dividing the profits of real bandits whom he protected.

Even more obnoxious can be the forester who controls the hunting preserves and grazing grounds. He decides how the peasants' pigs may be turned out in the oak forests, how and when firewood may be cut, and he battles incessantly with the multitudinous poachers. A few years ago even Conon was deceived by a fellow in his employ, one Maître Crispin. He was "a very handsome man with fine carriage and well armed with bow and sword." No one could *cong * more gracefully to Madame Adela, or do more to help messire to discover a great boar, but all the while he was filling his own chest. For example, he seized lame Georges' oxen on the pretext that he had cut three oaks and a birch in the seigneur's forest—yet he would forget the crime if

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Georges could find him one hundred sous! Fortunately Sire Macaire discovered the evil ways of his lieutenant, and Conon, exceedingly incensed, had the smooth Crispin turned over to Maître Denis and his halter after abrupt formalities. The present forester, taught by example, is more honest, although of course, all the real poachers curse him.

A great part of the peasant's time is spent neither in working nor in resting, but in walking. Few are so lucky as to have all their land in a single compact plot. Even a rather poor peasant has his farm scattered in several tiny holdings, possibly at the four quarters of the neighborhood. When a peasant dies, his children all divide the paternal estate, and if a separate piece of ground cannot be provided for each heir, some lots must be subdivided smaller still. The St. Aliquis lands



PEASANTS AT WORK

From a manuscript of the thirteenth century (Bibliothèque nationale).

thus present a curious sight—innumerable little parcels scattered everywhere, each carefully fenced off and each growing its own separate crops. Meantime their owners begin in the morning toiling with their heavy mattocks, on one of their holdings, then on to the next, and so on until sundown. Thus they trudge several miles, and yet are seldom far from their village, whither they must all return at dusk.

Primitive Agricultural Methods

Men of more fortunate days will be astonished when they survey the agricultural methods of even the least stupid peasants. Everything is according to traditions—"so it was with our fathers." In the abbey library there are some Latin books about agriculture. They deal with conditions in ancient Italy, however, not feudal France. The most benevolent monk hardly dreamed of examining his Cato or Columella to learn how to better the lot of the peasantry, though in fairness it should be said that the abbey farms enjoy on the whole a much superior cultivation. Not all peasants can own plows; they borrow or hire from their neighbors, or break the ground with the clumsy mattocks. What plows exist have only wooden plowshares. The wheat in St. Aliquis is beaten out by flails, although a little farther south it is trodden out by cattle. The soil is often impoverished, and it is usual to leave one-third fallow all the time to recuperate. Such a thing as "rotation of crops" is still a matter of vague talk save on some of the monastery lands.

Under these circumstances, even in the best of years, there is not much surplus of food. A short crop means misery. Men pessimistically expect a famine on the average of one in every four years. If there has not been one of late in St. Aliquis, it is because the saints are rich in mercy. "In 1197 a countless throng died of hunger," significantly wrote a chronicler in Rheims. Naturally, the villeins seldom get enough ahead to be able to learn the practices of thrift. If the year has been good, with an extra supply of corn in the barns, and plenty of pigs and chickens fattening, the winter will be spent in gorging and idleness. By spring the old crop is exhausted almost to the seed corn; then perhaps the new crop will be a failure. The next winter these

Life on a Mediaeval Barony

same peasants may be glad to make a pottage of dead leaves.

Lame Georges, who had his oxen sequestered, is, despite his misfortunes, one of the most prosperous peasants in the village. He limps because in his youth a retainer of Baron Garnier's twisted one of his feet while trying to extort money. Georges is really only forty-five years old, but to see his gray head, gnarled face, and bent back you would think him sixty. His wife Jeanne is four years younger than he, but looks as aged as her husband. "Old Jeanne," the children call her. The pair have been blessed with at least fifteen children, but four of these died in childbirth, and five more before they could grow up. The other six are, all but the youngest, married already and Jeanne has been a grandmother for several years.

Georges' house stands near the center of the village. To reach it you pick your way down a lane usually deep in mud. In front of each fenced-in cottage there is an enormous dungheap, beloved by the hens and pigs, which roam about freely. Georges' one-story dwelling is an irregularly built, rambling structure of wood, wattles, and thatch, all of dirty brown. This "manse" stretches away in four parts. The rearmost contains the corn cribs, the next mows for hay and straw, then the cattle sheds; and nearest, and smallest, the house for the family.

Pushing back the heavy door, after lifting the wooden latch, one enters a single large room; the timbers and walls thereof are completely blackened by soot. There is really only one apartment. Here everything in the household life seems to go on. The floor is of earth pounded hard. Upon it are playing several very dirty, half-naked children, come over to visit "grandmother,"

A Peasant's House

and just now they are chasing two squealing little pigs under the great oak table near the center. One makes no account of a duck leading her goslings in at the door in hopes of scraps from the dinner. A hen is setting on eggs in a box near the great fireplace.

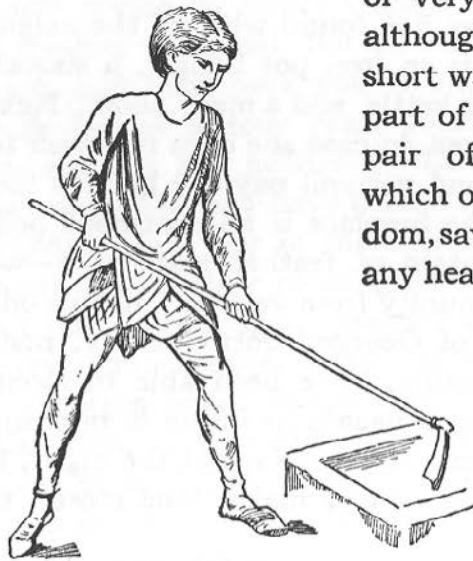
Jeanne has just kindled a lively fire of vine branches and dry billets. She is proud that her house contains many convenient articles not found with all the neighbors. By the fireplace is an iron pot hanger, a shovel, large fire tongs, a copper kettle, and a meat hook. Next to the fireplace is an oven, in case she does not wish to use that at the castle and yet will pay the baron's fee. On the other side of the fireplace is an enormous bed, piled with a real mountain of feather mattresses—we do not discuss their immunity from vermin. In this one bed a goodly fraction of Georges' entire family, male and female, old and young, have been able to sleep; of course, with their heads usually pointing in opposite directions. If a stranger chances to spend the night, it will be hospitable to ask him to make "one more" in that selfsame bed!

If the goodman takes us about his establishment we shall find that, in addition to various stools and benches, he owns a ladder, a mortar and pestle for braying corn, a mallet, some crudely shaped nails, a gimlet, a very imperfect saw, fishing lines, hooks, and a basket. He is fortunate enough also to own a plow, and, in addition, a scythe, an iron spade, a mattock, a pair of large shears, a handy knife, and a sharpening stone. He has replaced the stolen oxen with another pair and owns a two-wheeled wagon with a harness of thongs and ropes. Besides the oxen, there are three milch cows in his barn, and he has a hennery and pigpen. The place seems also to abound with long, lean cats, very wild, who gain a

Life on a Mediaeval Barony

living by hunting the numerous rats and mice which lurk in the dense thatch of the roofs.

Georges himself wears a blouse of dirt-colored cloth, or sometimes of sheepskin, fastened by a leathern belt. In cold weather he has a mantle of thick woolen homespun, now also dirt color, to his knees. He has a pair



A LABORER, THIRTEENTH CENTURY
Restored by Viollet-Le-Duc, from the manuscript of Herrade of Landsberg.

of very heavy leathern boots, although not seldom he goes on short walks barefoot. The lower part of his body is covered by a pair of loose woolen trousers which once were blue. Very seldom, save in storms, does he wear any headdress; then he produces

a kind of cap of the same dirty woolen as his coat. As for gloves, he never wears them except when hedging. Jeanne's costume is much the same, with a few changes to make it suitable for women.

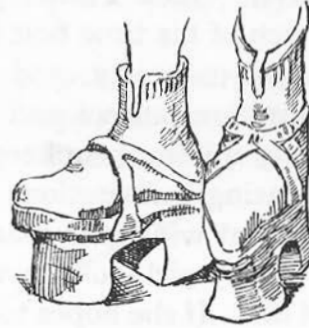
In her chest she has,

however, a green bliaut of Flanders wool made somewhat in imitation of those she has seen at the castle, and it even is beautified with red and purple embroidery. This bliaut she wears with pride on great festival days, and in it, despite the envious hopes of her daughters and daughters-in-law, she expects at last to be buried.

Georges' house is considerably better than many others. Some of his neighbors live in mere cabins that are barely weather tight. They are made of crossed laths stuffed with straw or grass, and have no chimney.

Very Poor Peasants

The smoke from the hearth escapes through a small hole in the roof (where the thatch is very liable to take fire) or merely through the door. None of these houses has glass windows. Georges fastens his few openings with wooden shutters, but poor Alard near by has to close his apertures by stuffing them up with straw, if it is too cold to leave them open. Alard, too, is without a bed. His family sleep on thin pallets of straw laid on the ground, with a few ragged blankets. There are plenty of peasants who have not even the straw.



PEASANT SHOES
Twelfth century (abbey church
of Vézelay)



A REAPER
From the doorway of the cathedral of
Amiens.

Alard inevitably has no cows, no oxen or cart, no plow, and only a few rude tools. He and his are barely able to satisfy the provost's men by grinding field labor, and have still enough grain laid up to carry them till the next harvest. If it is a little too dry, a little too wet, if, in short, any one of a number of untoward things happen, by next spring he, with his bent and bony wife and his five lean children, will all be standing at the castle or

abbey gate with so many other mendicants to cry their "Bread! For the love of Christ, a little bread!"

Life on a Mediæval Barony

The peasants marry as early as do the nobility. Of the moral condition of many of them it is best to say little. Good Father Étienne, the parish priest, spends much of his time first in baptizing infants of unacknowledged paternity, and then in running down their presumptive fathers and forcing the latter to provide for their children's upkeep. But a girl can often indulge in amazing indiscretions and later find some self-respecting peasant willing to marry her.

Every girl looks forward to her marriage as the climax of life. If she hopes to find a husband in the coming year, she will dance around a bonfire, then cast some pins into



A MARRIAGE IN THE
THIRTEENTH CENTURY
From a manuscript of the
Bibliothèque nationale
(Bordier et Charton).

a bubbling fountain. If these are thrown to the surface it is a sign the right swain will come along. When drawing water from a well, if she can throw into it an egg cracked upon the head of some companion, she can see in the water the image of her future husband. As for the young men, when one of them decides he wishes to marry a certain girl, he often comes to her parents,

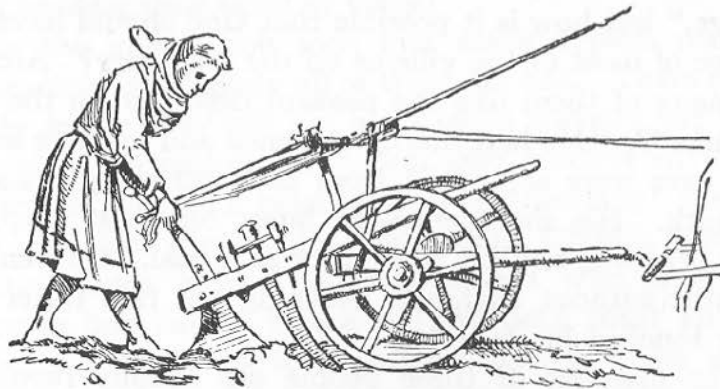
presenting a leathern bottle of wine. If they drink of the same his suit is accepted. However, if he is uncertain of his reception by the maiden herself, he invites himself to dinner at her home. If at the end she serves him with a dish of walnuts, it is a clear token that he is rejected. He had better slink away.

On the wedding day, if the bride has always been sage and modest, the neighbors present her with a white hen, but her mother gives her a piece of fine cloth, to make a gala dress which will serve ultimately for a

Hard Toil and Ignorance

shroud. At the ceremony itself the great question is, "How will the wedding ring slip on?" If easily the bride will be docile. If it goes on tightly she will rule her husband!

The peasants need every kind of public and private holiday. On ordinary days toil begins at gray dawn and usually continues until dusk. There are no eight-



A PLOW

Restored by Viollet-Le-Duc, from a manuscript of the thirteenth century at the Seminary of Soissons.

hour laws; even the "nooning" is short, although sometimes there is time taken out in hot weather for a siesta during the afternoon. The women labor in the fields as hard as do the men. Children begin weeding, digging, and carrying when very little. Their help is so important that many peasants look on large families as assets of so much unpaid field labor, rather than as liabilities which they must clothe and feed until the children reach maturity. Education is almost unknown. One or two very bright boys from the village somehow have been caught by the churchmen and trained for the priesthood. There is even a story of a lad born in a neighboring seigneurie who thus rose to be a bishop! But such cases are very

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exceptional. In the whole village by St. Aliquis, Father Etienne is the only person who understands the mysteries of reading and writing, except two assistants of the provost, who have to keep accounts for the baron.

It is very hard for great folk to understand such teachings of the Church as that "all men are brethren." "Doubtless it is true," Adela and Alienor have often told each other, that "God created man in His own image," but how is it possible that God should have the image of most of the villeins on the seigneurie? Are not so many of them like the peasant described in the epic "Garin"? "He had enormous hands and massive limbs. His eyes were separated from each other by a hand's breadth. His shoulders were large, his chest deep, his hair bristling, and his face black as a coal. He went six months without bathing. Nothing but rain water had ever touched his face."

The manners of these people are equally repulsive. Countless ballads as well as monks' sermons and treatises represent your typical villein as incessantly discontented, scolding about the weather, which is always too wet or too dry, treating his wife like an animal, hauling her about by the hair. Lately at the castle a jongleur told this anecdote: "A certain peasant showered his wife with blows on principle. 'She must have some occupation,' said he, 'while I work in the field. If she is idle she will think of evil things. If I beat her she will weep the whole day through, and so will pass the time. Then when I return in the evening she will be more tender.'" According to other stories, however, many peasants are clever, aggressive, and insolent—well able to care for themselves.

The castle folk and the burghers are none too careful in sanitary matters, but even to them the peasants are

Filthy Habits of Peasants

disgustingly filthy. They relate in Pontdebois this story: "Once a villein, leading some donkeys, went down the lane of the perfumer's shops. Instantly he fainted at the unaccustomed odor. They brought him to, however, by holding a shovel full of manure under his nose." Another story (told at the monastery) has it that the devil has refused to receive more villeins into hell because they smell so vilely!

In the village you soon find many typical peasant characters, and nearly all of them are bad. There is the surly fellow who will not even tell a traveler the way. There is the malcontent villein who mutters enviously whenever he sees a knight riding out hawking; there is the mad fool who reviles God, saints, Church, and nobility; there is the talkative villein who is always arguing bad causes before the provost's court and inciting his neighbors to senseless litigation, there is the honest simpleton who wandered up to Pontdebois and got his pockets picked while gaping at the sculptures on the portal of the cathedral; finally, there are the misers, the petty speculators in grain (who pray for a famine), and all the tribe of poachers. Certainly there are also a great number of hard-working, honest folk who bow respectfully when Messire Conon rides by and who pay their taxes without grumbling. Such give prosperity to the seigneurie; but it is the rascals who ever thrust themselves into prominence.

The St. Aliquis villeins seem doltish and dirty enough, but they are nothing to those existing in Flanders. Some monks have recently returned thence after doing business for their order. They tell with horror that in summertime Flemish peasants are seen around their villages, taking their ease, with no more clothes on than when they were born. When the monks remonstrated,

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the rough answer was: "How is this your business? You make no laws for us." It is pitiful (say the monks) that any seigneur should tolerate such things on his fief, for the peasants are such sodden creatures they cannot of themselves be expected to know better.

If the knights exploit the peasants, the clergy do so hardly less. It is notoriously hard for the bishop's tithe collector to secure the quota of pigs, hens, eggs, wheat, vegetables, etc., which everybody knows that the villein owes to the Church after or upon the same time he satisfies the collectors for the baron. Indeed, certain impious villeins complain, "The tithe is worse than the imposts and the *corvées*." The monkish preachers have to be constantly threatening these sinners who pay their tithes slowly. The Church tithe is the property of God. "It is the tax you owe to God, a sign of his universal dominion." Those who withhold it not merely imperil their souls, but God will send them "drought and famine," punishing them alike in this world and the next.

Villeins too often wickedly insist on working on Sundays and holy days. The peasants complain there are so many saints' days that it is hard to keep track of them, but if only they would go to Church on Sundays when the priest announces the next holy days they could avoid this sin. Worse still are the peasants who, when they see their fellows going dutifully to mass, hide under the hedges, then slip away to rob the unguarded orchards.

It seems certain, therefore, that God has no such love for villeins as he has for gentle knights and their dames. The knights display their superiority by always reminding their peasants of their condition. With some barons, to flog their villein for most trifling offenses is about as common as for them to eat their dinners. Even Conon

Gross Oppression by Knights

has plenty of use for his riding whip. Unless the blows are very brutal the average peasant takes this as all in the day's work. He merely trades out his own blows upon his wife and children. Indeed, it is commonly said that most villeins are so numb mentally they never can comprehend the simplest orders unless they are driven home with stripes. In time of war the fate of the peasants is, as we have seen, far worse than this. Whatever a feud means to the contending parties, to their villeins it means houses and crops burned, fruit trees girdled, young girls dragged off to a life of infamy, and probably the massacre of many peasants in cold blood. One of the reasons the nobles delight so in war is because it is seldom that they have to endure its real anguish and horror; but in the churches the non-nobles pray, "*Grant us to peace*" quite as fervently as they beseech, "Save us from famine"—and with equal justice.

The monkish preachers who make a business of scolding sometimes denounce high-born oppressors of the villeins. One monk thus cries out, "All that the peasant amasses in one year of stubborn toil, the noble devours in an hour. Not content with his lawful revenues, he despoils them by illicit exactions. As wolves devour carrion while the crows croak overhead, awaiting their share of the feast, so when knights pillage their subjects the provosts [their agents] and others of the hellish crew rejoice at the prospect of devouring the remainder." Or again: "Ye nobles are ravening wolves; therefore shall ye howl in hell," for you "despoil your subjects and live on the blood and sweat of the poor." (Jacques of Vitry.) Nevertheless, the selfsame preachers accuse the peasants of the cardinal sins of avarice and of shunning labor. Only rarely are the villeins comforted by being told that if they work faithfully and bring up

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a proper family they are morally on equality “with a cleric who chants all day in a church.”

On the St. Aliquis fiefs, and, indeed, on many others, these grosser abuses do not obtain, but nowhere are the villeins exempt from one evil which they must meet with dumb resignation—the seigneurial hunts.¹ Conon and his guests never hesitate at going with horses and hawks or hounds straight across plowed and seeded fields or even over standing grain. This is the lord’s absolute right, and protest is impossible. The hunters, too, are entitled, if far from home, to stop at the peasants’ huts and demand food and fodder, perhaps for a large party. If payment is made, it is merely out of charity. Greater evils still may come from the depredations of the wild game, if the fields are close to the hunting preserves. Villeins cannot harm any deer nibbling the young sprouts. They can only scare them away—and the cunning creatures soon grow daring. A wild boar can root up a dozen little farm plots before the baron can find leisure to chase him down. Upon some fiefs the peasants can arrange to pay an extra fee to their lord, in return for which he keeps only rabbits near their fields; but the hunt of a single rabbit, if the flying wretch doubles in among the corn, may ruin a family.

On the other hand, the penalties for poaching, for “killing messire’s game,” are terrible. It is probably safer on St. Aliquis’—as on any other fief—to risk killing a traveler than killing a fawn or even a hare. The law is pitilessly enforced by the foresters. Maître Denis will tell you he has hanged more stout fellows for poaching than for any other two crimes put together.

Do the villeins ever revolt? Sometimes, when they are driven to desperation by extreme misery; when they

¹ See page 67.

* Refers to page 67 in original work.

Futile Peasant Revolts

find a clever leader; when circumstances are peculiarly favorable. Then may come the sudden burning of manor houses and small fortalices; the massacre of their inmates; and other brutish deeds of tardy retaliation. The rebels are likely to boast, as did some insurgent peasants in Normandy in the eleventh century: "We have been weak and insane to bend our necks for so long. For we are strong-handed men, and solider and stouter limbed than the nobles will ever be. For everyone of them there are a hundred of us!"

Such revolts always have a single end. The ignorant peasants submit to no discipline. They cannot use the knight's weapons if they capture them. They cannot organize. If they seize a castle, the liquor in the cellars lays them out helpless through a week of orgy. The seigneurs instantly rally and with their great horses hunt down the rebels as creatures worse than wolves. The vengeance then taken on the insurgents is such that every ear that hears thereof must tingle. Perhaps along a league of roadway a corpse will be swinging from every tree. Such measures effectively discourage rebellion save under most exceptional circumstances. Even with atrocious seigneurs it is usually best to bow to the will of God and merely to pray for deliverance.

Georges' and Alard's mental horizons can be imagined. They have on rare occasions been as far as Pontdebois, although some of their neighbors have passed a lifetime without even that privilege. They have only the most limited, one might say only the most animal, hopes and fears. Their ideas of such things as the king's court, Paris, and the various Christian and Infidel lands are a jumble of absurd notions. "Religion" means a few prayers, a few saints' stories, as told in the church, the miracle plays at Christmas, and a fear lest

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by failing in proper respect to monks and priests they will be eternally tormented in worse torture chambers than old Baron Garnier's.

The villeins, of course, have their own rustic holidays, full of rough sports—wrestling, throwing weights, archery, and also cockfighting and bull baiting. The best of entertainment is when two blindfolded men, each carrying a cudgel, try to kill a goose or pig let loose in an inclosure. The whole village roars to see them belabor each other. During the wedding festivities, to show their dutiful esteem for Alienor and Olivier, the peasants had arranged a special ceremony in their honor. Four blindfolded men were led about the neighborhood, preceded by two men, one playing an oboe, the other carrying a red banner whereon a pig was painted. After this noisy merrymaking a real pig was produced, and before an august company of most of the castle folk the four champions “attacked the pig.” They hit one another so hard, that one was picked up almost dead. The pig became the property of the villein who had managed to pound the life out of the creature just as in mercy Alienor was about to beg that the contest end.

Despite grievances and grumblings, the average peasants are loyal, somewhat after the manner of dumb dogs, to their seigneurs. Conon and Adela command the real affection of their villeins because of acts of charity, but even Baron Garnier had been treated with an astonishing faithfulness. Many a knight has owed his life or honor to humble dependents whom he has not treated so well as his horses or hounds. It is the toiling thousands in the little thatched huts that make possible the wedding feasts, the adubgements, the tourneys, and the spectacular battles. Some day the exploitation will cease—but not in the thirteenth century.

Self Portrait Between the Borderline of Mexico and the United States, 1932

Frida Kahlo



Erich Lessing/Art Resource, NY

The Secret Life of Plants

From *New Scientist*, March 26, 2011

By Ferris Jabr

EVERY autumn swarms of dusty grey moths engulf the mountainside birch forests of northern Scandinavia, laying their eggs on twigs so that, come springtime, the newly hatched larvae can feast upon budding leaves. It looks like a battle that the trees, with no natural defences, are doomed to lose, but some have a secret weapon. They form an alliance with a neighbouring plant, a kind of rhododendron, borrowing wafts of its volatile insecticides as a sort of olfactory camouflage. “This kind of interaction has never been observed in the field before,” says Jarmo Holopainen at the University of Eastern Finland in Kuopio, who made the discovery (*New Phytologist*, vol 186, p 722). His study is one of the latest to demonstrate the unexpectedly complex relationships between plants.

We’ve known for some time that plants respond to one another, but only now are we realising how subtle and sophisticated their interactions can be. Plants continually eavesdrop on each other’s chemical chatter — sometimes sympathetically, sometimes selfishly. Some plants, like the Scandinavian rhododendron, assist their neighbours by sharing resources. Others recognise close relatives and favour them over strangers. And at least one parasitic plant homes in on its host’s telltale chemical scent (see “Scent of a victim”, page [59]).

“Plants don’t go out to parties or to watch the movies, but they do have a social network,” says Suzanne Simard, a forest ecologist at the University of British Columbia in Vancouver, Canada. “They support each other and they fight with each other. The more we look at plant signalling and communication, the more we learn. It’s really incredible.”

Since the development of time-lapse photography, it has been possible to document the dances and scuffles in densely populated plant communities: saplings on the forest floor compete for space to stretch their roots and shoots; fallen trees provide young ones with nourishment; vines lash around desperately searching for a trunk they can climb to reach the light; and wildflowers race each other to open their blooms in springtime and compete for the attention of pollinators. To truly understand the secret social life of plants, however, you must look and listen more closely.

A good place to start is underground in the rhizosphere — the ecosystem in and around plant roots. Beneath the forest floor, each spoonful of dirt contains millions of tiny organisms. These bacteria and fungi form a symbiotic relationship with plant roots, helping their hosts absorb water and vital elements like nitrogen in return for a steady supply of nutrients.

Now closer inspection has revealed that fungal threads physically unite the roots of dozens of trees, often of different species, into a single mycorrhizal network. These webs sprawled beneath our feet are genuine social networks. By tracing the movement of radioactive carbon isotopes through them, Simard has found that water and nutrients tend to flow from trees that make excess food to ones that don’t have enough. One study published in 2009, for example, showed that older Douglas firs transferred molecules containing carbon and nitrogen to saplings of the same species via their mycorrhizal networks. The saplings with the greatest access to these networks were the healthiest (*Ecology*, vol 90, p 2808).

As well as sharing food, mycorrhizal associations may also allow plants to share information. Biologists have known for a while that plants can respond to airborne defence signals from others that are under attack. When a caterpillar starts to munch on a tomato plant, for example, the leaves produce noxious compounds that both repel the attacker and stimulate neighbouring plants to ready their own defences.

Yuan Yuan Song of South China Agricultural University in Guangzhou and colleagues investigated whether similar chemical alarm calls travel underground. They exposed one group of tomato plants to a pathogenic fungus and monitored the response in a second group connected to the first via a mycorrhizal network. The diseased plants were sealed inside airtight plastic bags to prevent any communication above ground. Nevertheless, the healthy partners began producing defence chemicals, suggesting that the plants detect each other’s alarm calls via their mycorrhizal networks (*PLoS One*, vol 5, p e13324).

Another recent discovery, one which may be connected with Song's finding, is that some plants recognise members of their own species and apparently work together for the common good. Amanda Broz of Colorado State University in Fort Collins paired spotted knotweed plants inside a greenhouse either with other knotweeds or with blue bunchgrass. She then simulated an attack by spraying them with methyl jasmonate, a chemical many plants release when wounded. The knotweed's response depended on its neighbours. When growing near members of its own species, it produced leaf toxins to boost its defences. But it chose to focus on leaf and stem growth when its neighbours were bunchgrass (BMC Plant Biology, vol 10, p 115).

Such discrimination makes sense because, in the knotweed's native environment, dense clusters of a single plant tend to attract large numbers of insects to an all-you-can-eat buffet. So cooperating with other knotweed plants helps stave off an attack. However, when knotweed is surrounded by bunchgrass, a better strategy is to leave defence to its neighbours and concentrate on aggressive growth — which might also help explain why knotweed is such an effective invasive species.

Broz's research was published just last year, and it remains unclear how knotweed, or any other plant, could be recognising members of its own species. However, one instance of a plant with family values has been more thoroughly explored.

In a landmark paper published in 2007, Susan Dudley from McMaster University in Ontario, Canada, reported the first case of plants recognising and favouring their kin (Biology Letters, vol 3, p 435). Her studies of American sea rocket, a scraggly weed that grows along the shorelines of the Great Lakes, showed that a plant potted with an unrelated individual did not hesitate to spread its roots and soak up as much water and nutrients as it could. However, when Dudley planted sea-rocket siblings in the same pot, they exercised restraint, taming their eager roots to better share resources. Siblings and strangers that grew near each other but did not share pots showed no differences in root growth, indicating that sea rocket relies on underground chemical signalling to identify its kin. They don't seem to be using mycorrhizal networks, though.

In subsequent research with Meredith Biedrzycki from the University of Delaware in Newark, Dudley discovered that the signals take the form of "exudates" — a cocktail of soluble compounds including phenols, flavonoids, sugars, organic acids, amino acids and proteins, secreted by roots into the rhizosphere. How these indicate relatedness is still a mystery, though (Communicative & Integrative Biology, vol 3, p 28).

In the past few years, kin recognition has been discovered in other plants, including the botanical "lab rat" *Arabidopsis* and a kind of *Impatiens* called pale jewelweed. This has led some botanists to argue that plants, like animals, are capable of kin selection — behaviours and strategies that help relatives reproduce. Kin selection has an evolutionary rationale because it increases the chances that the genes an individual shares with its relatives will be passed to the next generation, even if altruistic behaviour comes at a cost to one's own well-being. "There's no reason to think plants wouldn't get the same benefits from kin selection that animals do," says Dudley.

Recognising siblings and restraining one's growth in response certainly looks like kin selection, but that still leaves the question of whether such interactions also improve the survival prospects of related plants. Research by Richard Karban at the University of California, Davis, goes some way to answering that.

Karban studied a desert shrub called sagebrush, which emits a pungent bouquet of chemicals to deter insects. When he clipped an individual plant's leaves to simulate an attack, he found that it mounted a more robust defence if it was growing next to its own clone than if its neighbour was unrelated. What's more, for a period of five months afterwards, the neighbouring clones suffered far less damage from caterpillars, grasshoppers and deer than did unrelated neighbours (Ecology Letters, vol 12, p 502).

Studying kin selection and other plant interactions doesn't just improve our knowledge of basic plant biology and ecology. "There are a lot of people really interested in it, because it's not just an intellectually neat puzzle," says James Cahill at the University of Alberta in Edmonton, Canada. "There are many potential applications, especially for agriculture."

One obvious area is in companion planting — the strategic positioning of different crops or garden plants so they benefit one another by deterring pests, attracting pollinators and improving nutrient uptake. This ancient technique, which traditionally relies on trial and error and close observation, can be highly effective. For example, beans fix nitrogen that boosts growth in some other plants, and when Europeans arrived in America in the 15th century, they discovered that Native Americans used corn as a natural trellis for

bean plants. Our modern understanding of plant interactions suggests we could find new, more subtle and potentially beneficial relationships, which could help us overcome a major drawback of modern monoculture farming. Since a single pathogen can wipe out an entire crop of genetically similar — and therefore equally vulnerable — plants, farmers make heavy use of pesticides. But instead of picturing an endless stretch of corn or wheat, imagine something more like a jungle of diverse species that work together above and below ground.

Breeding cooperation

Cahill has another idea. “Fertilisers aren’t always spread evenly,” he says. “Maybe we could breed plants to cooperate more effectively with their neighbours to share fertiliser.” Meanwhile, Simard thinks the recent discoveries about mycorrhizal networks have implications for both agriculture and forestry. Hardy old trees should not be removed from forests so hastily, she says, because saplings depend on the mycorrhizal associations maintained by these grandparent trees. She also suggests that farmers should go easy on fertilisation and irrigation because these practices can damage or destroy delicate mycorrhizal networks.

Clearly, we do not yet have all the information we need to start deploying such tactics. “What we want to do next is develop more advanced techniques to watch roots grow, to really see what they do with each other and how they interact in space,” Dudley says. She also wants to figure out what genetic factors control plant interactions and look at how they change survival and reproduction. “The molecular aspects are perhaps the most challenging,” she adds, “but we have made some big leaps.”

The idea that plants have complex relationships may require a shift in mindset. “For the longest time people thought that plants were just there,” says Biedrzycki. “But they can defend themselves more than we thought and they can create the environment around them. It turns out they have some control over what is going on through this chemical communication.” Passive and silent though plants may seem, their abilities to interact and communicate should not come as such a shock. “Some incredibly simple organisms — even one-celled organisms — can recognise and respond to each other,” says Broz. “Why is it so bizarre to think that plants could have this same kind of ability?”

Scent of a Victim

Many of the social interactions of plants seem to involve a form of sharing or cooperation mediated by chemical signals. However, some chemical communication is far from benevolent, as research on a parasitic vine called dodder has found.

Dodder contains almost no chlorophyll — the green molecule that allows plants to produce sugars from sunlight, water and carbon dioxide. Instead, after sprouting as a leafless tendril, it searches for a victim into which it sinks its nozzles and sucks out the sugary sap. “We knew how it creates nozzles and gets resources from the host, but nobody knew how dodder found its host,” says Consuelo De Moraes at Pennsylvania State University at University Park.

Some plants identify neighbours by sensing sunlight refracted off their leaves, but time-lapse video suggests that dodder uses a different technique. The footage shows that when the tendril searches for a host it twirls about like a snake tasting the air. Could it be searching for a chemical, wondered De Moraes?

To test this idea, she and her colleagues hid a variety of plants around a corner from a dodder tendril. If the vine were really using chemical sensing to find its victims, it should be able to home in on its hosts using the volatile chemicals they naturally produce.

That is exactly what they found. In fact, dodder even showed dietary preferences based on the different airborne chemicals, almost always choosing succulent tomatoes over twiggy wheat, and favouring healthy hosts by avoiding the chemicals given off by damaged plants (*Science*, vol 313, p 1964). “Not only does dodder use chemical cues to find a host,” says De Moraes, “it can distinguish between hosts of different qualities. It knows which plants are healthier and goes after them.”

(The original article is no longer available in print, but the pdf version contains all of the original text.)

A Letter to My Nephew

By James Baldwin

Originally published in *The Progressive*, 1962

(<http://www.progressive.org/news/2014/08/5047/letter-my-nephew>)



James Baldwin

Posted December 4, 2014

Editor's Note: In light of the protests around the country demanding a stop to police brutality and changes to a racist justice system, we are reprinting one of James Baldwin's most famous articles published in The Progressive magazine, from December 1962. (Baldwin later adapted it in his essay collection, The Fire Next Time.) Senior editor Matt Rothschild remarked today, "This might be the greatest piece we've ever published."

Dear James:

I have begun this letter five times and torn it up five times. I keep seeing your face, which is also the face of your father and my brother. I have known both of you all your lives and have carried your daddy in my arms and on my shoulders, kissed him and spanked him and watched him learn to walk. I don't know if you have known anybody from that far back, if you have loved anybody that long, first as an infant, then as a child, then as a man. You gain a strange perspective on time and human pain and effort.

Other people cannot see what I see whenever I look into your father's face, for behind your father's face as it is today are all those other faces which were his. Let him laugh and I see a cellar your father does not remember and a house he does not remember and I hear in his present laughter his laughter as a child. Let him curse and I remember his falling down the cellar steps and howling and I remember with pain his tears which my hand or your grandmother's hand so easily wiped away, but no one's hand can wipe away those tears he sheds invisibly today which one hears in his laughter and in his speech and in his songs.

I know what the world has done to my brother and how narrowly he has survived it and I know, which is much worse, and this is the crime of which I accuse my country and my countrymen and for which neither I nor time nor history will ever forgive them, that they have destroyed and are destroying hundreds of thousands of lives and do not know it and do not want to know it. One can be--indeed, one must strive to become--tough and philosophical concerning destruction and death, for this is what most of mankind has been best at since we have heard of war; remember, I said most of mankind, but it is not permissible that the authors of devastation should also be innocent. It is the innocence which constitutes the crime.

Now, my dear namesake, these innocent and well meaning people, your countrymen, have caused you to be born under conditions not far removed from those described for us by Charles Dickens in the London of more than a hundred years ago. I hear the chorus of the innocents screaming, "No, this is not true. How bitter you are," but I am writing this letter to you to try to tell you something about how to handle them, for most of them do not yet really know that you exist. I know the conditions under which you were born for I was there. Your countrymen were not there and haven't made it yet. Your grandmother was also there and no one has ever accused her of being bitter. I suggest that the innocent check with her. She isn't hard to find. Your countrymen don't know that she exists either, though she has been working for them all their lives.

Well, you were born; here you came, something like fifteen years ago, and though your father and mother and grandmother, looking about the streets through which they were carrying you, staring at the walls into which they brought you, had every reason to be heavy-hearted, yet they were not, for here you were, big James, named for me. You were a big baby. I was not. Here you were to be loved. To be loved, baby, hard at once and forever to strengthen you against the loveless world. Remember that. I know how black it looks today for you. It looked black that day too. Yes, we were trembling. We have not stopped trembling yet, but if we had not loved each other, none of us would have survived, and now you must survive because we love you and for the sake of your children and your children's children.

This innocent country set you down in a ghetto in which, in fact, it intended that you should perish. Let me spell out precisely what I mean by that for the heart of the matter is here and the crux of my dispute with my country. You were born where you were born and faced the future that you faced because you were black and for no other reason. The limits to your ambition were thus expected to be settled. You were born into a society which spelled out with brutal clarity and in as many ways as possible that you were a worthless human being. You were not expected to aspire to excellence. You

were expected to make peace with mediocrity. Wherever you have turned, James, in your short time on this earth, you have been told where you could go and what you could do and how you could do it, where you could live and whom you could marry.

I know your countrymen do not agree with me here and I hear them saying, “You exaggerate.” They do not know Harlem and I do. So do you. Take no one’s word for anything, including mine, but trust your experience. Know whence you came. If you know whence you came, there is really no limit to where you can go. The details and symbols of your life have been deliberately constructed to make you believe what white people say about you. Please try to remember that what they believe, as well as what they do and cause you to endure, does not testify to your inferiority, but to their inhumanity and fear.

Please try to be clear, dear James, through the storm which rages about your youthful head today, about the reality which lies behind the words “acceptance” and “integration.” There is no reason for you to try to become like white men and there is no basis whatever for their impertinent assumption that they must accept you. The really terrible thing, old buddy, is that you must accept them, and I mean that very seriously. You must accept them and accept them with love, for these innocent people have no other hope. They are in effect still trapped in a history which they do not understand and until they understand it, they cannot be released from it. They have had to believe for many years, and for innumerable reasons, that black men are inferior to white men.

Many of them indeed know better, but as you will discover, people find it very difficult to act on what they know. To act is to be committed and to be committed is to be in danger. In this case the danger in the minds and hearts of most white Americans is the loss of their identity. Try to imagine how you would feel if you woke up one morning to find the sun shivering and all the stars aflame. You would be frightened because it is out of the order of nature. Any upheaval in the universe is terrifying because it so profoundly attacks one’s sense of one’s own reality. Well, the black man has functioned in the white man’s world as a fixed star, as an immovable pillar, and as he moves out of his place, heaven and earth are shaken to their foundations.

You don’t be afraid. I said it was intended that you should perish, in the ghetto, perish by never being allowed to go beyond and behind the white man’s definition, by never being allowed to spell your proper name. You have, and many of us have, defeated this intention and by a terrible law, a terrible paradox, those innocents who believed that your imprisonment made them safe are losing their grasp of reality. But these men are your brothers, your lost younger brothers, and if the word “integration” means anything, this is what it means, that we with love shall force our brothers to see themselves as they are, to cease fleeing from reality and begin to change it, for this is your home, my friend. Do not be driven from it. Great men have done great things here and will again and we can make America what America must become.

It will be hard, James, but you come from sturdy peasant stock, men who picked cotton, dammed rivers, built railroads, and in the teeth of the most terrifying odds, achieved an unassailable and monumental dignity. You come from a long line of great poets, some of the greatest poets since Homer. One of them said, “The very time I thought I was lost, my dungeon shook and my chains fell off.”

You know and I know that the country is celebrating one hundred years of freedom one hundred years too early. We cannot be free until they are free. God bless you, James, and Godspeed.

Your uncle,

JAMES

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REVIEW

The Struggle to Govern the Commons

Thomas Dietz,¹ Elinor Ostrom,² Paul C. Stern^{3*}

Human institutions—ways of organizing activities—affect the resilience of the environment. Locally evolved institutional arrangements governed by stable communities and buffered from outside forces have sustained resources successfully for centuries, although they often fail when rapid change occurs. Ideal conditions for governance are increasingly rare. Critical problems, such as transboundary pollution, tropical deforestation, and climate change, are at larger scales and involve nonlocal influences. Promising strategies for addressing these problems include dialogue among interested parties, officials, and scientists; complex, redundant, and layered institutions; a mix of institutional types; and designs that facilitate experimentation, learning, and change.

In 1968, Hardin (1) drew attention to two human factors that drive environmental change. The first factor is the increasing demand for natural resources and environmental services, stemming from growth in human population and per capita resource consumption. The second factor is the way in which humans organize themselves to extract resources from the environment and eject effluents into it—what social scientists refer to as institutional arrangements. Hardin's work has been highly influential (2) but has long been aptly criticized as oversimplified (3–6).

Hardin's oversimplification was twofold: He claimed that only two state-established institutional arrangements—centralized government and private property—could sustain commons over the long run, and he presumed that resource users were trapped in a commons dilemma, unable to create solutions (7–9). He missed the point that many social groups, including the herders on the commons that provided the metaphor for his analysis, have struggled successfully against threats of resource degradation by developing and maintaining self-governing institutions (3, 10–13). Although these institutions have not always succeeded, neither have Hardin's preferred alternatives of private or state ownership.

In the absence of effective governance institutions at the appropriate scale, natural resources and the environment are in peril from increasing human population, consumption, and deployment of advanced technologies for resource use, all of which have reached unprecedented levels. For example, it is estimated that “the global ocean has lost

more than 90% of large predatory fishes” with an 80% decline typically occurring “within 15 years of industrialized exploitation” (14). The threat of massive ecosystem degradation results from an interplay among ocean ecologies, fishing technologies, and inadequate governance.

Inshore fisheries are similarly degraded where they are open access or governed by top-down national regimes, leaving local and regional officials and users with insufficient autonomy and understanding to design effective institutions (15, 16). For example, the degraded inshore ground fishery in Maine is governed by top-down rules based on models that were not credible among users. As a result, compliance has been relatively low and there has been strong resistance to strengthening existing restrictions. This is in marked contrast to the Maine lobster fishery, which has been governed by formal and informal user institutions that have strongly influenced state-level rules that restrict fishing. The result has been credible rules with very high levels of compliance (17–19). A comparison of the landings of ground fish and lobster since 1980 is shown in Fig. 1. The rules and high levels of compliance related to lobster appear to have prevented the destruction of this fishery but probably are not responsible for the sharp rise in abundance and landings after 1986.

Resources at larger scales have also been successfully protected through appropriate international governance regimes such as the Montreal Protocol on stratospheric ozone and the International Commission for the Protection of the Rhine Agreements (20–24). Figure 2 compares the trajectory of atmospheric concentrations of ozone-depleting substances (ODS) with that of carbon dioxide since 1982. The Montreal Protocol, the centerpiece of the

international agreements on ozone depletion, was signed in 1987. Before then, ODS concentrations were increasing faster than those of CO₂; the increases slowed by the early 1990s and the concentration appears to have stabilized in recent years. The international treaty regime to reduce the anthropogenic impact on stratospheric ozone is widely considered an example of a successful effort to protect the global commons. In contrast, international efforts to reduce greenhouse gas concentrations have not yet had an impact.

Knowledge from an emerging science of human-environment interactions, sometimes called human ecology or the “second environmental science” (25, 26), is clarifying the characteristics of institutions that facilitate or undermine sustainable use of environmental resources under particular conditions (6, 27). The knowledge base is strongest with small-scale ecologies and institutions, where long time series exist on many successes and failures. It is now developing for larger-scale systems. In this review, we address what science has learned about governing the commons and why it is always a struggle (28).

Why a Struggle?

Devising ways to sustain the earth's ability to support diverse life, including a reasonable quality of life for humans, involves making tough decisions under uncertainty, complexity, and substantial biophysical constraints as well as conflicting human values and interests. Devising effective governance systems is akin to a coevolutionary race. A set of rules crafted to fit one set of socioecological conditions can erode as social, economic, and

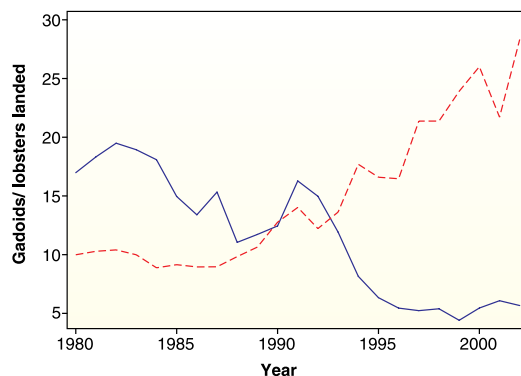


Fig. 1. Comparison of landings of ground fish (gadoids, solid blue line) and lobster (dashed red line) in Maine from 1980 to 2002. Measured in millions of kilograms of ground fish and lobsters landed per year. International fishing in these waters ended with the extended jurisdiction that occurred in 1977 (155).

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technological developments increase the potential for human damage to ecosystems and even to the biosphere itself. Furthermore, humans devise ways of evading governance rules. Thus, successful commons governance requires that rules evolve.

Effective commons governance is easier to achieve when (i) the resources and use of the resources by humans can be monitored, and the information can be verified and understood at relatively low cost (e.g., trees are easier to monitor than fish, and lakes are easier to monitor than rivers) (29); (ii) rates of change in resources, resource-user populations, technology, and economic and social conditions are moderate (30–32); (iii) communities maintain frequent face-to-face communication and dense social networks—sometimes called social capital—that increase the potential for trust, allow people to express and see emotional reactions to distrust, and lower the cost of monitoring behavior and inducing rule compliance (33–36); (iv) outsiders can be excluded at relatively low cost from using the resource (new entrants add to the harvesting pressure and typically lack understanding of the rules); and (v) users support effective monitoring and rule enforcement (37–39). Few settings in the world are characterized by all of these conditions. The challenge is to devise institutional arrangements that help to establish such conditions or, as we discuss below, meet the main challenges of governance in the absence of ideal conditions (6, 40, 41).

Selective Pressures

The characteristics of resources and social interaction in many subsistence societies present favorable conditions for the evolution of effective self-governing resource institutions (13). Hundreds of documented examples exist of long-term sustainable resource use in such communities as well as in more economically advanced communities with effective, local, self-governing rights, but there are also many failures (6, 11, 42–44). As human communities have expanded, the selective pressures on environmental governance institutions increasingly have come from broad influences. Commerce has become regional, national, and global, and institutions at all of these levels have been created to enable and regulate trade, transportation, competition, and conflict (45, 46). These institutions shape environmental impact, even if they are not designed with that intent. They also provide mechanisms for environmental governance (e.g., national laws) and part of the social context for local efforts at environmental governance. Larger scale governance may authorize local control, help it, hinder it, or override it (47–52). Now, every local place is strongly influenced by global dynamics (48, 53–57).

The most important contemporary environmental challenges involve systems that are intrinsically global (e.g., climate change) or are tightly linked to global pressures (e.g., timber production for the world market) and that require governance at levels from the global all the way down to the local (48, 58, 59). These situations often feature environmental outcomes spatially displaced from their causes and hard-to-monitor, larger scale economic incentives that may not be closely aligned with the condition of local ecosystems. Also, differentials in power within user groups or across scales allow some to ignore rules of commons use or to reshape the rules in their own interest, such as when global markets reshape demand for local resources (e.g., forests) in ways that swamp the ability of locally evolved institutions to regulate their use (60–62).

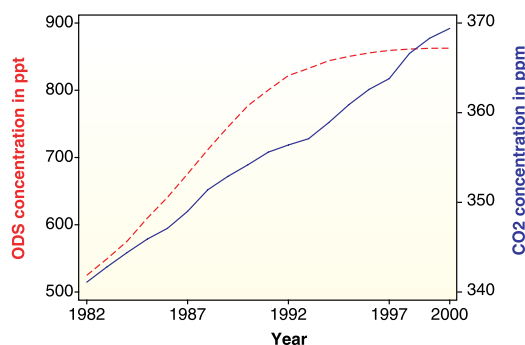


Fig. 2. Atmospheric concentration of CO₂ (solid blue line, right scale) and three principal ODS (dashed red line, left scale). The ODS are chlorofluorocarbons (CFCs) 11, 12, and 113 and were weighted based on their ozone-depleting potential (156). Data are from (157). ppt, parts per trillion; ppm, parts per million.

The store of governance tools and ways to modify and combine them is far greater than often is recognized (6, 63–65). Global and national environmental policy frequently ignores community-based governance and traditional tools, such as informal communication and sanctioning, but these tools can have significant impact (63, 66). Further, no single broad type of ownership—government, private, or community—uniformly succeeds or fails to halt major resource deterioration, as shown for forests in multiple countries (supporting online material text, figs. S1 to S5, and table S1).

Requirements of Adaptive Governance in Complex Systems

Providing information. Environmental governance depends on good, trustworthy information about stocks, flows, and processes within the resource systems being governed, as well as about the human-environment interactions affecting those systems. This information must be

congruent in scale with environmental events and decisions (48, 67). Highly aggregated information may ignore or average out local information that is important in identifying future problems and developing solutions.

For example, in 2002, a moratorium on all fishing for northern cod was declared by the Canadian government after a collapse of this valuable fishery. An earlier near-collapse had led Canada to declare a 200-mile zone of exclusive fisheries jurisdiction in 1977 (68, 69). Considerable optimism existed during the 1980s that the stocks, as estimated by fishery scientists, were rebuilding. Consequently, generous total catch limits were established for northern cod and other ground fish, the number of licensed fishers was allowed to increase considerably, and substantial government subsidies were allocated for new vessels (70). What went wrong? There were a variety of information-related problems including: (i) treating all northern cod as a single stock instead of recognizing distinct populations with different characteristics, (ii) ignoring the variability of year classes of northern cod, (iii) focusing on offshore-fishery landing data rather than inshore data to “tune” the stock assessment, and (iv) ignoring inshore fishers who were catching ever-smaller fish and doubted the validity of stock assessments (70–72). This experience illustrates the need to collect and model both local and aggregated information about resource conditions and to use it in making policy at the appropriate scales.

Information also must be congruent with decision makers’ needs in terms of timing, content, and form of presentation (73–75). Informational systems that simultaneously meet high scientific standards and serve ongoing needs

of decision makers and users are particularly useful. Information must not overload the capacity of users to assimilate it. Systems that adequately characterize environmental conditions or human activities with summary indicators such as prices for products or emission permits, or certification of good environmental performance can provide valuable signals as long as they are attentive to local as well as aggregate conditions (76–78).

Effective governance requires not only factual information about the state of the environment and human actions but also information about uncertainty and values. Scientific understanding of coupled human-biophysical systems will always be uncertain because of inherent unpredictability in the systems and because the science is never complete (79). Decision makers need information that characterizes the types and magnitudes of this uncertainty, as well as the nature and extent of scientific ignorance and disagreement (80). Also, because every environmental decision requires tradeoffs,

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knowledge is needed about individual and social values and about the effects of decisions on various valued outcomes. For many environmental systems, local and easily captured values (e.g., the market value of lumber) have to be balanced against global, diffuse, and hard-to-capture values (e.g., biodiversity and the capability of humans and ecosystems to adapt to unexpected events). Finding ways to measure and monitor the outcomes for such varied values in the face of globalization is a major informational challenge for governance.

Dealing with conflict. Sharp differences in power and in values across interested parties make conflict inherent in environmental choices. Indeed, conflict resolution may be as important a motivation for designing resource institutions as is concern with the resources themselves (81). People bring varying perspectives, interests, and fundamental philosophies to problems of environmental governance (74, 82–84), and their conflicts, if they do not escalate to the point of dysfunction, can spark learning and change (85, 86).

For example, a broadly participatory process was used to examine alternative strategies for regulating the Mississippi River and its tributaries (87). A dynamic model was constructed with continuous input by the Corps of Engineers, the Fish and Wildlife Service, local landowners, environmental groups, and academics from multiple disciplines. After extensive model development and testing against past historical data, most stakeholders had high confidence in the explanatory power of the model. Consensus was reached over alternative management options, and the resulting policies generated far less conflict than had existed at the outset (88).

Delegating authority to environmental ministries does not always resolve conflicts satisfactorily, so governments are experimenting with various governance approaches to complement managerial ones. They range from ballots and polls, where engagement is passive and participants interact minimally, to adversarial processes that allow parties to redress grievances through formal legal procedures, to various experiments with intense interaction and deliberation aimed at negotiating decisions or allowing parties in potential conflict to provide structured input to them through participatory processes (89–93).

Inducing rule compliance. Effective governance requires that the rules of resource use are generally followed, with reasonable standards for tolerating modest violations. It is generally most effective to impose modest sanctions on first offenders, and gradually increase the severity of sanctions for those who do not learn from their first or second encounter (39, 94). Community-based institutions often use informal strategies for achieving compliance that rely on participants' commitment to rules and subtle social

sanctions. Whether enforcement mechanisms are formal or informal, those who impose them must be seen as effective and legitimate by resource users or resistance and evasion will overwhelm the commons governance strategy.

Much environmental regulation in complex societies has been “command and control.” Governments require or prohibit specific actions or technologies, with fines or jail terms possible for punishing rule breakers. If sufficient resources are made available for monitoring and enforcement, such approaches are effective. But when governments lack the will or resources to protect “protected areas” (95–97), when major environmental damage comes from hard-to-detect “nonpoint sources,” and when the need is to encourage innovation in behaviors or technologies rather than to require or prohibit familiar ones, command and control approaches are less effective. They are also economically inefficient in many circumstances (98–100).

Financial instruments can provide incentives to achieve compliance with environmental rules. In recent years, market-based systems of tradable environmental allowances (TEAs) that define a limit to environmental withdrawals or emissions and permit free trade of allocated allowances under those limits have become popular (76, 101, 102). TEAs are one of the bases for the Kyoto agreement on climate change.

Economic theory and experience in some settings suggest that these mechanisms have substantial advantages over command and control (103–106). TEAs have exhibited good environmental performance and economic efficiency in the U.S. Sulfur Dioxide Allowance Market intended to reduce the prevalence of acid rain (107, 108) and the Lead Phasedown Program aimed at reducing the level of lead emissions (109). Crucial variables that differentiate these highly successful programs from less successful ones, such as chlorofluorocarbon production quota trading and the early EPA emission trading programs, include: (i) the level of predictability of the stocks and flows, (ii) the number of users or producers who are regulated, (iii) the heterogeneity of the regulated users, and (iv) clearly defined and fully exchangeable permits (110).

TEAs, like all institutional arrangements, have notable limitations. TEA regimes tend to leave unprotected those resources not specifically covered by trading rules (e.g., bycatch of noncovered fish species) (111) and to suffer when monitoring is difficult (e.g., under the Kyoto protocol, the question of whether geologically sequestered carbon will remain sequestered). Problems can also occur with the initial allocation of allowances, especially when historic users, who may be called on to change their behavior most, have disproportionate power over allocation deci-

sions (76, 101). TEAs and community-based systems appear to have opposite strengths and weaknesses (101), suggesting that institutions that combine aspects of both systems may work better than either approach alone. For example, the fisheries tradable permit system in New Zealand has added comanagement institutions to complement the market institutions (102, 112).

Voluntary approaches and those based on information disclosure have only begun to receive careful scientific attention as supplements to other tools (63, 77, 113–115). Success appears to depend on the existence of incentives that benefit leaders in volunteering over laggards and on the simultaneous use of other strategies, particularly ones that create incentives for compliance (77, 116–118). Difficulties of sanctioning pose major problems for international agreements (119–121).

Providing infrastructure. The importance of physical and technological infrastructure is often ignored. Infrastructure, including technology, determines the degree to which a commons can be exploited (e.g., water works and fishing technology), the extent to which waste can be reduced in resource use, and the degree to which resource conditions and the behavior of humans users can be effectively monitored. Indeed, the ability to choose institutional arrangements depends in part on infrastructure. In the absence of barbed-wire fences, for example, enforcing private property rights on grazing lands is expensive, but with barbed wire fences, it is relatively cheap (122). Effective communication and transportation technologies are also of immense importance. Fishers who observe an unauthorized boat or harvesting technology can use a radio or cellular phone to alert others to illegal actions (123). Infrastructure also affects the links between local commons and regional and global systems. Good roads can provide food in bad times but can also open local resources to global markets, creating demand for resources that cannot be used locally (124). Institutional infrastructure is also important, including research, social capital, and multilevel rules, to coordinate between local and larger levels of governance (48, 125, 126).

Be prepared for change. Institutions must be designed to allow for adaptation because some current understanding is likely to be wrong, the required scale of organization can shift, and biophysical and social systems change. Fixed rules are likely to fail because they place too much confidence in the current state of knowledge, whereas systems that guard against the low probability, high consequence possibilities and allow for change may be suboptimal in the short run but prove wiser in the long run. This is a principal lesson of adaptive management research (31, 127).

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Strategies for Meeting the Requirements of Adaptive Governance

The general principles for robust governance institutions for localized resources (Fig. 3) are well established as a result of multiple empirical studies (13, 39, 128–137). Many of these also appear to be applicable to regional and global resources (138), although they are less well tested at those scales. Three of them seem to be particularly relevant for problems at larger scales.

Analytic deliberation. Well-structured dialogue involving scientists, resource users, and informed by analysis of key information about environmental and human-environment systems, appears critical. Such analytic deliberation (74, 139, 140) provides improved information and the trust in it that is essential for information to be used effectively, builds social capital, and can allow for change and deal with inevitable conflicts well enough to produce consensus on governance rules. The negotiated 1994 U.S. regulation on disinfectant by-products in water that reached an interim consensus, including a decision to collect new information and reconsider the rule on that basis (74), is an excellent example of this approach.

Nesting. Institutional arrangements must be complex, redundant, and nested in many layers (32, 141, 142). Simple strategies for governing the world's resources that rely exclusively on imposed markets or one-level, centralized command and control and that eliminate apparent redundancies in the name of efficiency have been tried and have failed. Catastrophic failures often have resulted when central governments have exerted sole authority over resources. Examples include the massive environmental degradation and impoverishment of local people in Indonesian Borneo (95), the increased rate of loss and fragmentation of high-quality habitat that occurred after creating the Wolong Nature Reserve in China (143), and the closing of the northern cod fishery along the eastern coast of Canada partly attributable to the excessive quotas granted by the Canadian government (70).

Institutional variety. Governance should employ mixtures of institutional types (e.g., hierarchies, markets, and community self-governance) that employ a variety of decision rules to change incentives, increase information, monitor use, and induce compliance (6,

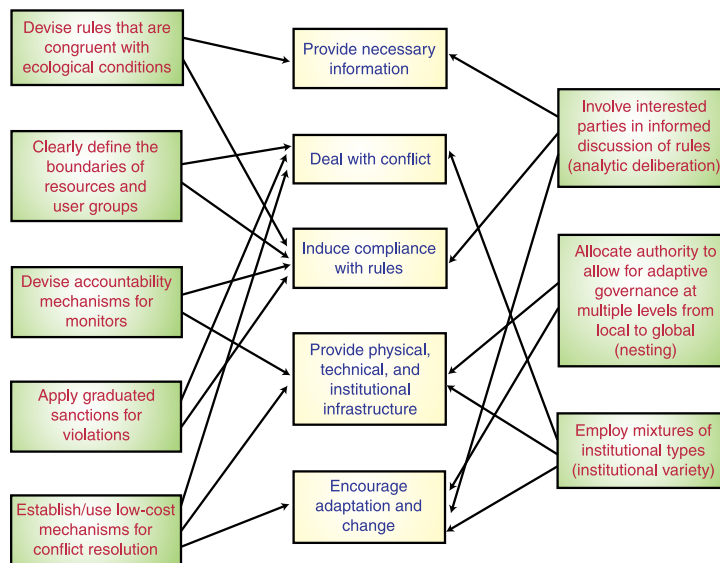


Fig. 3. General principles for robust governance of environmental resources (green, left and right columns) and the governance requirements they help meet (yellow, center column) (13, 158). Each principle is relevant for meeting several requirements. Arrows indicate some of the most likely connections between principles and requirements. Principles in the right column may be particularly relevant for global and regional problems.

63, 117). Innovative rule evaders can have more trouble with a multiplicity of rules than with a single type of rule.

Conclusion

Is it possible to govern such critical commons as the oceans and the climate? We remain guardedly optimistic. Thirty-five years ago it seemed that the “tragedy of the commons” was inevitable everywhere not owned privately or by a government. Systematic multidisciplinary research has, however, shown that a wide diversity of adaptive governance systems have been effective stewards of many resources. Sustained research coupled to an explicit view of national and international policies as experiments can yield the scientific knowledge necessary to design appropriate adaptive institutions.

Sound science is necessary for commons governance, but not sufficient. Too many strategies for governance of local commons are designed in capital cities or by donor agencies in ignorance of the state of the science and local conditions. The results are often tragic, but at least these tragedies are local. As the human footprint on the Earth enlarges (144), humanity is challenged to develop and deploy understanding of large-scale commons governance quickly enough to avoid the large-scale tragedies that will otherwise ensue.

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