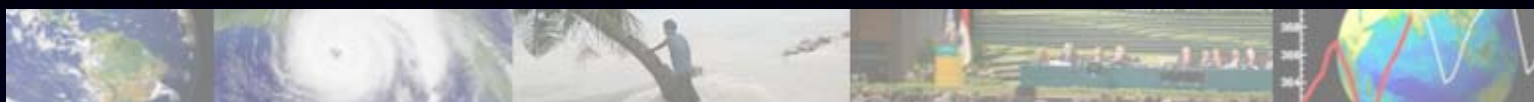

CLIMATE SENSE

A MULTI-DISCIPLINARY PUBLICATION ABOUT THE EARTH'S CLIMATE

climatesense.org

CLIMATE SENSE

A MULTI-DISCIPLINARY PUBLICATION ABOUT THE EARTH'S CLIMATE

Description:

- Multi-disciplinary articles
- Targeted to university students, interested community members
- Resource for educators
- Pro: Our niche
- Con: Lacks revenue generation potential

climatesense.org

CLIMATE SENSE

A MULTI-DISCIPLINARY PUBLICATION ABOUT THE EARTH'S CLIMATE

Other model:

- Lifestyle magazine
- Targeted to general public
- Pro: Revenue generation potential
- Con: Not our niche

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CLIMATE SENSE

A MULTI-DISCIPLINARY PUBLICATION ABOUT THE EARTH'S CLIMATE

What can you do:

- Submit an article or recommend someone who can
- Serve as an editor
- Engage faculty at your institution who teach global change curriculum

climatesense.org

CLIMATE SENSE

A MULTI-DISCIPLINARY PUBLICATION ABOUT THE EARTH'S CLIMATE

Discussion:

- John Calderazzo - Editor pro tem

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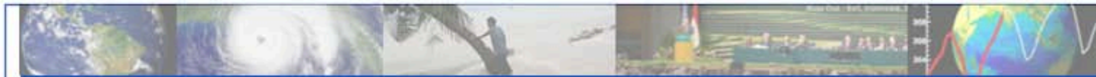
"Science is the greatest of all adventure stories, one that's been unfolding for thousands of years as we have sought to understand ourselves and our surroundings. Science needs to be . . . communicated . . . in a manner that captures this drama."

- Brian Greene

Well-chosen stories or story-techniques

- deeply engage the brain
- deeply engage the body through our 5 senses
- help people remember the message
- create an emotional bond with audience
- make it harder for you to be dismissed or demonized
- overall, they deepen your communication



CLIMATE SENSE

A MULTI-DISCIPLINARY PUBLICATION ABOUT THE EARTH'S CLIMATE

In This Issue

Introduction

WELCOME TO CLIMATE SENSE!

Are you concerned about climate change? Do you want know who is studying climate change at your local university and learn about their research? Do you want to come up to speed on climate issues in your community? If you are a student, educator, or community member interested in making sense of climate change, we think Climate Sense is a magazine for you!

Here's a sampling of what we are offering in this first issue:

Do your eyes gloss over when you hear or read about the Intergovernmental Panel on Climate Change? Why and how will the IPCC's findings very likely affect your everyday life and the welfare of your neighbors, friends, and family?. IPCC scientist and lead author Richard Somerville speaks frankly about the urgency of taking action now.

CSU atmospheric sciences profess Scott Denning explores where the remnants of fossil fuel burning really go, and why we should care,. Does the carbon that comes out of our smokestacks and cars and planes float forever in our skies?. Are trees really "the answer" for taking this stuff out? If so, what happens to it? continued on page 10

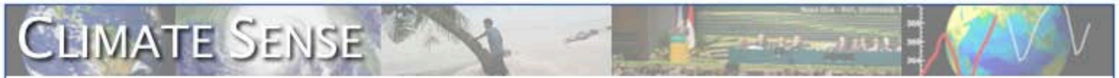
SPOTLIGHT ARTICLE

CONCERNS OF A CLIMATE SCIENTIST

IPCC scientist and lead author Richard Somerville speaks frankly about the urgency of taking action on climate change.

Visit Climate Sense online to join in a dialogue with Dr. Somerville.

ClimateSense.org



Articles

CONCERNS OF A CLIMATE SCIENTIST

By Richard C. J. Somerville

President Obama's speech on June 25, 2013 proposed a broad array of new Federal initiatives to reduce the threat of severe climate change. This is encouraging news indeed, because until now, there has been little evidence in Washington of political leadership on this important issue. President Obama's announced commitment to act has now given the world reasons for being more hopeful. In the months and years ahead, we shall see whether effective policies can be implemented that produce meaningful results.

What concerns me most about climate change now is the stark contrast between the apathy of the public and the troubling facts that we climate scientists have established and that President Obama clearly recognizes. Most people are not well informed about what our science has discovered. In the United States, we also have the sad spectacle that almost the entire national leadership of the Republican party still does not accept the most basic findings of mainstream climate science. In the 2012 US Presidential election, the topic of climate change was essentially ignored by both sides. Problems cannot be solved by pretending they do not exist, and future generations will not judge us kindly unless we accept the science and act quickly.

The existential threat of climate change affects national security, economic prosperity, and the health and safety of people throughout the world. It should not be marginalized as a niche issue of interest only to a few people whom we label as "environmentalists." Journalists should never make the mistake of framing the issue as a controversy - is man-made climate change real and serious or not - in which both sides deserve equal time.

The plain fact is that what mankind decides to do in the coming years and decades will largely determine the climate that our children and grandchildren will inherit. To meet the very real threat of climate change caused by human activities, policymakers must listen to the science and then must act.

Humanity needs to decide collectively how much man-made climate change is acceptable. Science cannot specify what level of climate change is "dangerous." That is a question involving risk tolerance, values, priorities and other subjective concerns. It is governments that will decide, by their actions or inactions.

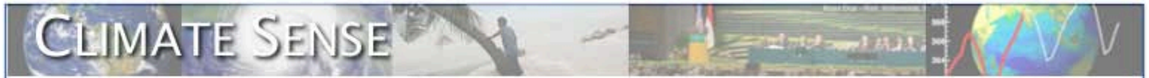
Sections

Articles
All published content. Articles in the online magazine are tagged by subject and key words.

Essential Facts
Primers on science related to the Earth's climate, climate policy, and local climate issues.

Field Notes
Short articles from field programs around the globe.

How To
Articles that inform readers on how to organize and run events, workshops, lecture series.



CONCERNS...

Governments already have made a tentative decision. Many governments have adopted the aspirational goal of limiting global warming to 2 degrees Celsius (or 3.6 degrees Fahrenheit) above the average pre-industrial temperatures of the 1800s. Given that goal, climate science can provide useful information about what actions are needed to give a reasonable chance of meeting the goal. Science tells us that it is urgent to act soon. The world has already warmed by almost half of the 3.6 degrees Fahrenheit goal. Some further warming is unavoidable. However, humanity has the ability to limit the amount of future climate change.

We are already watching human-caused climate change occur. It is not only a problem for the future. It is happening here and now. The warming is just a symptom. Climate is complex, and warming has many consequences. Melting Arctic sea ice and rising sea level are consequences. Extreme weather events today occur in a changed environment. For example, Hurricane Sandy, which killed hundreds of people and caused some 75 billion dollars in property damage in 2012, occurred in a climate with higher ocean temperatures and more water vapor in the air than only a few decades ago. The heat-trapping gases and particles that humanity has emitted into the atmosphere increase the odds of severe weather events, just as steroids taken by a baseball player can increase the odds of home runs. Today we are seeing climate change on steroids. To limit global warming to moderate or tolerable amounts, the entire world must act quickly to reduce these emissions. As the world's only superpower, the United States needs to reduce its own emissions and must also provide leadership so that other countries will reduce their emissions too.

Carbon dioxide (CO2) is the single most important heat-trapping gas that humanity emits into the atmosphere. Because some of the CO2 that we emit will stay in the atmosphere for many centuries, it is our cumulative emissions that matter. If today's rates of emitting heat-trapping gases and particles continue without change, then after just 20 more years the world will probably be unable to limit warming to 2 degrees Celsius.

To have a reasonable chance of meeting this 2 degree Celsius goal, the science shows that global emissions of heat-trapping gases and particles must peak soon and then start to decline rapidly, not in 50 or 100 years, but within the next 5 to 10 years, reaching near zero well within this century. Given the 2 degree Celsius goal already agreed to by many governments, the case for great urgency in taking meaningful actions to reduce emissions is a consequence of science. It is based on facts and evidence. It is not an ideological or political choice. We have a window of time within which we simply must act if we are serious about meeting the 2 degree Celsius goal. The window is still open, but it will soon close and will then remain closed.

If the world continues to procrastinate throughout the current decade, so that global emissions of heat-trapping gases and particles continue unabated for another ten years, then we will almost certainly have lost the opportunity to limit warming to 2 degrees Celsius. Thus, it is encouraging that President Obama's announcement comes now, rather than later. All of us can help, and we climate scientists in particular can participate in the critically important effort to increase our knowledge of climate change and to communicate our understanding clearly and objectively to as broad an audience as possible.

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CLIMATE SENSE

Essential Facts

WHERE HAS ALL THE CARBON GONE?

By Scott Denning

Most people know that burning carbon-based fuel produces CO_2, and that all that extra CO_2 in the air will warm Earth's climate. But a lot of people don't know that only half the CO_2 from burning fossil fuel stays in the air, and that the other half "goes away." Where does it go? How does it get there? How long will it stay there (wherever it goes), and what happens if it "comes back?" Most important, is there anything we can do to make more CO_2 "go away" and to keep it gone?

People make over $300 billion per year buying and selling coal, oil, and natural gas, so they keep really good track of the stuff. We know from these sales that people burn about 10 billion tons of carbon each year. A billion tons is the mass of a cubic kilometer of water, and we call these gigatons (like gigabytes), abbreviated GtC. Measurements of CO_2 all over the world show that only about 5 GtC/yr shows up in the air, and the growth rate of CO_2 has stayed about half rate of fossil fuel burning for decades.

So where has all the carbon gone?

Some of it dissolves into the oceans. Dissolved CO_2 in water is called carbonic acid, and it's what gives soda or beer or wine a fizzy sparkle that complements cheese or chips. Carbonating the oceans is a bad idea, and ocean acidification could eventually prove deadly to plants and animals that make alkaline shells. More to the point, it's really slow, because CO_2 from the air can only dissolve into the thin layer of warmer water that floats on top of the ocean. More than 90% of the ocean water is extremely cold and dense and dark and sits quietly on the bottom where it doesn't touch the air. Only near the poles in winter does the surface water get cold enough to sink carrying fossil CO_2 into Davy Jones' Locker.

Until 1963, nuclear weapons were tested in the atmosphere and produced a huge slug of radioactive CO_2 that behaves exactly like all other kinds of CO_2 and has been slowly dissolving into the oceans ever since. Radiocarbon ($^{14}CO_2$) from bomb tests is found throughout the surface oceans and thin plumes of it are slowly creeping along the bottom below the coldest parts of the Arctic and Antarctic seas. But the vast middle of the ocean has no bomb $^{14}CO_2$, nor any other atmospheric pollutants. Most of the ocean hasn't seen the air since the Middle Ages. It doesn't know we're here yet!

The rate of CO_2 accumulation in the air accounts for about 50% of fossil fuel combustion. The rate of bomb $^{14}CO_2$ uptake shows that the oceans take up another 3 GtC/yr, or 30% of fossil fuel emissions. So where's the other 20%?

You've probably seen the green bumper sticker that reads, "Trees are the Answer." It's true that trees and all other plants eat CO_2 for a living. Photosynthesis is the incredible process by which nonliving CO_2 gas in the air is transmuted into living biomass using the energy of the sun.

Every year, photosynthesis transforms more than 1/7 of all the world's CO_2 in the atmosphere into leaves, stems, roots, wood, and crops. So how come we're not worried that the biosphere will run out of CO_2? Because unfortunately all living things eventually die, and that goes for plants too. When plants die or shed dead leaves they become food for animals or microbes which digest them to harvest all that stored solar energy, and then breathe the carbon back into the air as CO_2. This planetary exhalation produces 1/7 of all the CO_2 in the air each year, and if the rate of plant growth were balanced by the rate of death, the amount of carbon in the biosphere would stay constant.

CLIMATE SENSE

CARBON...

Believe it or not, measurements show that plants and soils worldwide take up about 2 GtC/yr or 20% of fossil fuel emissions. Bluntly, the biosphere is growing faster than it's dying! The total amount of biological carbon has been increasing for decades, despite massive tropical deforestation, clearing land for agriculture, suburban sprawl, and paving paradise to put up a parking lot. Despite what we see out the window, the planetary biosphere is expanding by billions of tons of carbon per year.

The simplest explanation for the net growth of land carbon stocks is that CO_2 actually makes plants grow faster. Of course making extra plants by "CO_2 fertilization" also provides more dead leaves and other microbe food, but the average lifetime of carbon in biological material is between 10 and 20 years (some kind of average between thousand year-old Bristlecone pines and the grass my dog dug up last week). As long as rising CO_2 ramps plant growth up faster than decomposition, there's a net uptake each year.

But most plants aren't sitting around fat and happy waiting for additional CO_2, as they might be in a greenhouse. Experiments in which whole outdoor ecosystems are exposed to high CO_2 show that most plants are hungry for extra water nitrogen, light, warmth, space, or other things that limit their growth. For those plants, extra CO_2 won't help. Which is too bad, because CO_2 fertilization is the gift that keeps on giving. It would be great if we could count on photosynthesis vacuuming up more and more CO_2 as we burn more and more coal.

As it turns out, we're also dumping huge amounts of nitrogen on the biosphere, both from fertilized crops and as a byproduct of urban and industrial air pollution. Hot combustion inadvertently burns some of the nitrogen in the air, making nitrogen oxides that stain the air yellow ("the brown cloud"). These nitrogen gases rain out downwind and act like dilute MiracleGro falling from the skies, and some of the growth of the biosphere is driven by this inadvertent fertilization.

When Europeans colonized the New World in the 18th and 19th Centuries, they converted huge areas from forests to farms, releasing vast amount of carbon in to the air. In the past century, much of that farm land has reverted to forest as people moved into towns and got office jobs. Every molecule of wood in New England was derived from atmospheric CO_2, and we estimate that these regrowing forests sequester as much as 1 GtC/yr.

Ironically, our changing climate itself may be responsible for some of the terrestrial carbon sink. Growing seasons are longer in many parts of the world and have increased by 50% over the far North. In parts of the Arctic, woody shrubs that store a lot of carbon are invading landscapes that used to be tundra, storing lots of carbon.

The trouble with land storage of biological carbon is that it's not nearly as reliable as the oceans. Fertilization only speeds up plant growth until nutrient demands are met, and can even harm plants if its overdone. Regrowing forests only suck CO_2 out of the air until they mature and death catches up with annual growth. And a little Arctic warming may sequester carbon by growing shrubs, but too much could melt the permafrost, releasing more CO_2 than decades of regrowth and fertilization could store.

It's hard to predict what will happen to the Earth's metabolism in the changing climate of the next few decades. Some ecologists think there's still capacity for lots more growth of biomass. Others think the land is already about as full of carbon as it can get, and that climate change is more likely to release the fossil CO_2 it's already stored. It's important to find out, because the fate of carbon stored on land has the potential to swing the balance of atmospheric CO_2 over the next Century by as much as all the coal being burned in China!

Scott Denning is a professor of Atmospheric Science at Colorado State University.
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CLIMATE SENSE

Articles

NOTES FROM A CLIMATE CHANGE REFUGEE

By John Calderazzo

Bellvue, Colorado.

The sheriff's call came at 3:30 a.m.: Leave immediately.

Luckily, SueEllen and I were already up, grabbing passports, childhood photos, dog food, wall hangings from travels in Thailand and Zanzibar. A next-door neighbor had called earlier, warning us that flames were coming fast over the tinder-dry western foothills. The fire was being driven by searing winds that hours before had transformed our backyard Aermotor windmill blades into a silver blur.

This was early June, a little over a year ago. Summer hadn't even officially begun.

We'd gone to bed knowing that a lightning-caused wildfire was spreading in the high country beyond our beautiful valley on the outskirts of Fort Collins. We'd also heard that firefighters were trying to protect the historic Stove Prairie mountain school not far from where the flames had started. Kids still sometimes rode horses to that school. Yet, all of that was a good seven miles away from us, as the sparks fly.

Nevertheless, as we slept, the sparks had literally been flying like mad. Jumping from one dry treetop to another, they helped the fire bound forward sometimes a quarter-mile at a time.

As we drove off in cars rattling with our keepsakes, I took a good look back. I'm a writer whose last two books have been about volcanoes, none of them anywhere near Colorado; but now the foothills looked full of erupting craters, raging volcanoes on the move.

At least we'd had time to gather our wits and valuables--unlike my friend, Gary, who lived a few miles up the steep and winding Poudre River canyon. As he stood in his front yard, deciding whether or not to evacuate, a 100-foot-high wall of fire exploded over a ridge.

Gary fled with the only one of his four cats he could find. Another neighbor of his escaped with just her dog and a sewing machine.

So it went for us and, eventually, for thousands of our northern Colorado neighbors. Within a week or so, more than 200 homes were burned to ash. One woman, who lived alone in a mountain cabin not far from the Stove Prairie school, lost her life.

A hard rain later in the summer sent mudslides racing down denuded hillsides, closing roads and blackening the wild and no-longer-so-scenic Poudre River. Thanks to the plummeting pH of the river water, the state fish hatchery down the road from our home lost 240,000 fingerlings.

But our place and the homes of Gary and his sewing machine-toting neighbor were spared. (So were Gary's three other cats.)

For this, SueEllen and I could thank the leaping whims of wind-pushed fire and the incredible work of firefighters who managed to beat back the blaze just 300 yards from our property. After staying in the basement of friends in Fort Collins, we returned to our home of 22 years with a fresh case of survivor's guilt. Oily smoke- and cinder-tinged air lingered in the valley for weeks.

After we "settled" back in (an overly-optimistic word, since weeks passed before we felt safe taking our keepsakes back with us), I happened to be scanning the blackened foothills with my binoculars one afternoon when a new thought came to me. Whether we were touched by luck, tragedy or something in between, all of us who had fled or been evacuated had shared a genuinely new experience. We were now among the first generation of Colorado's climate change refugees.

We were refugees, it's true, with unbelievably greater resources and therefore far better recovery chances than, say, the poverty-smashed lowlanders of Bangladesh. Those poor folks, like so many people in sub-Saharan Africa, present the much more common and tragic faces of

REFUGEE...

today's climate-change refugees, worldwide.

But we were refugees just the same. In saying this, I'm not arguing that climate change directly caused what came to be known as the High Park fire. Lightning set the forest aflame, as it has sparked fires for millennia.

Nor am I saying that global climate change had necessarily caused the drought that was plaguing the Front Range and so much of the Rocky Mountain West. At the time of our fire, a neighbor's rain gauge showed that our valley had gotten less than 3 inches of rain in 2012. On the same date the year before, more than 11 inches had fallen.

Nor was the fire "caused" by single-digit humidity and a week of almost-unprecedented 100-degree F. high temperatures. But certainly all of those factors must have played a part in the effect.

The same goes for forest management practices that over the years have left many of our forests more fuel-loaded than is healthy. Millions and millions of acres of beetle-killed pines may be another factor.

The same goes for forest management practices that over the years have left many of our forests more fuel-loaded than is healthy. Millions and millions of acres of beetle-killed pines may be another factor.

Really, though, how can a hotter and drier climate not mean more frequent and intense fires, whatever the immediate cause?

I'm a CSU English professor, not a climate scientist. But I work with a number of them, in-state and elsewhere, to help communicate their findings to the public, and their fact-based arguments for human-caused global warming keep piling higher and higher, with very little countervailing evidence that I can see.

One 2008 study conducted by Colorado's Rocky Mountain Climate Organization and the Natural Resources Defense Council found that the average worldwide temperature from 2003-2007 was one degree Fahrenheit higher than the 20th century average. In the 11 Western U.S. states, that difference was 1.7 degrees.

Over the last 17 years, the study also notes, there's been an increase in the number of Western wildfires, with more acreage burned per fire. There's also been an astounding 78-day increase in the fire season. This study largely agrees with regional and global projections from the USGS and the Intergovernmental Panel on Climate Change.

For weeks after our evacuation, the western foothills of our partly-scorched valley were alive with the sound of helicopters dousing hot spots and trying to stop new advances. Lingering smoke fogged our days, and lots of people waited endlessly for permission to return to their homes or ashen property in the high country.

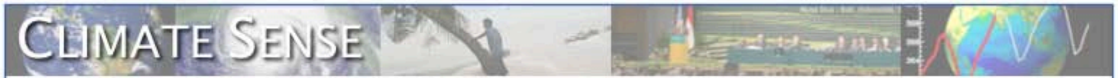
Other Colorado wildfires sprang up, including one on the edge of Colorado Springs that incinerated dozens of houses in minutes.

I'd like to conclude on a note of hope, noting the human heroics that saved so many structures, and the happy fact that as the fires slowed an evacuated alpaca at the Larimer Humane Society gave birth to a newborn by the name of Cinderella.

But the long range prognosis for our neck of the woods is no Cinderella story. This year, until a wet April put a dent in our drought, we were heading for a dryer season than last. Now, with every new rain, coal-black mud comes pushing through our valley, plays havoc with roads in the high country, and turns the Poudre pitch-black.

I once thought that the everyday effects climate change were largely invisible or very far away---the problem of people I would never meet. I don't feel that way anymore.

John Calderazzo teaches nonfiction writing at Colorado State University and with his wife and English Department colleague directs a climate change outreach and education program: changingclimates.colostate.edu.



Essential Facts

WHY WEATHER?

By David Randall

The weather is all around us. We literally live in it. We experience and talk about the weather every day of our lives -- hot afternoons, cold mornings, rainy days, sunny days, windy days, winter, summer, and so on. We all know about (and some of us have experienced) tornadoes and hailstorms and hurricanes and blizzards and flash floods. We have heard about fronts and jet streams and monsoons. Everybody knows that it's warmer near the Equator and colder near the poles. Everybody knows that in various places around the world there are deserts and rain forests and glaciers. Most of us are at least vaguely aware of a weather-related thing called El Niño.

So we know about the weather. Right?

Well, not so fast. The trouble starts as soon as we start asking "Why" questions about the weather. Here are some examples:

Given that warm air rises, why does the temperature get colder as you go uphill? Shouldn't a lot of the warm air be up there already?

Why do the winds over North America blow mostly from west to east, while closer to the Equator the ("Trade") winds blow mostly from east to west?

Why is the weather in San Francisco different from the weather in Baltimore? The two cities are the same distance from the Equator. They are both next to the ocean.

Why are the coldest winter nights always clear nights?

Most people don't know the answers to these questions, but maybe the TV weather person knows. Or maybe not. It could be that nobody really knows about these things.

Stop right there.

I'm here to tell you that there is a world-wide community of scientists who spend their careers looking for (and finding) answers to "Why" questions about the weather. I'm one of them. Brief answers to the questions above are given at the end of this essay.

Why am I a weather guy? As a kid, I was fascinated by thunderstorms and snowstorms, and I still am, because when a storm comes something's happening! One day when I was pretty young my Dad was driving our car along the side of a river. He pointed through the windshield to rain moving across the water. We could see the edge of the rain, a sharply defined wall that was coming towards us. Seconds later we passed through the wall, and our car was noisily splattered with big drops. It was exhilarating, and made me wonder about how storms work, but I did not know then that there is a true science of the weather. I thought that science was only about atoms and stars and biology and math.

A few years later, when I was an undergraduate majoring in Aeronautical Engineering, I learned how to calculate things like the lift and drag on a wing, and the thrust produced by a spinning propeller or a jet engine. The subject is called "aerodynamics." It's about how the air moves, and I was taught how to ask and then find answers to "Why" questions about moving air. It was fun because it was interesting.

At some point it dawned on me that methods like those of aerodynamics can be used to understand and predict the weather. Aeronautical engineers try to make the air do things, like lift an airplane into the sky. Weather is what the air does when it moves around on its own, in the natural environment. I soon found out that there was a small but growing community of scientists using methods like those of aerodynamics to understand and predict the weather. Well, that did it. I changed my major and eventually received a Ph.D. in Atmospheric Sciences from UCLA.

At this point, you might very reasonably ask: "OK, if you weather scientists are so smart, why can't you

CLIMATE SENSE

WEATHER...

make better forecasts?" The answer to that question is more interesting than you might expect:

First of all, the record shows that forecasts are much better now than they were 25 years ago, and they continue to get better every year. The improvements have been documented, in great detail, by the weather prediction centers around the world, who compete with each other to make the best forecasts. The advances come from several kinds of work, including better understanding (answers to more of the Why questions); better measurements of the weather, mostly from satellites; and more powerful computers.

An essential limit to forecasting skill is chaos, a word that is now part of the popular science vernacular. Chaos is about the ability of small causes to produce big effects. An example is the famous "butterfly effect," in which the flap of butterfly's wings in China can change the weather in New York City a few days later. Here is how to say the same thing more carefully: A tiny change in the weather today can lead to a big change in the weather a few days from now.

What "tiny change" am I talking about? A forecast starts from measurements of today's weather and runs the clock ahead to predict the future weather. The measurements of today's weather can never be perfect; no matter how hard we try, they will always contain small errors. The small errors are the "tiny change" in the weather today that can lead to a big change in the weather predicted for tomorrow. Making the small errors even smaller can be very expensive, and buys us only a slight improvement in forecast skill. As a result, chaos limits our ability to predict the weather more than a couple of weeks ahead even in principle. This has been understood for about 50 years. The limit has nothing to do with any particular forecasting method. It doesn't matter how powerful future computers may become. Chaos makes weather forecasting beyond a few weeks impossible.

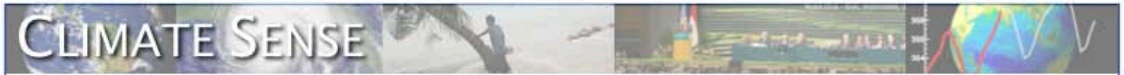
The second take-home point is that our modern understanding of chaos got its start from an atmospheric scientist, the late Edward Lorenz of MIT. Lorenz's insights have led to the development of a whole new science, sometimes called Nonlinear Dynamics, but the starting point was weather prediction.

A few lines back, I said that forecasting the weather more than a few weeks out is impossible. Nevertheless, here is a long-range forecast that I have great confidence in and would be happy to take large bets on: I predict that next January in Fort Collins, Colorado will be colder, on the average, than next July in the same place. Want to bet against that?

Why is it possible to predict how the average weather changes between summer and winter, but impossible to predict the weather beyond a few weeks? As you probably remember from some science or geography class, our seasons change as the Earth moves around the Sun because the Equator is tilted with respect to the plane of the Earth's orbit. The Northern Hemisphere has summer when it is tilted towards the Sun, and winter when it is tilted away. This tilting effect forces summer and winter to be different. The seasonal change is "forced," and that is what makes it predictable, even though the weather is chaotic.

Day-to-day changes in the weather are different. They are not forced. They simply come from the somewhat random development, movement, and decay of individual weather systems -- predictable for awhile, but only until the butterfly effect kicks in.

David Randall is a Professor of Atmospheric Science at Colorado State University and the Director of CMMAP, the Center for Multi-Scale Modeling of Atmospheric Processes: cmmap.org



INTRODUCTION...continued from page 1

CMMAP Director David Randall may stare at a computer screen for long hours everyday, but he provides both personal and scientific insight into the weather that surrounds all of us all the time. It's a lot more complicated---and relevant to our lives—than you may think.

Writer and CSU English professor John Calderazzo takes an up close and very personal look at last year's Front Range wildfires and wonders whether he and thousands of others who were burned out or evacuated might really be among the first of Colorado's climate change "refugees".

CLIMATE SENSE DESCRIPTION

Climate Sense is a publication for multi-disciplinary articles related to the Earth's climate. Our goal is to engage a broad community of students, educators, policy makers, and members of the public in a broad-reaching, cross-cutting conversation surrounding the Earth's climate and climate change.

Articles in Climate Sense will be concise, informative, and relevant to current issues related to climate change. Every article will be multi-disciplinary, and might include contributions from physical, natural, and social sciences, the humanities, and the arts; what sets us apart is that we make connections and encourage exchange among many varied fields.

We encourage articles that explore the policy interface with the natural sciences, humanities, and social sciences. Climate Sense is an online publication with articles that are freely available to everyone to read and download.

MISSION

Our aim is to foster cross-disciplinary conversations about current topics related to climate change, and to promote climate literacy among university students, scientists and scholars, and the broader general public.

AUDIENCE

Our target audience is students, researchers and educators at the university level. We hope to draw in a broader range of interested readers as well.

EDITORIAL POLICY

Climate Sense is not peer-reviewed. All decisions are made by our editors, who consider factors including

Presentation: whether the writing is interesting and compelling;

Broad interest level: whether the piece speaks to students, educators, policy makers, the public, as opposed to being aimed primarily at other specialists in the writer's own field;

Multi-viewpoint: whether the piece involves more than one disciplinary/ professional/practitioner perspective;

Relevance: whether the content will promote climate literacy. In some cases, the editors may solicit responses to individual pieces to create moderated, on-line conversations.

REVIEW POLICY

Articles submitted to Climate Sense are reviewed by our Editors to evaluate the degree to which they are well written and interesting. The review process does not constitute "formal peer review", in which articles are sent out for anonymous peer review.

OPEN ACCESS POLICY

Climate Sense provides immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge.

PUBLICATION SCHEDULE

Articles are published as they become available following editorial approval and minimal copyediting and typesetting to adhere to stylistic requirements set forth by the publication.

FORMAT

Original articles in Climate Sense are preceded by short introductions written by one of our Contributing Editors. The introductions highlight the multidisciplinary, informative, and topical merit of each piece. Our editors will also summarize material available from other online sources, such as popular climate blogs to academic journals. By acting as information brokers, we help our readers make sense of the plethora of online content on climate science and climate policy.

CONTENT AND STYLE

We solicit the widest possible range of informative, interesting, current, well-written articles on Earth's changing climate, with the important caveat that every article needs to address more than one discipline. We are not an academic journal. We encourage authors to avoid the academic voice; we like lively, direct narratives, and we're happy to see the word "I." As an online journal, we will try to work with authors who want to exploit the ability to include non-traditional material such as audio, video, and so forth.

Rodger Ames and others contributed to this introduction. Rodger is the CMMAP Knowledge Transfer Manager and the Executive Director for Reach, a Fort Collins, CO based nonprofit that focuses on science education: reachscience.org