St. Pauli News in Detail





Greeting and Ushering

Feb. 1 Jim/Jan Strandlie
Feb. 8 Craig/Sally Torkelson
Feb. 15 Chad Torstveit
Feb. 22 Val Torstveit

Altar Preparation: Tammy Haugen
(February 8 and Ash Wednesday)

* * * * *

February Milestones



Birthdays

Feb. 15 Jordan Rondorf
Feb. 18 Becky Stickler
Feb. 20 Gary Iverson
Feb. 25 Arlo Rude
Feb. 26 Evie Johnson

Anniversaries

None that the editor is aware of.

* * * * *

Church Council and WELCA did not meet in December, so no minutes are included in this newsletter.

* * * * *

Holy Communion

Sunday, February 8

Pr. Darrel Cory will be here to preside over communion services. Kevin Reich has been granted permission by the Synod Bishop to serve communion on Ash Wednesday and Easter Sunday services.

* * * * *

Quart and Pint Jars needed for Soup Deliveries

The WELCA ladies will again be preparing chicken dumpling soup for delivery on February 12.

We need both pint and quart-sized jars with lids for the soup. They don't need to be canning jars – they can be jars you may have purchased spaghetti sauce in or pickles. Simply leave them on the kitchen counter.

* * * * *

Personal Care Kit Items collected during Lent

What is needed per kit:

- Light-weight bath-size towel
- 2 bath-size soap bars in packaging
- Adult-size toothbrush in original packaging
- Sturdy comb (no packaging)
- Metal nail clippers (no packaging)

* * * * *

In Memorium



Clarice Sorteberg

December 9, 1932 – January 15, 2026

Clarice was Gary Iverson's aunt.

Clarice Hannah (Benston) Sorteberg, of Thief River Falls, MN, passed away on Thursday, January 15, 2026, surrounded by her loving family at the Thief River Care Center.

Clarice was born on December 9, 1932, at home in rural Thief River Falls to Clarence and Hilma (Olson) Benston. The youngest of three daughters, she was raised on a small family farm just outside the city limits, an area now known as Sorteberg Drive. Her father worked as a carpenter, and her mother managed both the home and farm. Growing up during the Great Depression, Clarice learned the value of hard work early in life as she helped her mother and sisters sustain the family.

She attended school in Thief River Falls and graduated from Lincoln High School with the Class of 1951. Following her dream of becoming a teacher, she completed Teacher's Training and earned her teaching certificate. Eventually she graduated from Bemidji State University with her teaching degree. Clarice began her career at Silverton Country School before moving to the Grygla Consolidated School and the Holt School.

One Saturday evening, while attending a dance in Middle River, she met her one true love, Russell Sorteberg. They married in 1953 at Trinity Lutheran Church. Together, they welcomed four children: Michael, Merle, Kristine, and Crystal.

Clarice and Russell were delighted to purchase her parents' farm. She was not only born there, but lived nearly her entire life on that farm until 2022. While teaching at Holt School, Clarice chose to pause her teaching career to raise her children, giving her more time to help on the farm and support her children's involvement in church, 4-H, and school activities. At Trinity Lutheran Church, she served faithfully through Sunday School teaching, Circle, and Altar Care, ensuring her children were raised with a strong foundation of faith.

Clarice and Russell cherished the simple joys of farm life, and their family grew with the arrival of their first granddaughter in 1982. Sadly, later that year, Russell passed away. With strength, grace and faith, Clarice navigated her grief and sought work to support her daughters still at home. She began her career at DigiKey in 1987, where she worked for 22 years until retiring at age 77. She treasured the friendships she made there.

Clarice was a devoted 4-H leader for more than 20 years with the Smiley 4-H Club, continuing her passion for teaching by mentoring young people in a variety of project areas. As a child, she fondly remembered the family dressing up and walking to the Pennington County Fair. As a mother, she looked forward to the fair every year, supporting her children as they prepared their 4-H projects for exhibit. On the farm, the family raised small grains, hay, cattle, and other livestock. Clarice kept a large vegetable garden and raised 300 chickens annually, selling eggs to local customers, restaurants, and schools.

For 73 years, Clarice faithfully wrote letters to her Teacher Training classmates. Their round-robin tradition, where each person added a new letter, removed their previous one, and mailed the packet to the next, continued across generations of life changes. Keeping this circle of correspondence alive for so many decades stands as a remarkable testament to enduring friendship, commitment, and love.

Clarice was known for always having a fresh pot of coffee ready and for being a wonderful cook. She will be especially remembered for her delicious sweets, festive Christmas gatherings featuring family singing, and Norwegian traditional foods, lutefisk and lefsa. She made birthday's special by celebrating with our cousins and always a homemade cake. Clarice enjoyed traveling with family and friends and highlights included Norway, cruises to Hawaii and Caribbean, and Florida.

Clarice joyfully welcomed into her life nine grandchildren, including two sets of twins and eleven great-grandchildren, with one set of twins among them. She was a devoted wife, loving mother, and proud grandmother and great-grandmother. Clarice was a friend to many and a cherished presence in the lives of all who knew her.

She is survived by her children: Michael (Lori) Sorteberg, Merle Sorteberg, Kristine (Robert) Robson, and Crystal (Dan) Barth-Pelletier. Grandchildren: Lisa (Ryan) Schlosser, Dustin (Jess) Sorteberg, Sean (Amanda) Sorteberg, Chelsea (Dacotah) Byklum, Toni (Tyler) Foss, Mathew (Shelby) Barth, Ethan (Savannah) Barth, Aaron Robson, and Hunter Barth. Great-grandchildren: Noah Schlosser, Beau Schlosser, Eli Schlosser, Summer Sorteberg, Sophie Sorteberg, Spencer Sorteberg, Kipp Foss, Nash Byklum, Mack Foss, Aubree Barth and Reed Barth. She is also survived by sisters-in-law Carol Dalum and Donna Sorteberg; brother-in-law Duane Austin; and many nieces, nephews and dear friends.

Clarice is preceded in death by her parents, Clarence and Hilma; her husband, Russell; her sisters, Marie Iverson and Mildred Rondorf; her son-in-law, Daniel Barth; as well as many brothers-in-law, sisters-in-law, and cherished friends.

For the past three years, Clarice resided at the Thief River Care Center, where she enjoyed participating in activities, especially Bingo. She formed many close friendships and deeply appreciated the kindness and care of the staff. The Sorteberg family extends heartfelt thanks to the entire Care Center staff for their care and compassion.

Clarice's legacy of love, hard work, devotion to her family, and her strong Christian faith will live on in the hearts of all who knew her.

Funeral for Clarice was held at 10:30 am on January 23, 2026 at Trinity Lutheran Church with Reverend Christy Klemz officiating. Burial was held at Greenwood Cemetery. Visitation and prayer service was held on Thursday evening at Johnson Funeral Service.

Why Make Quilts for Lutheran World Relief?

Once again, we will hold our annual quilt-making activities for two days in each of the months of January, February and March. We'll begin with Tuesday and Wednesday, January 6-7 beginning each morning at 10:00 a.m. (lunch included)

Why make quilts for Lutheran World Relief (LWR)?

LWR distributed its first quilts in 1945 to families in war-torn Europe following the Second World War. Within a decade, the ministry was reaching around the globe to villages far removed from the world's attention. Today, an average of 300,000 quilts are lovingly given worldwide each year.

LWR Mission Quilts are highly regarded throughout the world because of their quality and consistency. St. Pauli's careful adherence to LWR's quilt-making guidelines ensures that every quilt is useful, consistent and fair.

Making these quilts for LWR serves as a tangible expression of our care for global neighbors in times of crisis, providing both immediate survival aid and long-term health benefits.

Practical Uses and Survival

LWR Mission Quilts are designed to be highly versatile tools for people facing poverty, war, or natural disasters:

- **Warmth and Bedding:** Their primary purpose is to provide insulation against cold and rain as durable bedding.
- **Emergency Shelter:** They are frequently used as simple tents or floor coverings for families displaced from their homes.
- **Utility Tool:** Used as wraps to carry babies, sacks for transporting belongings, or room dividers for privacy.

Health and Development

- **Preventing Stunting:** In cold regions like Tanzania, quilts help children retain calories for growth rather than burning them to stay warm. Research has shown that providing these quilts helps prevent physical stunting and helps children grow up healthy.
- **Encouraging Healthcare:** Distributions are often paired with local medical programs; for example, offering a quilt may encourage families to travel long distances to prenatal clinics.

Meaning and Connection

- **Symbol of Dignity:** Receiving a high-quality, handmade item communicates to those in crisis that they are not forgotten and are loved by people they may never meet.
- **Intergenerational Community:** The process of making these quilts brings together volunteers of all ages—including middle schoolers and experienced mentors—to learn a skill while serving a humanitarian cause.
- **Impartial Aid:** LWR distributes quilts based solely on need, regardless of the recipient's religious or political background. To maintain this impartiality, quilts must not contain religious or patriotic symbols.

Global Reach

Since its founding in 1945, the ministry has distributed nearly **28 million quilts** to 136 countries. While many are sent abroad to countries like Ukraine, Haiti, and Tanzania, the program recently expanded in late 2025 to include domestic disaster responses within the United States.

In addition to quilts, St. Pauli makes school, personal care, baby care, and fabric kits. Check the 2025 Annual Report for details.

803,181 Quilts and Kits in 15 Countries



315, 818
QUILTS



179,200
SCHOOL KITS



231,811
PERSONAL CARE KITS



66,984
BABY CARE KITS



9,368
FABRIC KITS

This shipping information is from LWR's 2025 Fiscal Year (Oct. 2024 - Sept. 2025).

COUNTRY	SHIPPING WAREHOUSE	QUILTS	SCHOOL KITS	PERSONAL CARE KITS	BABY CARE KITS	FABRIC KITS
ANGOLA	Maryland	33,000	16,900	27,000	9,000	
DJIBOUTI	Minnesota	9,520	15,225			
GEORGIA	Minnesota			65,100		
	Maryland	49,500				
HONDURAS	Minnesota		29,290			
JORDAN	Maryland	6,600	6,500			
LIBERIA	Minnesota	5,100			3,500	
MADAGASCAR	Minnesota	9,520			7,350	
MALI	Maryland	51,975	19,500	15,000	6,000	1,568
ROMANIA	Maryland	6,270	3,380	3,900		
SERBIA	Maryland	7,425		6,300		
SIERRA LEONE	Minnesota		15,225		7,350	
TANZANIA	Minnesota	9,520			7,350	
UKRAINE	Maryland	8,250		6,000		
UNITED STATES - EAST	Both	85,737	40,794	65,561	20,950	5,360
UNITED STATES - CENTRAL	Both	17,720	4,350	9,150	784	1,800
UNITED STATES - WEST	Both	10,581	28,036	33,800	1,200	640
ZIMBABWE	Minnesota	5,100			3,500	
	TOTAL	315,818	179,200	231,811	66,984	9,368

PUSH!

Continuing our series from “Winter’s Song – a Hymn to the North” by TD Mischke

“Roll down your window… Keep it down so you can hear me… Now, put your car in drive, but don’t give it any gas just yet… Put it in drive and keep your foot on the brake… Got it?... Now, wait till I say go and then give it gas, but when it moves forward, let up on the gas and let the car roll back again, then give it more gas till it moves a bit more forward, then let up. We’re going to get your car rocking, back and forth, okay? … So, give it gas ‘til it moves forward, then let up ‘til it moves backward, then repeat, over and over. We need some momentum here… Okay, ready, go!... Yeah, that’s good, that’s good… Now let up… Now give it gas again… Good… Now let up… Keep doing that… Yes, yes, yes… Keep it up… That’s it… Keep it up, keep it up…You got it… Okay, now just gas, just gas, just gas… Go, go, go… Yes, yes, yes, you got it! You’re out! You’re out!

What year did words like these first accompany the visible steam moving in staccato bursts from the mouths of bundled Northerners, straining on some snow-covered roadway? On what blustery winter day was such chatter first aimed at a driver in a bind? Decade after decade, it’s been the same advice, given by someone staring with grim determination at tires spinning in place.

“Push, everyone, push.” A shout heard above the road of a revving engine. Three, four, five people, bodies bent against the rear bumper, boots dug into a white mound, shoulders pressed against cold metal, voices groaning, “Puuuuush…!”



The first time you try to push a car through the snow with human muscle, it’s a rite of passage. By the 30th time, it’s a well-rehearsed play. But over the years it becomes a sacred, beautifully choreographed ritual. Finally, late in life, such acts are engaged in as therapy, as necessary to the soul of a Northerner, so as to continue to tightly knit that intimate connection to the season and to provide a sense of place. Ultimately, it serves the helper with the muscle more than the driver with the problem. Pushing a vehicle out of the snow is a Northerner’s touchstone. It helps solidify our identity the way a uniform might for a Boy or Girl Scout. The Scouts have merit badges that move them gradually along to some higher plane. Northerners have rituals that move us deeper into who we are.

The guy on the corner starts his snowblower and clears his walkway. As he nears his property line he pauses and then decides not to turn around. Instead, he keeps moving in a straight line past the next house, and the next, and the next. What’s he doing? You spot the heads in nearby windows as neighbors peer out.

“There goes Roger,” someone says. “He’s going to tackle the entire block. He’s cutting a swath for everybody!”

Why is Roger doing this? First and foremost, Roger knows that only a few neighbors have snowblowers, and he feels stubborn pangs of guilt when he’s seen clearing his walkway effortlessly while they grimace with a shovel. Secondly, Roger longs to be a good man. He doesn’t find as many opportunities as he’d like, but here’s one. Everyone in the neighborhood on this day, will see that Roger can be a decent guy. Sure, he drinks too much and he’s a blowhard and his car could use a muffler. But there’s a good heart in there. That’s what Sara is going to say, in a minute or so. She’s going to turn away from her window, walk past her husband, and say, “That Roger’s okay.”



In the wintertime you need to be okay. You can be a jerk come summer, but winter is when you need to be better. It’s when you need to look out for other people. Old people fall, homeless people shiver, cars smash into one another, people find themselves alone for the holidays. A Northerner needs to be aware, needs to be conscious of his or her surroundings, needs to move through the day with an understanding of community. It’s how Northerners have gotten by since people first moved to this region. It’s not about selflessness. It’s about how we all make it through. It’s how life is made easier, for everyone. And, as with the person pushing the car free of the snowbank, the beneficiary is almost always the one providing the aid. In that service, you become more of what you’re meant to be, and you embrace that. You feel yourself slip into that comfortable sense of being a decent person, and it feels as warm as a favorite sweater. A familiar light enters you. It’s a communal light, one that bonds you to the group, that makes where you live something more than a location on a map.

We push, we Northerners, we push. Along with the cars and snowblowers, we push ourselves to be compassionate. It doesn't always come naturally, which is why the season is a gift. And the season pushes us in return. Some are pushed right out of the region, down to the sunny South. But those who remain have a way to make it through. No matter how cold the temps get, those temps are no match for the warmth of human empathy.



Andrew is pushing a shopping cart filled with blankets, clothes, and plastic shopping bags containing toiletries and canned goods. He's on his way past the park and across the busy street to some nearby railroad property. Before the tracks appear, there's a clustering of trees and a meager pond. Tucked beside the thick exposed roots of a massive oak tree there's a blue tarp weighted down with rocks and tied in place with twine. This is home. Andrew has a propane stove but no propane. The tank is empty. He'll have to head to that well-traveled intersection a mile away to stand with his cardboard sign and his 15-gallon propane tank. The sign is specific. "Just want to be warm. Please help." The heater is not used for warmth as much as it is for cooking, but Andrew wants a sign that will keep it simple.

Few people can argue with the way a tattered fellow with a cardboard sign can appear more in need on a cold January evening than on an August afternoon, even with the general presentation of that person being roughly the same. As one pulls up to an intersection, the situation seems far less like desperate desire and far more like emergency need. Cold changes everything. First, it takes far more gumption to stand there, shivering, asking for money. And for the person driving by, just the idea of being homeless in such weather is disruptive to the heart. Dollars pass through the rolled-down window with more frequency. The contrast between the person with the sign and the driver in his or her warm car goads the conscience more dramatically than a few months ago.

The internal and external forces that push each of us in winter include the push we all receive to get outside. It's sometimes battled by the pull of one's dwelling, the pull of one's couch, the pull of a book or film, and the pull of comfort food and blankets. But unless you absolutely can't handle what's on the other side of those walls, there is that push to routinely breathe fresh air and move your body, and that means the push to leave that snug world with the thermostat set at sweet 70. There are three ways Northerners receive the push: grudgingly thoughtfully, or enthusiastically.

Grudgingly means a quick walk around the block, maybe a bit farther in mild temps, but not a whole lot farther. You're not doing this for enjoyment. And grudgingly means only the basics: gloves, hat, coat, and boots, that's it. The walk is swift and is intended to assuage the nagging guilt that you might be harming your health with your sedentary winter ways.

Thoughtfully can mean a simple walk as well. But it's long and it's planned and it's with the realization that, no matter how cold it is, there's clothing to keep you comfortable. A base layer to wick away moisture and insulate, a light flexible mid-layer to trap body heat, and a tough windproof outer layer with a good hood. Long thermal underwear and loose-fitting moleskin pants work together to trap heat, and you're pushed to move at a healthy clip because movement adds warmth. The time outdoors can be invigorating, and it makes your return home all the more rewarding. On a star-lit winter night, after a good snowfall, where you're the only one outside in that deep quiet, it can be a sacred service to your soul, not just a boost to your cardiovascular system.

Some people are pushed to go further in their outdoor purists and become winter sports enthusiasts. They're pushed to learn to skate or ski, or they buy snowshoes or learn to ice fish, or they make sure they get out tobogganing with their kids on the weekends. Surrounding Northerners in all directions are winter's unique opportunities. The necessary incentive to explore those opportunities can be nothing more than the often-repeated warning of our elderly citizens:

"What you will come to regret most at the end of your lives," they tell us, "are not those things you tried and failed at or that you found wanting. It will be all those things you never tried at all."

Winter pushes Northerners to reflect. The cold and dark make it almost impossible to avoid taking time to look deeply into one's own life. We are all pushed inward, and in so doing we're pushed to evolve. And there is little deep reflection in a human life that isn't followed by some desire for change. Winter is often the gestation period for change, with spring presenting the perfect setting for its birth. In this way winter is deceptive. All is quiet, frozen, and still. But it's the season best suited to kick-starting our most dramatic transformation.

We just need a little push.



AROUND THE NEIGHBORHOOD



Pictured from left to right are: front row – Kaiden Nelson, Lincoln Davis, Damian Kazmierczak, Thomas Eidsmoe, Ian Jacobson, Brian Berg; back row – Tristan Hruby, Elias Motta, Landen Larson, Chandler Pream, Joseph Bruggeman and Hunter Miller. (Photo by Joe Vennewitz printed in *The Times* January 21, 2026)

.

The Thief River Falls boys varsity wrestling team won the Prowler Invite for the second time in three years and the sixth time in program history.

Lincoln Davis, Tristan Hruby and Landen Larson won individual championships and Kaiden Nelson went 2-1 with a pair of falls in a runner-up effort at 107 pounds.

Kaiden is a 9th grader and the great-grandson of Barb Nelson, grandson of Laurie Nelson, and son of Ben Nelson.

Coach Kenny Geiser said, “Kaiden Nelson, Lincoln Davis, Elias Motta, Landen Larson and Joey Bruggeman have performed very well. Kaiden and Joey are pleasant surprises for sure.”



Remember this photo from last month?

Jan Strandlie correctly identified them. Taken on the old front steps of the church.

Front row: Marisa Johnson, Charissa Bjorge, “No-Time-For-Pictures” Jeff Davidson, Bruce Folkedahl

Back row: Damita Johnson, Steven Wiskow, Jimmy Rondorf, Christy Mathson, Jacki Davidson, Dale Iverson

"BREAKFAST FOR A BILLION"

We Live Like Royalty and Don't Even Know it – Part 2

Fertilization, irrigation, genetics: the three practices that let us feed the whole world for the first time in history

By Charles Mann

Sometime in the 1980s, an unprecedented change in the human condition occurred. For the first time in known history, the average person on Earth had enough to eat all the time.

Depending on their size, adult humans need to take in 2,000 to 2,500 calories per day to thrive. For as far back as historians can see, a substantial number of Earth's inhabitants spent much of their lives below this level. Famine and want were the lot of many, sometimes most, of our species.



What harvest in Montana

Even wealthy places like Europe were not protected from hunger. France today is famed for its great cuisine and splendid restaurants. But its people did not reach the level of 2,000 to 2,500 calories per day until the mid-1800s. And even as the French left famine in the rear-view mirror, starvation was still claiming hundreds of thousands of Irish, Scots, and Belgians. During WWII in 1944–45, the Netherlands suffered a crippling famine — the *Hongerwinter*. More than 20,000 people perished in just a few months. Food shortages plagued rural Spain and Italy until at least the 1950s.

In poorer regions the situation was bleaker still. The United Nations created the Food and Agriculture Organization (FAO) in 1945. One year later, the FAO issued the *World Food Survey*, a forty-page report that was the first-ever comprehensive attempt to measure what the world ate. Half the Earth's inhabitants, it reported, subsisted on fewer than 2,250 calories per day. Globally, just one out of three people had clearly adequate diets.

Worse, many believed, humanity's rising population meant that the task of feeding everyone would get harder. Between 1950 and 1990, human numbers doubled, from 2.5 billion to 5 billion. (The figure is now more than 8 billion.) So overwhelming seemed the task of providing for all these people that a stream of bestselling books argued it was impossible. The most famous warning — *The Population Bomb*, published in 1968 by Stanford ecologist Paul Ehrlich — began with a stark statement: "The battle to feed all of humanity is over." The book promised that "hundreds of millions of people are going to starve to death" in the 1970s because farmers would not be able to grow enough food. No matter what we do, Ehrlich wrote, "nothing can prevent a substantial increase in the world death rate."

But hundreds of millions did *not* starve to death. The world death rate did *not* substantially increase. Instead, harvests rose — and have kept rising. By the 1980s, farmers were producing so much food that the global average food consumption had reached 2,000 to 2,500 calories per day, a landmark in history. Today the average is closer to 3,000 calories per day, and the emerging problem is obesity — too much food, rather than too little.

The picture is not wholly rosy — almost one out of ten people still do not get enough to eat. But hunger today is generally due to low incomes and poor food distribution, rather than failing to grow enough food. Farmers produce enough for everyone, but not all get what they need. Still, our daily lives are nothing like those of previous generations.

What happened? Modern agriculture.
Farming is one of our species' oldest activities, dating back roughly 13,000 years. About six thousand years ago, farmers began using draft animals — horses, oxen, and so on. For millennia after that, what farmers did in their fields changed little. But in the 1960s and 1970s, in what is called the "Green Revolution," research scientists, government agencies, agricultural businesses, and farmers themselves put together a new, strikingly more productive version of agriculture — Farming 2.0, if you will.

Today, Farming-2.0-style agriculture — which began with innovations in field crops like wheat but spread to other parts of farming, such as cattle ranching and chicken-raising — is by almost any measure the world's most critical industry. It is directly responsible for our daily bread. But despite its overwhelming importance, Farming 2.0 is in many ways unknown to most of us, because it has been so smoothly successful that we have almost no picture of the underpinnings of the vast system that provides us with breakfast, lunch, and dinner. Too few have any sense of its scope, what brought it into existence, and in what ways it will need to change.

Its scale is staggering. Some 40% of our planet's land is covered by cropland and pasture, the overwhelming majority of which is devoted to this type of agriculture. Increasingly, the farms themselves are huge — one in China covers 22 million acres. And they are supplied and their products processed and shuttled about the world by a web of gigantic multinational companies — Cargill, BASF, Wilmar, Archer Daniels Midland, and others. Supervising this enormous network of production and exchange are agricultural agencies in every world government that set rules for and inspect what farmers produce and sell. The result of this huge, global system is on display in every supermarket. The gleaming arrays of highly networked international goods — fruit from Peru, pasta from Italy, sugar from Brazil, vegetables from the Netherlands, condiments from China, coffee from Ethiopia — that line the aisles would have astonished our grandmothers and great-grandmothers.

All of this was brought into being by the Green Revolution. In its simplest form, the Green Revolution was a mix of modernized versions of two ancient technologies and one brand-new science. The old-but-updated technologies were *fertilization* and *irrigation*; the new science was *genetics*. Combining these three into Farming 2.0 was, arguably, the most important event in the 20th century — it literally reshaped the face of the Earth.

'Bread from Air'

Fertilization is the older of the two old technologies. People have known for at least 8,000 years that adding organic substances — notably, animal feces and urine — to the soil helps crops grow and flourish. But for almost all that time nobody knew *why* manure was good for crops. Only in the first decades of the 19th century did several German researchers discover that plant growth was controlled by the amount of nitrogen they take in through their roots — and that manure and every other type of fertilizer work principally because they add nitrogen to the soil.

Without nitrogen, plants cannot perform photosynthesis, the process by which they capture power from sunlight and carbon dioxide from the air to drive their growth. More technically, plants primarily need nitrogen because it is an essential constituent of rubisco, the molecule at the heart of photosynthesis. Like military recruiters who induct volunteers into the army and then return to their desks, rubisco molecules take carbon dioxide from the air, insert it into the tangle of chemical reactions that makes up photosynthesis, then go back for more. Rubisco's facilitating actions are the limiting step in photosynthesis, which means that the rate at which rubisco functions determines the rate of the entire process. The more rubisco, the more photosynthesis; the more photosynthesis, the more crop growth; the more crop growth, the greater the harvest.



Celery field in Salinas, California

At first glance, the notion that soil could somehow be short of nitrogen seems odd. Nitrogen makes up more than three-quarters of the atmosphere. How could it be in scant supply? The reason is that more than 99% of the Earth's nitrogen is in the form of nitrogen gas. Nitrogen gas — N_2 in chemical notation — consists of two nitrogen atoms bound together so tightly that plants' cellular machinery cannot split them apart for use. Instead, plants can absorb nitrogen only when it is combined with other elements, such as hydrogen, carbon, and oxygen, into compounds that plants can break up.

Scientists refer to the process of creating usable nitrogen mixtures as "fixing" nitrogen. In the soil, nitrogen is mainly fixed by microorganisms. Some break down organic matter, making its nitrogen available to plant roots in easily digestible forms. Others, such as the symbiotic bacteria that live around the roots of clover, beans, lentils, and other legumes, use clever biochemical tricks to break apart nitrogen gas and change it into compounds that plants can take in. A small amount is fixed by lightning, which zaps apart airborne N_2 molecules, after which they combine with oxygen into compounds that dissolve in rainwater. In the mid–nineteenth century, some of the same scientists who had discovered nitrogen's essential role in photosynthesis realized that factory-made nitrogen compounds — chemical fertilizers — could substitute for manure. The trick was to make those artificial compounds. And the key to making them, chemists believed, was to learn how to manufacture ammonia — the same substance that is in ordinary household ammonia today — as a precursor, because they knew that ammonia could be easily transformed into nitrogen-containing substances that plants can absorb.



Tractor spraying a green field

Chemically speaking, ammonia (NH_3 to scientists) is simple: one nitrogen atom and three hydrogen atoms, arranged in a rough pyramid. Researchers had long known how to get pure hydrogen — the H — from hydrogen gas. But, like plants, they were unable to pry apart N_2, nitrogen gas, to make NH_3. Decades of attempts to make synthetic ammonia failed.

Early in the 20th century, a German scientist named Fritz Haber found that he could break up nitrogen gas by heating and compressing it in the presence of special alloys that catalyze — facilitate — the process. The catalyzing alloys were Haber's special contribution. Building on Haber's work, a German chemical engineer named Carl Bosch then figured out how to produce ammonia on the industrial scale needed for farmers' fields. Both men received Nobel Prizes.

The prizes were richly deserved; the Haber–Bosch process, as it is called, was arguably the most important technological development of the 20th century, and one of the most consequential human inventions of any time. It made it possible to win "bread from air," as the German physicist Max von Laue wrote in an obituary of Haber.

Because Haber and Bosch completed their work in the run-up to World War II, the Haber–Bosch process was not widely deployed until after the fight was over. The first leg of the Green Revolution — the first part of the rise of Farming 2.0 — was for countries across the world to build fertilizer factories.

Today more than 1% of the world's industrial energy is devoted to making ammonia fertilizer. "That 1 percent," the futurist Ramez Naam says, "roughly doubles the amount of food the world can grow."

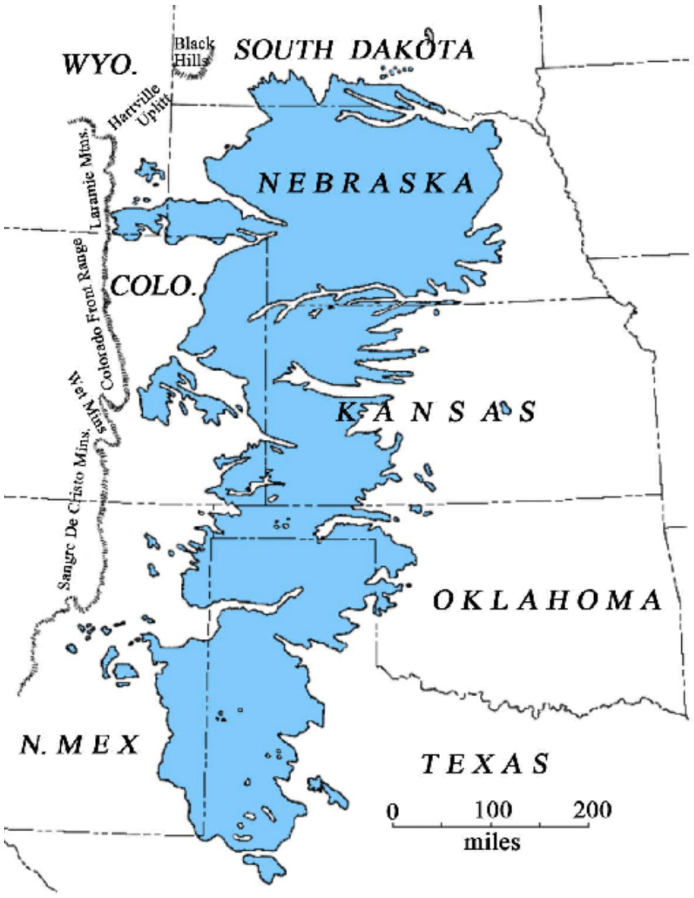
Increasing the food supply fostered an increase in human numbers. The energy scientist Vaclav Smil has calculated that fertilizer from the Haber–Bosch process is responsible for about 40% of the world's dietary protein. Roughly speaking, this is equivalent to feeding 40% of the world: about 3.2 billion people. More than three billion men, women, and children — an incomprehensibly vast cloud of dreams, hopes, and fears — owe their existence to two obscure early-twentieth-century German chemists and the fertilizer industry they spawned.

Pumps and Dams

Equally important to Farming 2.0 was the second leg of the Green Revolution, irrigation. Irrigation dates back nearly as far as fertilizer — the oldest known example is from about 6000 B.C., in the Jordan Valley, which lies between Israel and Jordan. But it sprang up independently in many places, from ancient China to ancient Mexico to ancient Zimbabwe.

In every one of these places, the basic concept was simple: divert water from a river or lake above the farm into its fields, watering the crop. But irrigation was difficult to establish in most areas, because those rivers and lakes are typically lower than the farmland around them, and water doesn't flow uphill. Mechanical pumps to extract water from wells, over riverbanks, and up slopes did not exist until classical Greece — the famous mathematician Archimedes is known for one especially useful type, a screw — and high-capacity pumps were unknown until the Renaissance. But even when better pumps became available, so much energy was required to pump the volume of water necessary to flood fields that more often than not irrigation was impractical.

In most cases, the arrival of fossil fuels — compact, easily transportable energy — answered the question of how to make large-scale irrigation practicable. In the late 19th century, farmers on the Great Plains of North America erected thousands of windmills to pump groundwater from wells into their fields. But those windmills could typically draw water from no deeper than 30 to 60 feet, and digging wells was expensive. In the mid–20th century, pumps powered by fossil fuels let farmers reach 300 feet below the surface to the great Ogallala Aquifer, an underground region of water the size of Lake Huron that stretches from South Dakota to Texas. Plains agriculture exploded. By the late 1970s, water from the Ogallala was responsible for much of the wheat, corn, alfalfa, and cotton grown in the United States. Forty percent of the nation's cattle drank it.



Ogallala Aquifer, which has been mined so much scientists now worry it will run dry.

When water couldn't be pulled out of the ground, nations used new engineering techniques to build huge dams and canals to store irrigation water. Construction began in the mid-1800s on the first great modern water storage complex, in the Indus Basin between Pakistan and India. Slowly increasing in scale and including one of the biggest dams in the world, this massive project grew to transform the Indus into a global agricultural power. Other big projects were built in the Ganges Valley in India, the Soviet Union's Aral Sea, Egypt's Nile Valley, and the Colorado, Columbia, and Central Valleys in the United States. Today, a quarter of the world's cropland is irrigated — but it provides roughly 40% of all the food humans consume.

Breeding Abundance

The third part of the Green Revolution was the introduction of genetics — or, more precisely, the use of genetic tools to create new varieties of crops that could take better advantage of the sudden rise in fertilizer and irrigation.

This effort largely traces back to a little-known project in Mexico during and after the Second World War. So many Mexicans then were suffering from hunger and malnutrition that the resultant unrest had led the United States to fear its neighbor would fall to a fascist coup. The U.S. government asked the Rockefeller Foundation, one of the biggest and most influential U.S. research-funding charities, to help Mexico increase its production of corn, the country's primary staple food.

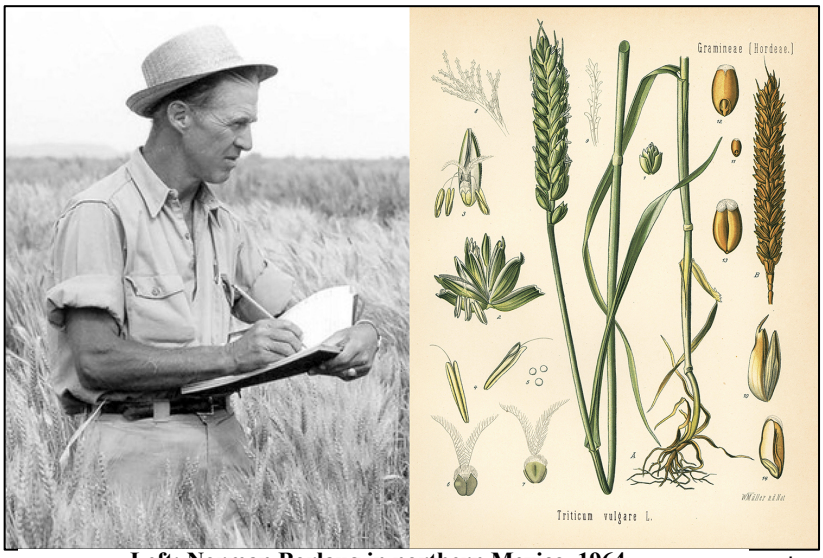
The corn project met with little success. But the foundation ended up changing the world anyway. As a side project, it brought down a young plant-science researcher, Norman Borlaug, to look at stem rust, an ancient disease that afflicted Mexico's wheat crop. In conventional terms, hiring Borlaug for this task was an odd, even foolish choice. Borlaug knew little about wheat, had never been to Mexico, and didn't speak Spanish. But, as it turned out, his intense ambition and endless willingness to work made up for these deficits. In an unprecedented move, he collected hundreds of varieties of wheat and bred them together in every imaginable combination, hoping to create a novel hybrid that could naturally fight off stem rust. The task was breathtakingly arduous — one reason it had never been tried.

Wheat flowers, known as florets, grow in little bunches atop the stalks. Like many other varieties of flower, each wheat floret has both male and female reproductive organs. Rising on thin stalks from the center of the floret are the *stamens*, the male parts of the plant, which contain the pollen in little pods at the tips. Below these are the delicate filaments of the female parts of the flower, the *stigmas*, with the ovary below. When the stigmas develop enough to be capable of reproduction, biochemical signals cause the stamen tips to burst, releasing thousands of dust-like grains of pollen. The grains settle on the ends of the stigmas. Sensing their arrival, the stigmas create a small tube that permits the pollen to link to the ovary beneath. Male and female mechanisms join and begin creating a seed, the grain that the farmer will harvest.

Because both pollen and ovary come from the same plant, the new seed has the same genes as its parent — it's an identical copy. To create new varieties, plant breeders must stop wheat as and a couple of assistants sitting on little home-made stools in

the sun, opening up every floret on every plant of a particular variety, carefully plucking out the stamens (male parts) with tweezers, hundreds of plants at a time. When they were done, the wheat was entirely female — the plants had been, so to speak, feminized. Borlaug and his assistants then covered all the altered florets with folded paper so that no pollen could get in.

In the next step, they snipped off the stigmas (the female parts) from a second wheat variety, making those plants entirely male. Opening the paper covers on the previously "feminized" florets, Borlaug inserted the stigma-less, male florets, twirled them around to release their pollen, then sealed the paper back up. And then he did this all over again for the next two wheat varieties, and the next two — hundreds of thousands of



Left: Norman Borlaug in northern Mexico, 1964.
Right: Common wheat.

breedings in all, each and every one performed under the harsh Mexican sun. After a few days he removed the paper from all the hybrids, hand-planted them in fields, let them grow, and exposed them to stem rust. Most would die, but a few would survive, and he would breed the survivors to make new varieties, hoping to create resistant hybrids.

After years of labor, Borlaug bred rust-resistant varieties of wheat. But he did more than that. He bred wheat varieties that were more productive than others, and, realizing that those high-yield ones would bear so much grain that they would become top-heavy and fall over, he bred varieties that had much shorter, stronger stalks — dwarf wheat, as it is called. Even more than that, his varieties were unusually tolerant of local conditions — they could be planted almost anywhere.

Borlaug's varieties doubled, tripled, even quadrupled yields — but only if the plants were massively fertilized and given plenty of water, which usually required irrigation systems. Within a decade, Mexico changed from a country that had to import much of its wheat to a wheat exporter. Borlaug's wheat then went to India, Pakistan, Egypt, and other nations, raising their yields, too.

The results convinced the Rockefeller and Ford Foundations to try the same thing with rice. The staple crop of much of Asia, the world's most populous region, rice is humankind's single most important food. The foundations established a new laboratory in the Philippines for the rice project — the International Rice Research Institute. In the 1960s and 1970s, IRRI researchers used Borlaug's mass-breeding methods to develop new, highly productive strains of rice. Like Borlaug's wheat, the IRRI rice was part of a package that included increased irrigation and fertilizer use. Between 1961 and 2003, Asian irrigation more than doubled, from 182 million acres to 417 million acres, and fertilizer use went up by a factor of more than twenty, from 4 to 87 million tons. Combined with the new rice strains, the consequence was a near-tripling of Asian rice production.

The effects were staggering. In the 1970s, much of South and East Asia were plagued by hunger. By the 21st century, Asians had an average of 30% more calories in their diet. Millions upon millions of families had more food, and with that came so much else. Seoul and Shanghai, Jaipur and Jakarta; shining skyscrapers, pricey hotels, traffic-choked streets blazing with neon: all are built atop a foundation of laboratory-bred rice.

What Needs Fixing

All this progress came at a cost. Farming 2.0 has transformed human life, but it has also wreaked environmental havoc. Agriculture has always caused erosion, water pollution, biodiversity loss, and other ecological problems. Green Revolution farming, which places more demands on the Earth, has worsened these issues, with irrigation mismanagement and fertilizer overuse being particularly alarming. Poor irrigation practice can poison the soil by filling it with the salts dissolved in water; fertilizer overuse can pollute rivers, lakes, and oceans with the runoff from fields. All these problems must be resolved.

And they are complicated by another. The sheer scale of Farming 2.0, with its giant farms and giant firms, has led food consumers increasingly to mistrust the industry. They don't believe these enormous, profit-making enterprises have their best interests at heart. The mistrust is aggravated by the very success of modern agriculture, which has made it possible for much of the world's population to live without having any connection to the farms and farmers who provide their food.



A chicken farm in Arkansas

Meanwhile, the world's population will keep increasing, probably to 10 billion this century. People will likely be more affluent, too, which means they will demand better food. The next task for the next generation of farmers, researchers, and agricultural companies will be to maintain the gains of the past for all these new people while preserving the environment for the future. The task for everyone else will be to learn enough about the food system to help them do it.

Next month: "What Keeps the Lights On"

MUSIC STARTS WHERE OUR WORDS END

Mindekirken pastor bids adieu

By Leslee Lane Hoyum, Rockford, MN

Mindekirken's guitar-strumming pastor, Gunnar Kristiansen, offered his last sermon to parishioners on Jan. 25. After four years of service, Pastor Kristiansen will finally take retirement seriously. Mindekirken has had the benefit of his spiritual leadership twice, once from 1998 to 2000 and again from 2021 to 2026.

Kristiansen brought a unique set of skills to Mindekirken. Although he had served parishes in Hamarøy and Bodø, Norway, he spent most of his career serving as chaplain and family therapist in a mental health facility in Bodø and, for one year, working as a high school pastor in Namsos counseling suicidal teenagers. He also ministered on the streets of Oslo, which is a job not only focused solely on spreading the gospel. "It can be painful," said Kristiansen. "To see young lives wither and die is terrible. I especially remember one guy from north of Trondheim whom I saw sitting near the Oslo Central Station. I originally met him when I worked in Namsos. His mother was extremely anxious for him. He agreed to speak with her on my phone. I quickly realized how a gesture as simple as a phone call can mean so much. I will never forget it." Most of Kristiansen's Oslo mission work was with the Suicide Hot Line, an experience about which he could speak for hours.

One bonus gift Kristiansen brought to Mindekirken was his ability to play all types of music on his guitar. "Music starts where our words end," said Kristiansen, "simply because we have no words for everything in our spiritual life. When Bach wrote 'Soli Deo Gloria' (Only God has the honor) at the top of his compositions, he hit the nail on the head," said Kristiansen. "To me, music is a perfect way to praise God."

Kristiansen's love of guitar stems from his grandmother, who taught him his first simple chords. When he was a student, he had the privilege of taking guitar lessons from a professor at the highly acclaimed Norwegian Academy of Music. "My favorite music genre is opera," Kristiansen continued. "I know — you're probably saying, 'What? All that yelling?' Yes, I must say. I find most music interesting at the very least, even heavy metal." He prefers to play and sing ballads, which is what the Mindekirken congregation loves to hear, especially when accompanied by the Mindekirken Band, which he formalized in 2021.

So, now what will Pastor Kristiansen do in retirement? Well, for sure, he is not slowing down. "Finally, I will have time to spend with my seven grandchildren, the youngest being only 3 months old," said Kristiansen. "It'll be so much fun watching them grow up. The first year I am home in Norway I will be living in Oslo. It's all about taxes," he confessed. "I need to live in my condo for a year before selling it to avoid tax implications. But after that, I'll be spending much of the year in my hometown of Bodø." But, of course, Bodø is just home base, since Pastor Gunnar has several international connections.

Just one and a half years ago, Kristiansen was invited to visit Montefalcone, Italy, with his colleague Nils from Gildeskål, Nordland, and fell in love with the place. Yes, he bought a house that at one time had a donkey living in the lower level. However, now all four floors are remodeled and ready to visit, enjoy the views, and learn to relax.



Photo courtesy of Leslee Lane Hoyum

But Pastor Kristiansen's great passion is a nonprofit he founded in 2012 in Bohol, Philippines — iHelpFriendship. "It was merely by happenstance I even visited Bohol," he said. "Street ministry was extremely cold in Oslo that year, and I needed to warm up. I asked to take two weeks of my summer vacation, and the request was granted. I decided to visit the Philippines and inquired of friends where I might visit. They suggested Bohol, a place unspoiled that best illustrated real life among the 7,000 Philippine islands. Although well known for its coral reefs and unusual geological formations, we were in for a surprise. Poverty was rampant, medical care was mostly unavailable, and people were starving.

"We met with several Pentecostal church pastors, who described the reality of life on Bohol, the life that tourists never see. Immediately I felt the call, and God told me this was, indeed, my new mission. On the last day we were there, we founded iHelpFriendship and returned to Norway to garner support and begin a sister organization. If someone had told me that we would feed thousands of starving seniors, give nourishing pudding to hundreds of underweight kids, annually support 100 students in a vocational school, create a mental health program for hundreds of patients, and offer mental health programs in most of Bohol's 52 municipalities, I would not have believed it. But we do. Now, we have added a new project: reducing child and teen pregnancies."

The Norwegian-American community wishes Pastor Gunnar Kristiansen great success with his missions. His life has been a patchwork quilt of giving to disenfranchised people. His life and actions remind us of a song he has often played and sung at Mindekirken, Alf Prøysen's "Du ska få en dag i måra som rein og ubrukt står" ("You will get a tomorrow that is pure and unused.") It represents the concept of a fresh start — a new day is a clean slate, free from the mistakes or burdens of the past and full of potential. Through his faith, Pastor Kristiansen has always brought hope to those he touches. Mindekirken and the Norwegian-American community have been blessed by the service he has provided us.

Note: For more information about Mindekirken, go to https://www.mindekirken.org/, and for information about iHelpFriendship, go to https://www.ihelpfriendship.net/.

The Back Page

MY CUP OVERFLOWETH

I've never made a fortune and it's probably too late now,
But I don't worry about that much, I'm happy anyhow.
And as I go along life's way, I'm reaping better than I sowed.
I'm drinking from my saucer 'cause my cup has overflowed.

Haven't got a lot of riches and sometimes the going's tough,
But I've got loving ones around me and that makes me rich enough.
I thank God for his blessings and the mercies He's bestowed.
I'm drinking from my saucer 'cause my cup has overflowed.

I remember times when things went wrong, my faith wore somewhat thin,
But all at once the dark clouds broke and the sun peeped through again.
So, Lord, help me not to gripe about the rough rows that I've hoed.
I'm drinking from my saucer 'cause my cup has overflowed.

If God gives me strength and courage when the way grows deep and rough,
I'll not ask for other blessings. I'm already blessed enough.
And may I never be too busy to help others bear their loads.
Then I'll keep drinking from my saucer 'cause my cup has overflowed.

~Author Unknown

