

# PLANT SCIENCE SAYS



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## Kevin Wanner Joins Faculty



*Kevin, Tish and Ryan - over looking Okanagan Lake by Kelowna, British Columbia, where we lived for three years. The Okanagan valley is the fruit and wine producing region of British Columbia.*

Hello ! I am happy to introduce myself as the new extension entomologist at Montana State University. I am excited to begin my joint entomology research and extension position within the Department of Plant Sciences and Plant Pathology. After completing a Master of Pest Management degree at Simon Fraser University in Vancouver, British Columbia, I began a seven year career in applied entomology and integrated pest management. This included government and industry experience in the province of Ontario and in San Diego (at the time, moving from Sault Ste. Marie, Ontario, to California was an

easy decision!). In 2000, I decided to return to graduate studies at the University of British Columbia in Vancouver to complete my PhD degree (going back to a graduate student stipend for income was not an easy decision!). During my doctoral studies I undertook the challenge of learning insect molecular genetics. My goal was to develop an area of basic research that complemented my background in IPM and so I began to study the molecular genetic mechanisms that allow insects to locate their host plants and mates using their sense of smell (olfaction). Chemical ecologists have exploited insect olfaction to develop traps for monitoring and mating disruption, key components of IPM programs. It has been a long road, but I am now excited and ready to utilize my experience to help manage agricultural pests in Montana through my extension and research activities.

During my career, I have been very fortunate to have the support of my wife Tish (Patricia) and our son Ryan (age 8). During the last 15 years, we have had to move to new communities every 2-3 years. Our last stop was in Urbana at the University of Illinois, a very nice community, but being a native of British Columbia and having grown up in the shadow of the Rockies, we all are very excited to finally settle in a community that feels like home. My wife enjoys skiing and we all enjoy soaking in natural hot springs. Our son Ryan had a fishing rod waiting for him when he was born and began playing with real fish hooks at about age 18 months (while his mom was not always happy, Ryan only "hooked" himself once and quickly became

adept at handling hooks, although on occasion you had to be careful when you sat on the chair or couch!). During my interview, the people of Montana that I met left a strong impression. Agriculture and pest management communities tend to be close, and we look forward to becoming a part of Montana's community. While there is much more that I could include in this introduction, I will save the rest until we meet in person!

### **Update on Animal BioScience Building**

Construction bids will soon be arriving to build the new Animal Bioscience Building. The 40,500 square foot, brick building will be constructed on the north edge of campus next door to the Plant Bioscience Building. Construction is expected to begin this summer. Detailed drawings are attached.

The design of the Animal Bioscience Building, which will house the Department of Animal and Range Sciences, consists of two floors of classrooms, laboratory classrooms, a distance delivery facility and resource rooms, such as a computer lab, and a range learning center. The third floor, which will be completed in a second phase of building construction, offers physiology and nutrition laboratories that will be used by MSU faculty to train the next generation of scientists. Offices for faculty, staff and graduate students finish out the building design.

Unlike most of the buildings on campus, the majority of the funds to construct the Animal Bioscience Building have been raised from private sources throughout the state of Montana and the agricultural industry nationwide. Donors have contributed anywhere from \$5 to \$2.7 million to make the construction of this facility a reality (see <http://ag.montana.edu> for a list of the Ranchers Circle level donors).

The construction zone for this building will require the closure of Deer Street between the Plant Bioscience Building parking lot and the 13<sup>th</sup> Street parking lots and the use of some parking spaces by the contractor for staging. The building is anticipated to be completed by the summer of 2010. Detailed drawings of the layout are at the end of this newsletter.

### **Annual USDA-NRI project director meeting, April 16-18**

**By Andreas Fischer**

The annual USDA-NRI project director meeting ("Genes to products – agricultural plant, microbe and biobased product research) took place from April 16-18 at the Bethesda North Marriott Hotel & Conference Center. Amazingly enough, while leaving Bozeman in a snowstorm on the morning of the 15<sup>th</sup>, in DC it was actually spring... Using the subway from National Airport to the meeting was kind of fun; the DC subway system reminded me of Paris (quite user-friendly & almost impossible to get lost), but is much more modern.

As in the past, this meeting brought together grantees from several NRI programs, leading to a small meeting (~100 participants or so), but with participants of quite varied scientific background. Abstracts from all presented projects are available on CD; if anybody is interested, please let me know. The scientific tidbit which amazed me most came in a talk by Bill Lucas (a long-time phloem transport biologist); he mentioned that analysis of phloem sap has indicated the presence of 1,200 proteins and several hundred RNAs. Clearly, the phloem is not just some kind of syrup, but also an important information/signaling highway. On the grant "technical" side, most or all of you are aware that NRI programs now request letters of intent, resulting in an invitation (or not) to submit a full proposal. Last year, guidelines stated that no feedback would be provided if no full proposal was invited. Program leaders indicated that they were not comfortable with this policy, and that it would probably be changed in the next cycle (RFA coming out this fall), i.e. they are planning to provide a few lines of comments for every project not invited for submission of a full proposal. Also, if you did submit a letter of intent last fall or so and it was rejected, you can still contact your program leaders (preferably sometime this summer), and they will provide some feedback to help with the next cycle. The second piece of information, of which I was not aware, is that NRI is relying less on *ad-hoc* reviewers and more on grant panels for

grant evaluations, due to increasingly poor success with contacting people for outside reviews (same problem journal editors are facing, I guess). "My" program leader, Gail McLean, indicated that outside reviews are still solicited, if she and/or a given year's panel manager feel that the panel does not have the necessary expertise to judge a particular project.

Besides poster sessions and presentations of 20-30 minutes each, the program leaders organized two panel discussions, one on cell wall "deconstruction" and one on nutrient uptake and utilization. Being a panelist for the second subject area gave me the opportunity to briefly talk about our research (oriented towards nutrient remobilization from senescing cereal leaves), and to help make the point that if we (plant scientists) are supposed to find ways to produce all that biomass, we also need plants that are further optimized for nutrient use – fertilizer is basically money, and has become a lot more money over the last few years.

## **Camelina could have huge potential for growers**

**By Tom Lutey, of The Billings Gazette**



David Sands is ready for an agricultural revolution. He has a crop so diverse that you can wash your face with it, spread it on bread and eat it, heat your house with it, feed cows with it, turn it into plastic, even fuel your truck with it.

The only thing it won't do - this crop that Sands, a

Montana State University scientist, is so excited about - is plant itself.

At MSU, researchers keep creating new ways to use camelina, an Iron Age crop with great potential that somehow fell through the cracks of agricultural evolution.

Montana scientists resurrected the seed a couple of years ago as gas crept toward \$3 a gallon. It won the endorsement of Gov. Brian

Schweitzer, who raved about its potential to put Montana on the biofuels map. Playing on the oilseed's feminine name, he was soon telling people he was crazy for this gal camelina.

Now, scientists like Sands say there's much more than fuel to the cousin of the mustard seed. And if they could lure farmers away from the freakishly high profits of wheat, they'd prove it in the ground.

"We think this could be big for Montana," Sands said. "You know, the governor called camelina his girlfriend. Well, we're going to take her and turn her into a real Cinderella." The optimism surrounding camelina in the lab is the mirror opposite of in-field camelina pessimism. On the farm, the talk is mostly about the surest bet, the crop that's selling high this spring, this fall and into the future. A farmer getting \$13 a bushel for his 2009 wheat isn't going to plant an experimental crop selling on contract for \$9 a bushel.

But here in the artificially lit, climate-controlled vaults of the Plant BioScience Building in Bozeman, optimism easily germinates.

The grass outside is a dirty spring brown and puddles still freeze in the shade, but inside, in 94-degree heat and 72 percent relative humidity, students are growing kudzu, the green-vined plague of the South. They've somehow persuaded the plant to starve itself to death. A few doors down, students are shooting grain with a DNA gun, essentially blasting new characteristics into its genetic structure. Lying on research counters are bags of flour ground from prehistoric grains that pose no danger to victims of celiac disease, an intestinal disorder that makes it impossible to eat foods such as pasta, fries and soy sauce.

Rest assured, if someone ever extracts blood from a turnip, it will happen in a lab like this.

### The Wonder Supplement

Camelina is a shooting star here. Feed it to chickens and you get heart-healthy eggs. Stir it into peanut butter, and in theory children have what they need to better focus in class. Some scientists are calling camelina a wonder

supplement because of the omega-3 fatty acids in its oil. Omega-3s are the good fats that lower cholesterol, prevent excessive blood clotting and may reduce coronary heart disease risk. They're considered essential to the human body, but they're also a fat the body cannot make.

In mice, omega-3 supplements have improved the mental function of Parkinson's sufferers. And last year, the Journal of Developmental and Behavioral Pediatrics reported that children with behavioral problems showed improved learning ability on an omega-3-supplemented diet.

"I want it in the school lunch program," Sands said. "Imagine. Kids get omega-3s in their lunch. Now they can go back to class and sit still. Now they can learn."

Flax, oily fish and walnuts are primary market sources for omega-3 currently, but entrepreneurs like Bob Fritz believes newcomer camelina has an edge over the frontrunners. Fritz's Benicia, Calif., company, Animal Naturals, sells Omega Dog, an omega-3 oil supplement made completely from camelina grown in Montana. The product is sold exclusively at Petco, where a 31-ounce bottle costs \$24.99. Roughly \$10 of that price is paid to the grower. With those kinds of profits, Fritz questions the wisdom of filling a diesel truck with camelina. He expects to launch a camelina supplement line for human consumption within the year.

"When I first talked to growers up there, they were telling me about biodiesel and I said, 'Listen, you're missing the picture. Using this as biodiesel is like using a race car for a doorstop. It's ridiculous,' " Fritz said. "Its real value is nutrition. This is an elegant solution to our omega-3 needs."

The mainstream sources for omega-3 oil both have problems, Fritz said. Much of the fish oil relied upon for omega-3 comes from salmon, which are increasingly testing positive for contaminants such as mercury and fire retardant. Coupled with contamination concerns are worries that salmon are being overfished.

Flax oil, also called linseed oil, has been an

extremely popular omega-3 alternative to fish oil, Fritz said. But flax oil spoils quickly. Fritz correlates flax's problems with spoilage to where it's grown. The seed plant does not fare well in harsh climates, where its cellular structure quickly deteriorates.

#### Cold is good

Plants that do thrive in harsh environments tend to have built-in resistance to cellular breakdown, which usually translates into better shelf life as well. Camelina, drought-resistant and ready to grow in the cold, is one of those plants. The cold weather also seems to improve its vitamin E content, which is a big selling point in health markets.

"The fact that it lives in a tough neighborhood benefits us," said Fritz said.

There's evidence in the climate-controlled vaults at MSU that camelina could outperform wheat as a made-for-Montana crop. The seed plant grows thick and green at 38 degrees, an indication according to researchers that camelina can be planted in Montana as early as January.

The crop would lay dormant until early spring and then reach its thirsty, young adulthood right about the time spring rains arrive in May or June. The crop would be harvested in July, allowing growers to go into some of the driest months of the year without needing to irrigate.

"The biggest advantage that camelina has is that it will grow when the ground is still cold," said Gary Iverson, who farms camelina near Sunburst. "It's growing in the ground at about 38 degrees where most crops won't grow until it's 44 degrees."

Iverson got into camelina about three years ago at the urging of MSU. The university was looking for a group of farmers willing to grow experimental crops coming out of the bioscience program. The lure to the program initially was high-protein oats, but after a year Iverson and a couple dozen other growers agreed to grow a few hundred acres each of camelina. In 2004, they formed Great Northern Growers Cooperative so they could work as a group with MSU scientists.



The partnership has gone well. Great Northern is building a mill to roll oats in Belgrade and setting aside some space in the facility for bottling camelina oil. Initially, the cooperative's interest in camelina was rooted in biodiesel. Fuel prices were just beginning to hit \$3 a gallon and plant fuel was all the buzz. Politicians in farm states were looking for ways to put acres into fuel productions, and in states like Montana where corn ethanol wasn't a serious option, green diesel from oil seed plants like canola and safflower took center stage.

But growers quickly concluded that fuel tanks weren't the best place for "the governor's girlfriend." Great Northern is focusing on natural supplement and cosmetic markets. They're the oilseed farmers behind Omega Dog. And it turns out that cosmetic companies like L'Oréal and Estée Lauder have been using camelina in anti-wrinkle products.

#### Fueling the future

Other camelina advocates in state are developing camelina as a fuel oil. Great Plains-The Camelina Co. in Bigfork promises to create a camelina biofuel industry in Montana. Great Plains is partnered with European-based Ineos Enterprises, one of the largest biodiesel producers in the world. Great Plains announced earlier that it would spend \$20 million this year constructing a seed crusher and biodiesel refinery. A site for those facilities hasn't been determined. Targeted Growth, a Seattle biofuel company, announced last November that it will create a research and development center in Bozeman with Green Earth Fuels of Houston. Their corporate offspring will be known as Sustainable Oils.

Sustainable Oils' goal is to produce 100 million gallons of camelina-based biodiesel by 2010.

However, there hasn't been a rush among farmers to plant camelina, and that has prompted attempts to sweeten the pot. Earlier this year, the Montana Department of Labor and Industry, through its agro-energy program, offered to reimburse the seed costs of farmers planting camelina for the first time.

At a time when camelina seed was selling for 10 cents a pound, the state offered to cover costs up to \$1.30 a pound for a minimum of 10 acres planted at seeding rates of three to five pounds an acre. Thirty-two counties in northern and Eastern Montana were targeted. Wheat profits were thought to be keeping farmers from trying camelina.

To better compete with grains, Great Plains in February offered camelina growers \$9 a bushel for their crop. That's roughly twice what the seed sold for last year.

A couple million acres of camelina would have to be planted to meet the long-term goals of state biofuel companies. Acres like that are going to be hard to get at a time when even the camelina true believers of Great Northern are opting for grain.

"There were about 23,000 acres planted last year," Iverson said. "This year, because of the price of wheat, a lot of growers are saying, 'Yeah, I'm going to plant wheat this year.'"

#### **MWBC Grants**

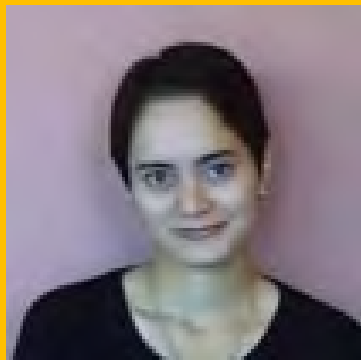
The following received Montana Wheat and Barley grants:

- Jamie Sherman, "Marker Assisted Breeding in Spring and Winter Wheat"
- Deanna Nash, "Improved Quality of Montana Hard Red and Hard White Wheat"
- Li Huang, "Characterization and transfer of new rust resistance genes"
- William Dyer, "Managing current and future herbicide-resistant weeds"
- Alan Dyer, "Distribution and severity of root diseases in Montana's Wheat"
- Mary Burrows, "Susceptibility of Great Plains wheat varieties and weeds to Wheat streak mosaic virus"
- Tom Blake, "Development and Deployment of Improved Barley Varieties for Montana Small Grains Producers"
- Kevin Wanner, "Molecular genetics of wheat stem sawfly odor receptors to enhance IPM based on chemical ecology"
- Luther Talbert, "Spring Wheat Breeding and Genetics"
- Jack Riesselman, "Continuing as an Underwriter for MONTANA AG LIVE!"

Jack Martin, "Impact of Polyphenol Oxidase Genes on Agronomic and Quality Traits in Winter Wheat"

Phil Bruckner, "Enhanced Field Selection for Wheat Stem Sawfly Resistance" and "Winter Wheat Breeding/Genetics"

### Leila's Feiz's Paper is Editor's Pick



Leila's paper entitled, "Relationship Between Wheat (*Triticum aestivum* L.) Grain Hardness and Wet-Milling Quality" published in the May issue of *Cereal Chemistry* paper was chosen

as editor's pick by Dr. Carl Hoseney, Editor in Chief.

Grain hardness variation has effects on end-use properties of wheat (*Triticum aestivum*). The Hardness (Ha) locus consisting of the Puroindoline a and b genes (Pina and Pinb) controls the majority of grain hardness variation. Starch production is a growing end-use of wheat. This study illustrates a genetic link to the practical problem of starch yield in a wet milling process. Read more in [Relationship Between Wheat \(\*Triticum aestivum\* L.\) Grain Hardness and Wet-Milling Quality](#) in January/February's *Cereal Chemistry*.

### New Employees

#### Peggy Bunger (Kevin Wanner)



My name is Peggy Bunger and I have recently joined the lab of Kevin Wanner. Some of you may know me from Mark Quinn's lab at VMB, where I worked with human and bovine genes and ran the departmental

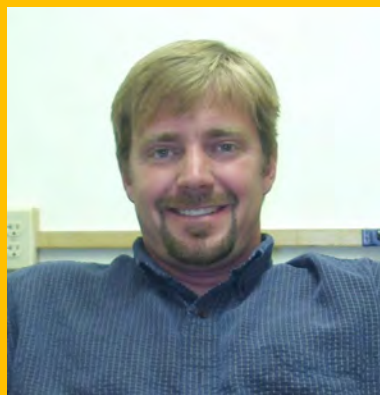
sequencer. I am very excited at the prospect of learning insect genetics and being a part of this department.

I grew up in northern Montana and Nebraska, but moved to Bozeman in 1993 when my husband accepted a job in Montana. While our children have married and moved away, we have no plans to leave. Outside of work, I am an avid quilter (or at least an avid quilt "planner") and will admit to spending too much time in fabric shops.

Please stop by and say hello.

### New Grad Student

#### Cecil Tharp – Kevin Wanner



My name is Cecil Tharp. I am currently pursuing a PH D. in Plant Science with emphasis in Entomology / Crop Science. My research is focused on the evaluation of cultural and

chemical control tactics for the sustainable control of the Haanchen Mealybug. I received a technical degree in Parks and Recreation Management and Wildlife Mgmt from NDSU prior to transferring to MSU over 18 years ago. Received my B.S. degree in Biology prior to obtaining my M.S. degree in Entomology (Integrated Pest Management). Worked as a Biological Technician (Insects) for MSU & the USDA/ARS for over 8 years. At present I am employed by the Department of Animal and Range Science as the Pesticide Education Specialist. I was born and raised in Williston, ND where I picked up many hobbies including hockey, hunting, fishing, hiking, racquetball, and skiing. My favorite hobby is raising my little girl and working on my acreage.

### Grants

Cathy Cripps, "Inoculation of Whitebark Pine Seedlings with Native Mycorrhizal Fungi". USDA Forest Service through the Whitebark Pine Foundation.

### Publications

Moore-Gough, C. and R.E. Gough. (2008) "Flowering Perennials for SUN – Upper Plains

## Can you recommend some spring flowering bulbs that will do well on my site?

By Cheryl Moore-Gough

We always recommend planting spring-flowering bulbs in fall, but people don't often think of the spring flowers until they see them. And then the questions come in. They'll be coming up soon, so let's cover the most popular ones now.

Everyone is familiar with crocus. These diminutive, early blooms sometimes open before all the snow is gone. They come in many colors from white to purple and are perfect for perking up your emotions in the early spring. Try Dutch crocus (*Crocus vernus*), the flowers of which range from white to purple, the purple-flowered *Crocus tommasinianus* and the multi-colored *Crocus sieberi* subspecies *sublimis*.



One of my favorites is the grape hyacinth, or Muscari. You all know what these small flowers look like. Squill (*Scilla siberica*) is

another early delight that bears four or five hanging white or blue flowers on small plants only a half-dozen inches tall.

And how about snowdrops? There are several species of this genus, *Galanthus*, that will work for you. All have three-lobed bells of white flowers and do quite well in partial, high shade. If you are thinking about planting some of these, or others, do so in September. To make your planting look more natural, scatter your bulbs over the lawn area and plant them where they fall. As the gray winter takes on a spring chill and the color begins to develop beneath the snow, you'll be glad you did.

If you want to know more about spring bulbs, contact your local county extension office or visit our Gardening & Horticulture website to get your free copy of MontGuide 199903, *Choosing Biennials and Herbaceous Perennials for Montana Gardens*.

## Bob's Byte

By Bob Johnston

Starting next month, MSU will be enhancing the security controls that help protect MSU Domain accounts. What does this mean for you? Starting after May 27<sup>th</sup> you will be required to change your password before you can logon to your computer. This will impact desktop machines and those laptops that connect to the MSU secure wireless link.



The password guidelines outlined below apply to all MSU Windows Domains. The intention is that these standards will align as best possible with those requirements for the MyMSU portal accounts, thus enabling the use of the same password for both accounts.

- Eight character minimum
- Contain characters from three of the following four categories:
  - Uppercase letters
  - Lowercase letters
  - Numbers
  - Special characters
- 180-day password expiration
- Four password history

- Accounts disable after 10 login attempts within 10 minutes
- Seven days must pass before another password change is allowed.

Please see <http://password.montana.edu> for more information on password resets.

### Recipes of the Month

The recipes below are made with barley. These are the recipes from the meeting that was held when Governor Schweitzer was here a few days ago. If you would like more info. go to the following article at MSU today: BGLife barley debute targets health needs.

#### Carrot Spice Cake

2 cup barley flour  
 1 1/3 cup sugar  
 2 tsp baking soda  
 1 tsp salt  
 1 1/2 tsp cinnamon  
 1 tsp cloves  
 1 tsp nutmeg  
 1 3/4 tsp vanilla  
 3 eggs (or 5 egg whites)  
 1/4 cup oil  
 1/2 cup water, boiling  
 1 cup walnuts, chopped  
 2 cups carrots, shredded

Preheat oven to 350°F. In a mixing bowl, combine barley flour, sugar, baking soda, salt, cinnamon, cloves and nutmeg. Mix. In a separate bowl, combine eggs and oil. Mix well. Pour boiling water over shredded carrots and add to liquid ingredients. Beat with electric mixer on medium speed for 1 minute. Add dry ingredients to the carrot mixture and stir until thoroughly mixed. Add walnuts and evenly mix.

Bake in a greased and floured 9 inch x13 inch pan for 35 minutes. Allow cake to cool before cutting or removing from pan.

Per serving: Calories: 194, Calories from Fat: 78, Total Fat: 9g, Saturated Fat: 1g, Cholesterol: 35mg, Sodium: 292mg, Total Carbohydrate: 27g, Dietary Fiber: 2g, Soluble Fiber: 0.8g, Sugars: 15g, Protein: 4g. Exchanges: Carbohydrate: 1.5, Fat: 1.5

#### BGLife Cranberry Muffins

1 1/2 cups Heart Balance Cereal (uncooked)  
 1 cup all-purpose flour  
 1/3 cup granulated sugar  
 1 Tbsp baking powder  
 1/4 tsp salt (optional)  
 1/2 tsp cinnamon  
 1 1/4 cup skim milk  
 1 egg or 2 egg whites, lightly beaten  
 2 Tbsp canola oil  
 1 tsp vanilla  
 1 cup dried cranberries (sweetened)



Heat oven to 400°F. Line 12 medium muffin cups with paper baking cups.

Combine Heart Balance Cereal with remaining dry ingredients in large bowl; mix well. Stir in berries. In small bowl, combine milk, eggs, oil and vanilla; mix well. Add to dry ingredients; stir until moistened.

Fill muffin cups almost full. Bake 17 to 20 minutes or until light golden brown. Cool muffins in pan on wire rack for ten minutes; remove from pan. Serve warm.

Per serving: Calories: 178, Calories from Fat: 28, Total Fat: 3g, Saturated Fat: 0g, Cholesterol: 18mg, Sodium: 159mg, Total Carbohydrate: 34g, Dietary Fiber: 3g, Soluble Fiber: 1.2, Sugars: 14g, Protein: 5g. Exchanges: Carbohydrate: 2, Fat: 0.5

#### Chocolate Chip Cookies

3/4 cup canola oil  
 1 1/4 cup Splenda® Brown Sugar Blend, packed  
 2 egg whites  
 1/4 cup water  
 1 tsp vanilla extract  
 1 cup all-purpose flour  
 1/2 tsp salt  
 1 tsp cinnamon  
 1/2 tsp baking soda  
 3 cups Heart Balance Cereal  
 1/2 cup toasted pecans, chopped  
 1/2 cup semi-sweet chocolate chips

Preheat oven to 350 degrees. Beat oil, Splenda, egg whites, water, and vanilla



together until creamy. Add flour, salt, cinnamon and baking soda into the bowl and blend. Stir in Heart Balance Cereal, pecans, and chocolate chips. Drop teaspoonfuls of the dough onto greased cookie sheets (flatten slightly unless you like a rounder, nugget-type cookie—these don't spread at all). Bake 7 to 10 minutes.

Per serving: Calories: 104, Calories from Fat: 46, Total Fat: 5g, Saturated Fat: 1g, Cholesterol: 0mg, Sodium: 41mg, Total Carbohydrates: 14g, Dietary Fiber: 1g, Soluble Fiber: 0.6, Sugars: 6g, Protein: 2g Exchanges: Carbohydrate: 1, Fat: 1

Barley Almond Salad

Barley, pearl, cooked  
Almonds sliced, raw  
Olive Oil, salad or cooking  
Lemon juice  
Carrots, fresh, raw  
Celery, fresh, raw  
Parsley  
Onions, fresh  
Garlic, fresh, raw  
Salt  
Sugar  
Pepper, black

Calories 202, Calories from Fat 81, Total Fat 9g, Saturated Fat 1 gm, Cholesterol 0 mg, Sodium 600 mg, Total Carbohydrate 22 g, Dietary Fiber 4 g, Soluble Fiber 2g, Sugars 5 g, Protein 4 g Starch 1.5 Fat 1.0

Barley Berry Salad

Barley, pearl, cooked  
Cranberries, dried  
Tomato  
Feta Cheese, crumbled  
Green Bell Pepper  
Cucumber  
Onions  
Garlic  
Salt  
Pepper  
Parsley  
Balsamic Vinegar  
Maple Syrup  
Dijon Mustard



Calories 179, Calories from Fat 31, Total Fat 3 g, Saturated Fat 1.9g, Cholesterol 11 mg, Sodium 600mg, Total Carbohydrate 25g, Dietary Fiber 4 g, Soluble Fiber 2g, S u g a r s 9g, Protein 4 g Starch 2.0

**May Birthdays**

Heather Rimel	12
Matthew Moffet	14
Robyn Klein	15
Chaofu Lu	16
Mareike Johnston	22
Kim Prosek	22
Tom Blake	24
Bob Johnston	29
Yerlan	31
Deanna Nash	31



**Go to the next page for detailed drawings of the layout of the new ABS building.**

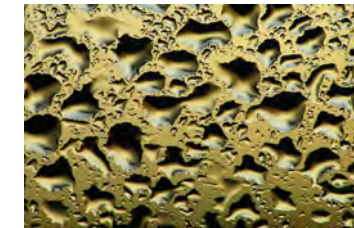
FEBRUARY 11, 2008

Animal Bioscience Facility  
MONTANA STATE UNIVERSITY AT BOZEMAN  
A/E #21-02-05  
PPA #05-0040  
ARCHITECT'S #0603.00

## CONTRACTOR PREVIEW



A D F O R M A M

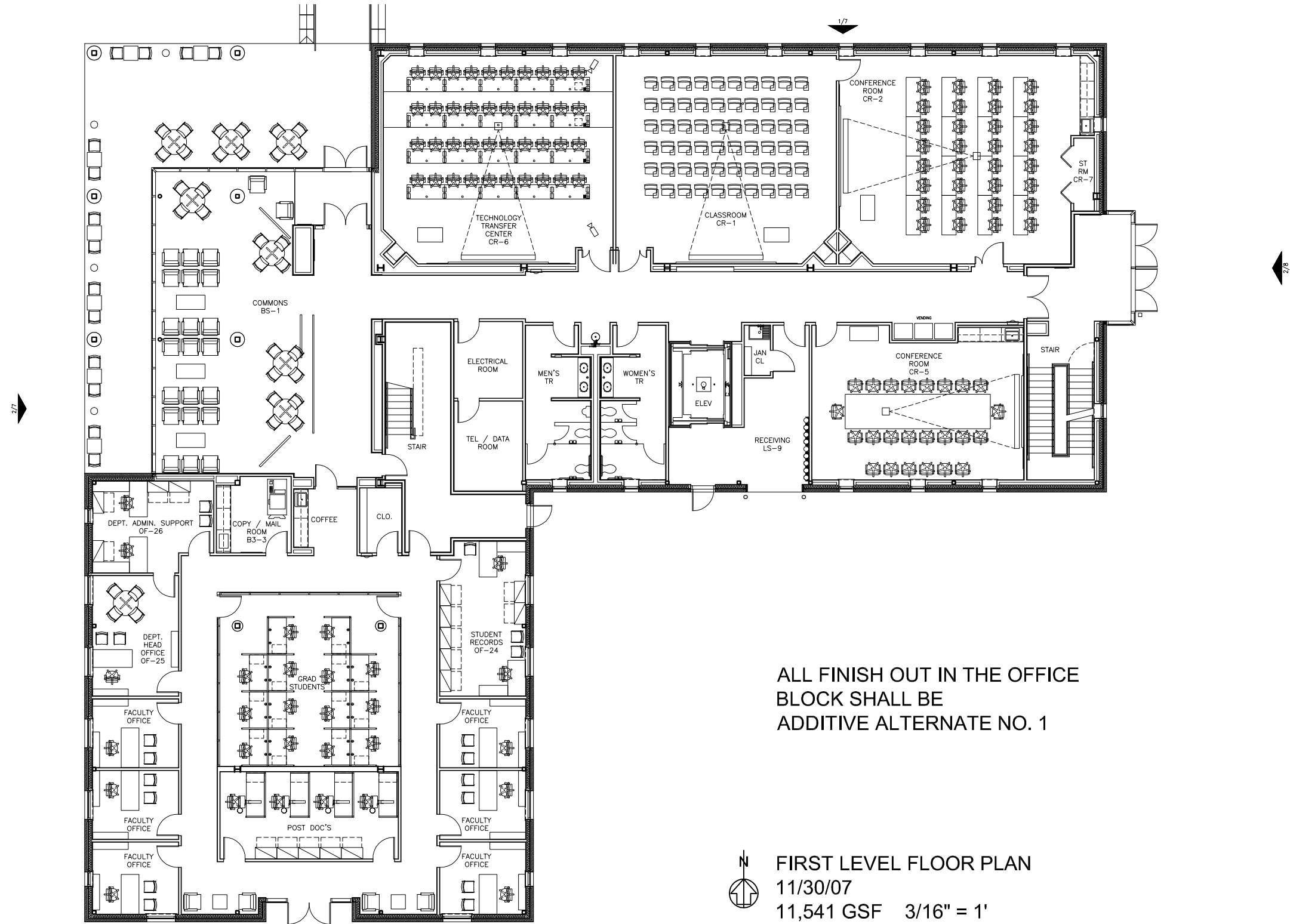


STRIVE FOR BEAUTY


**StudioFORMA**  
ARCHITECTS

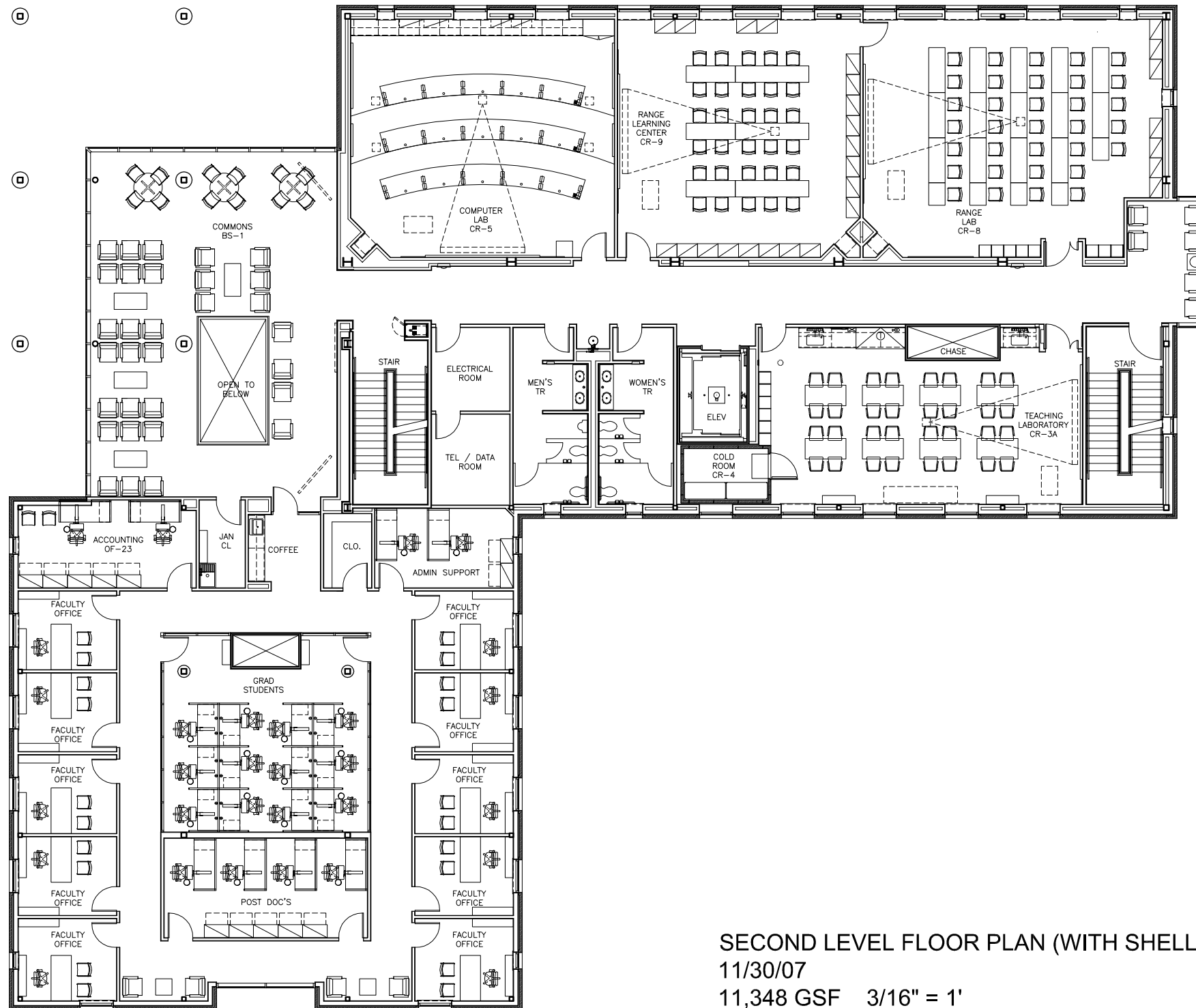
PO Box 6339  
Bozeman, MT 59771-6339

PHO 406.585.1400  
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EML mark@studioforma.biz  
URL www.studioforma.biz



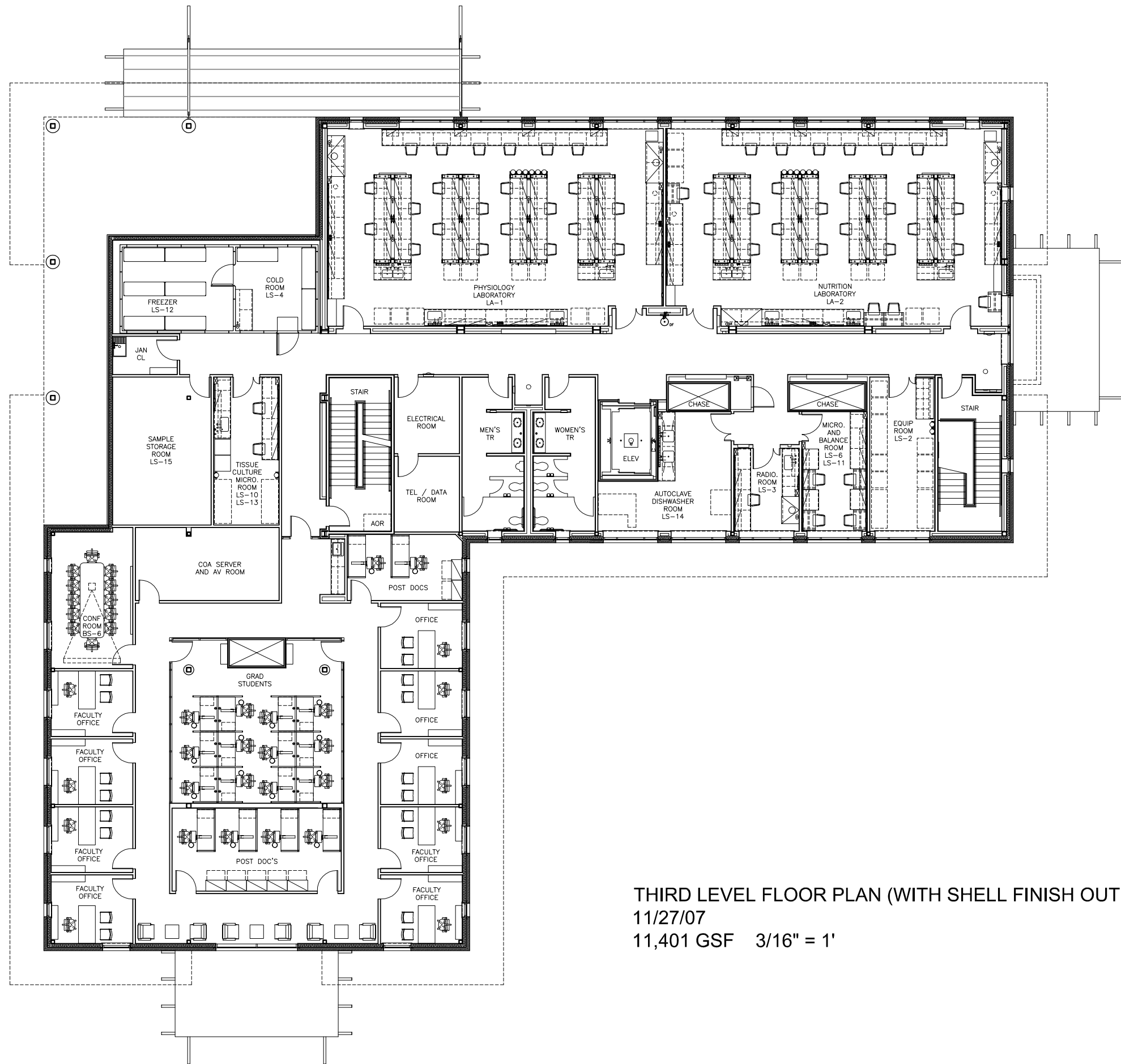
ALL FINISH OUT IN THE OFFICE  
BLOCK SHALL BE  
ADDITIVE ALTERNATE NO. 1


**FIRST LEVEL FLOOR PLAN**  
 11/30/07  
 11,541 GSF 3/16" = 1'



SECOND LEVEL FLOOR PLAN (WITH SHELL FINISH OUT)  
 11/30/07  
 11,348 GSF 3/16" = 1'





THIRD LEVEL FLOOR PLAN (WITH SHELL FINISH OUT)  
 11/27/07  
 11,401 GSF 3/16" = 1'