Chapter 8 - Astronomy

Dobson's Cosmology Classes and Lectures

The SFAA brochure reads:

> *"Imagine if you had a chance to learn Morse code from Samuel Morse, or study Cartesian Geometry from Rene De Carte. Imagine how you'd feel if you had to tell your grandchildren that you had missed your chance to build your own diesel engine under the supervision of Rudolph Diesel. Well, don't miss your chance to Make your own Dobsonian Telescope! Explore the Universe with John Dobson! How it got the way it is and how we got the way we are to wonder about it. His specialty is seeing the philosophical meaning behind quantum mechanics and relativity theory. What does Heisenberg's Uncertainty Principle tell us about the nature of our universe? Hear his alternative view to the Big Bang cosmological model."*

So I went for this fleeting opportunity and I enrolled in John Dobson's Cosmology class at the Randall museum during the same months as the telescope making class, giving a well rounded autumn of JD. Held in evenings with around a dozen of us, with a few others from telescope making, having the same idea in mind. It was a wonder filled lecture based course of having our minds stretched by Dobson's knowledge, experience and wit!
John Muhilly was always there, who gave JD a ride, living nearby. They go way back; he built a few good telescopes in his classes over the years. I first met him at Dobson's 90th birthday celebration a month previous, and who became a friend through Cosmology Classes.

The content

Cosmological Physics being the main focus, with a healthy dose of his personal anecdotes; and a teaching quality offered specifically by Dobson what I might simplify as "unique ways of looking at things."
I doubt that I'm a good authority on the subjects he covered, so I'll mostly stick to my memorable impressions, plus I will add my rough class notes at the end of this chapter. [like Ken Frank would say, "I'm not a card carrying cosmologist."]
Here is an excellent resource for all things Dobson:
http://www.sidewalkastronomers.us/id31.html

JD

His speaking style is character filled with never a dull moment, using wit and creative analogies to communicate ideas. Really helpful with subjects like quantum physics /Heisenberg's uncertainty principle / Planck's constant types of concepts, as merely a slice of modern textbook physics covered. He used mathematical equations only a few times on the white board, (fine with me who needs an entirely separate algebra course.)

What sets Dobson apart from current conventional physics lessons have influences in part from his history as a Vedantic monk. Ideas about the illusory nature of what we see. As one of his examples, mistaking a rope for a snake ; you have to know what a snake looks like to be able to make that mistake in the first place. He related this to seeing gravity, inertia and electromagnetism as having qualities of something else showing through. Like I mentioned, a percentage of his teaching is about different ways of looking at things, albeit unorthodox. Some

have a hard time accepting his approach. I found it to be expansive — of what I ***think*** I understood.

One thing that negatively affected his reputation among cosmologists, was his dislike for the big bang creation theory. [I think that is why he was no longer at the CAS.] Controversial by the current standards of plausible evidence, yet whenever asked if the big bang occurred or not, he coyly avoided answering by replying "I'm not that old!"
Always food for thought, which is to our critical advantage. JD was a steady-state oriented cosmologist, from the older school of Fred Hoyle, and the ancient Vedantic views about the infinite. Fascinating, but only one of several interesting and valuable viewpoints he had to offer. My favorites were his unforgettable creative analogies about the observable universe.

His ***Frustration*** model made perfect sense as an illustration to understand a tendency of how things work. [the Earth is wanting desperately to be pulled into the Sun, but inertia prevents that from happening, so the Earth (and all of the planets) is frustrated! And so on with the Sun, galaxy, etc. The full breakdown can be found online, and dozens more of his essays.)
http://www.sidewalkastronomers.us/id168.html

Another favorite Dobsonism was his description of the density of a neutron star: "A fleet of battleships, with soldiers on parade, all crammed into a one pint mayonnaise jar."
I loved how carefully he would alliterate this, with a flair and accent of another era. And importantly, he would get the point to sink in!

He would also put us on the spot, saying "now it's your turn, and you're not supposed to agree with me!" while pushing his ears forward. Involving, not just a lecture. Some of the other's would be more talkative than me, if they were more versed in Cosmology. Those events definitely always got my noggin ticking!

Attendees and places

After the first class, I was invited to Dobson's house where he lives for half the year, for his Cosmology talks that he generously offered for free. His longtime friend Carol Strauss helped to organize, and for use of the upstairs living room was made possible by friend Loretta Botta. Wonderful folks who became good friends of mine in the years ahead.

A variety of people would show up for those evenings, with JD always keeping the discussion engaging. Some would drive a long way for these sessions. I recall an artist woman from Santa Cruz who was totally into it. And occasional out of state visitors just once. Patricia from New Mexico. And old students of Dobson's.
Carol or John M would usually record each class on cassette tapes (I have a few of those tapes from Carol, but alas my old cassette deck died, never replaced for the goal to digitize them. Maybe someone will someday.)

The years held at 4135 Judah were 2006-2010, intermittently. Sometimes the upstairs was not accessible, so we'd crowd into JD's ground floor apartment, working just fine.

One evening in '07 we were down there and an earthquake shook the house for a number of seconds followed by an aftershock! The old house survived the 1906 earthquake, but being out near the ocean is not the firmest bedrock, so we really felt that harmless temblor. I believe that my good local artist friend Bruce Mckay was among us that time.
Dobson went on to predict disaster for the neighbourhood, when the oceans rise to flood the coast — and when the permafrost melts, then we're gone. "So cheer up, things are sure to get worse." [He usually reserves that comment about after the sun expands enough to fry the Earth someday in the far off future.]

Lectures and appearances

JD would be scheduled for occasional SFAA presentations at the Randall auditorium. Those were great, with slides showing of the years of setting up giant telescopes in national parks. Images to accompany his storytelling. I remember his account when arguing with a park ranger who had issues with the telescopes, saying that the sky is part of the park. Dobson's reply, "no, the park is part of the sky!" The Astronomers won, and became an important seasonal feature.

Other local activities he'd be invited to appear might include events with the ASP, schools, observatories and elsewhere. That's what he'd be doing around the world — invited and accommodated as a highly respected leading member of the worldwide Astronomy community. Russia, Australia, etc... Dobson got around! He was voted one of the top 25 most influential people who changed the world, by the Smithsonian.

And of course he got out for SA at 9th & Irving! I gave him a ride for a few of those memorable outings. Joining with the telescope I made in his class, learning ways to deal with the public from his example. Great times !

More content

The topics he favored ranged from astrophysics to anthropology. Loren Eiseley was one of his top favorite authors, and I can see why. He wrote so eloquently about earth Sciences and the evolution of life. ***The Immense Journey*** was recommended, pulled out for reading a few paragraphs in class — becoming a fast favorite of mine as well. One where I'd give copies away it was that good!
Dobson was also into Feynman, and had opportunities to have meaningful, productive exchanges with him. He said that Feynman was very approachable. Hawking less so. I don't remember Dobson's question for him, but I do remember the answer given; "after a long pause, he typed out, ‘I’m not sure if that's a meaningful question.’ ”
JD had hundreds of stories. A friend of his once upon a time remarked (according to JD) "when they put John underground, surely the jaw will still be moving!"
There's so much to find online by Dobson, and I suggest the Sidewalk Astronomers website, containing links to several fascinating essays that he wrote.
http://www.sidewalkastronomers.us/id31.html

I was very fortunate to have had Dobson as my teacher and mentor during those years. Enriching in both astronomical activities and thought experience. Good influences for curious minds!

Here are my lengthy class notes, mostly from the Randall museum of '05. Unadorned and possibly giving snapshot samples of what was covered.

Dobsonian Cosmology puzzle pieces. (class notes) Autumn of 2005 and 2006 and spring 2007

Hydrogen protons – hot – cold- Sun is shining because its hot. 11 million degrees. Nuclear fusion keys. Sun cool. Gravity keeps the sun hot.
Universe is made of matter – 92 kinds. -Hydrogen & helium 798% matter.
Free fall time same for all clouds of same density.
Clouds, stars, magnetic fields, gravity. Electric current drags magnetic field with it.
Energies: Gravity; Kinetic; Radiation; Electromagnetic

The Earth has 2 iron cores. Theoretically from their collision long ago forming into one, contributing to its larger size. It has a larger core than Venus, otherwise the cores should be more dense with iron and stone the closer they are to the sun (due to the suns magnetism). The planets out further are made of much lighter material.

Magnetic Field (egg beater) Solar system formation: " great magnetic egg beater".

The moon is made of material that blew off of the surface of the Earths core and is made of lighter material.
The moons tidal influence slows the Earths rotation, and that

energy goes into pushing the Moon away by a few inches every year. And so eventually solar eclipses will be extinct.

If an asteroid hit the Earth, when you realize it's entering the atmosphere, there's only enough time to say "Oh Shit!"
"Holy Shit" would be one too many syllables; there wouldn't be enough time for that.

Iron is the dumbest substance in the universe. (why? Its nuclear energy isn't great enough?)

Disc galaxy = only one that can have a solar system.
Why are galaxies shaped wide but not up and down?
(has to do with the way gravity pulls it all together in orbit, making it bulge in the direction of its spin)
Planets can only form in this kind of environment.

Planets get "roundized" when forming in their orbit. ("Roundized: that's a nice word!")

Saturn and Jupiter are not perfect spheres, pulled into ovoid/ elliptical shapes by the gravitational spin.
The moon looks like a sphere to us, but it's ovoid in the side view, pulled into that shape by the Earths pull on one side of it.

The Sun: It has a 10 billion year span of being as it is, while it gets hotter and smaller as it goes along. We are now at its halfway point at 5 billion years, while it has 5 billion more until it balloons out into a red giant expanded out past the Earth, then it becomes a hot dwarf star that will leave a planetary nebula (like M57).
"Cheer up, things are sure to get worse"

Sunshine in UV – slows it down and hoards off nearby electrons.
Jupiter and Saturn are not planets, they're stars!
Jupiter rotates 10 hours at a time and it's big enough that you can fit 1400 Earths into it. That's not a planet. That's a star. Shines in IR.

If a spaceship was orbiting a black hole, and dropped me off at some point to send me off to the black hole while I had a large neon clock, what would you see?
The clock would appear to be moving slower, and would turn red for the receding red shift. Then as I approached very close to the black hole, I would appear elongated. My feet would touch it to become particles. You can't pass through a black hole (like in Star Trek), you'd become a mix of particles. And to go out through the other side, assembly would be required; batteries not included.

Space weldings. The friction of metals in space meld together quickly. A penny broken in half on the moon would easily adhere back together again unlike here on Earth, since there is no atmosphere there to come between them. There is no oxidizing in space.

1908 Tunguska event (comet burst) The pyramids were designed to withstand a Tunguska-like event.

Entropy - Negative entropy. Measure of the scrambledness of energy. With no tendency to unscramble.
Can't make a galaxy out of stars only of gas clouds. Only gravity free of entropy; kinetic energy.

Mass in the universe; "It's no big thing".

E=m (c2 is a commensurate space/time ratio)

Hydrogen goes to helium = nuclear.
Gravity bomb = iron bathtubs piled up into the size of the sun!
I cubic inch of neutron star = I cubic mile of iron. (piece of a supernova)

Authors : Vera Rubin , Burbage

Sag Teapot = center of galaxy direction.
black spots of milky way – clouds.

No such thing as how fast a clock is going.
Earth has two iron cores.
Everything is made up of mostly hydrogen and gravity.

Impossibility cubed.
No distance between now and then.
Farther= faster
The reason you hear the bell is because the fire engine missed you.

A 9 gram marshmallow dropped into a neutron star would vaporize Berkeley.

1 cubic inch of a neutron star= the density of 1 cubic mile of iron.

Things are more dense near the sun.
Gravity falls> things gets shiny.
Lot of evidence of recycling.

Are crows black? If I had an orange one then you would be dead (lol!).
Would negative entropy hold as far as 15 billion years (?)
The universe is wound up tight. (think of the weight of a clock as wound up compared to unwound. The energy put into it is greater when wound up).

The smaller the electrical particles, the greater the charge and density. The larger they get, the less dense.

The sun has nuclear fusion due to the heat caused by the gravity. (do I have that right?)

We are the hotel for mitochondria; the hotel manager is just dead.

Maya—mistake of seeing things. To see through the unseen thing is the falseness or illusion (the thing is space and time)
No separation waves, in space and time.
Expectations are a result of this life. For formulating ready made answers.

The probability function is duality waves or the undivided or the absence of the universe. Nothing doesn't exist. If you have time, then to have change, just space you have dividedness. If you have time space, then you have infinity, which is connected to the evidence of the recycling process.

"Outsideness is fake" (there is no outside universe)
Event perceived Past. Separation is 0. Evidence is 0.
Matter is not converted into energy. It is equal.

TNT= chemical. Uranium bomb= electrical. Hydrogen bomb= Nuclear (+ & - together)

5 Vedic elements. One mistaken for ether. Matter, space and spaced-outness.
Ether died in 1905. (it became disproven)

Spin up & spin down. = Magnetically opposite spins, opposite polarities.

Entropy is scrambled energy. Opposite is trying to put it back together.

The hydrogen clouds show the spectrums, of the designated constellations.

There are (3) impossibilities: Getting everything out of nothing. [?]
Getting anything out of a black hole. And the 3rd (? I didn't get it)

Cannot see anything even if there's something there.

Exclusion principle. Anti-parallel spins. Fermi particles.
Spin up/spin down. can't do parallel spins.

Superfluidity
Superconductivity
Bose particles = sheep
Fermi particles = ornery

When standing on the floor, the electrons are buzzing under foot.
Electrons are pushed too hard.

Spinning galaxies.
Why spinning – Earth spins.
Everything is spinning. Spinning earth, hurricanes , galaxies.
M86, M87

Energy = equal force = 0.
No additional momentum to the universe.
Universe is finite.

Clouds form stars and they shine " you must have noticed"

Genetic programming; hard to get out of the box we're brought up in.

Duality helps the plurality and vice versa.

Heisenberg
Mistake of seeing it in space and time. You don't know what it is.
"Can't have a mistake without a take"
(can't have a moustache without a face" = my mistake ;-)

Those stupid people in Greece.
That which shines = NOT fire.
"Translated things by a few thousands years of jerks!"

What do we have different than the chimpanzees?

Why do we gasp? = ages of being among ocean waves; the gasp is to hold your breath, the wave is about to hit.
Fists for beating off sharks. We come from beach life.

One island or island hoppers?
Language > larger brain.
We are the "dream animal". Hard to undo the impressions from childhood.
-we have the skin of water mammals.
The dream animal needs training. Postpone growing up = postponing the decay of curiosity. (neoteny).
Language helped survival. Hair = for kids to hold in the water.
Shoulder blades, water origins.
Breaking shells = tools of stone. Warm water origins = Africa.

Haight street sidewalk astronomy; a young man looks at the moon and exclaims "Out-fucking-rageous"! That's a lot more than 'Outrageous', I was impressed! And I told this story to the whole lecture hall; what an naughty boy I was."

Dark side of the moon is very dark, they find it from space by looking for a patch of starless sky.

The universe is made of energy (Shakti)
Nuclear energy is an electron sitting on a proton of a hydrogen atom.

"Nowadays people claim the ancient Vedantics just sat and meditated – that's bullshit, they were looking at things, they were physicists."

The (Vedantic) universe name= The Changing. So they must recognize the changeless for comparison.

DVD "Universe, the cosmology quest" Fred Hoyle.

Red Shift
Energy down > mass is down
Uncertainty goes up.

Recycling> gravitational.
Universe is based on frustration.
"I'm the only one who doesn't have creation".

Heisenberg uncertainty principle is the most certain.
Train analogy ; quantum mechanics. Which part of the train? Too hard to say. To find a pinpoint look for the p.o. of a city. (like trying to find the particle. Plancks constant)

Negative entropy is available energy.

Gravity falls hydrogen together & they shine. (stars)

Expanded radiation loses its energy in the expansion > "0"
The energy lost in the expansion drives the expansion.

How far away is the moon?
5 miles per second to get there in 3 days.
600 years drive to Jupiter in a car.

Inertia. Electrical push –stronger by 10 to the 36th power.

-Is the universe neutral? (equal and opposite force)

Pendulum – keeps track of the rest of the universe.
Angular momentum = 0

"The universe is all dressed up with no place to go" (0)
Universe made of 0.

If all of this is a mistake?
If any of this is a mistake, why do they all go to 0?
Changeless ; Infinite; Undivided shows through.

Observer> Observed = 0
Wake from dream = one of you in dream = flock of folks.

Near death experience= Objectify the body, its not me, its "that". Its not you.

Lowest state of entropy/ hydrogen all spaced out. Everything else down the tubes.

Gravitation and Kinetics = free of entropy. Entropy doesn't go up by the clock.-absence of change (beyond edge)

Can you perceive without the perceived? A subject without object (Vedantins) "Brahmin"
Maya= mistake of seeing things in space and time.

Heisenberg. If you see it in space and time, you don't know what it is.
Fermi particles.

Rest mass – recycle into rest mass.
Something out of nothing?

Big bang theory>they think it was all 0 size. And the negative entropy would have all had to come from that fireball? It would have died down ago and wouldn't have lasted 15 million (billion?) years.

"Observational Cosmology" article by JD in 1979.

Why is the moon 9 times brighter when its full compared to a 1/4 moon?
Answer = Shadows.
Moon shadows lessen the light reflected back when not full.

The sun is retarded, it doesn't see its own shadows.

No atmosphere on the moon. It has glass bead from explosions. Examining a moon rock, it has glass pocket formations.

Prefers "Observational causation " instead of the term he once used of "Apparitional " , since it sounds spooky, and we don't want any spooks.

The big bang cosmologists want to invent the physics to match the model, instead of making the model match the physics.

Fermi particles. Bose particles. (I need to define the difference and what they do)

Negative entropy : it would have had to be all wound up in the fireball of the "big bang".

Radiation drives the cosmological expansion.

Pushing electrons together they get heavier, since the energy of pushing them together is in there.

The smaller the particles, the greater the electrical charge.

The Moon: Craters are round from the explosions upon impact of the meteors, or they would be oddly shaped if it was only from their impact.

Sentience in everything. Drop your keys, they know how to find the Earth. And it's the gravitational pull of the keys to the Earth, and the Earth to the keys. (Believes that's what Newton saw with the apple).

We're presently genetically programming ourselves to drive on freeways without alcohol. But in 50 years time after the oil runs out. predicted that there'll be bicycles on the freeways.

An account of him picking up a "strong sense of pilgrimage" when near where Vivikenanda was at a train station depot in Alameda a century ago, unbeknownst at the time . (picked up on his pilgrimage energy/vibes? A surprisingly paranormal belief)

If everything grew by a thousand times bigger, would it remain the same? I thought yes due to our own size growing relative to all else, but no. Gravity and electricity change when they grow in size, so we would notice a difference. Electrical particles are less powerful as they grow.

Life on other planets? Seems likely.

But not near globular clusters since those stars don't spin, so no planets form there. they are facing the center of the cluster due to the gravitational force they are creating. "They should've asked me before they sent a signal to M13."

Open clusters: be careful what you say about open clusters….
Since when do they close (?)
recycling exists there, so planets could be born .
Stellar winds blow the rest of the stuff away.

Meteorites = gravel. some are like a grain of sand. some are like a potato. (Viewing meteor showers " I don't do gravel.")

For an alien microorganism to travel to earth, in ice would be its best way in.

Iron from a meteor is broken apart by the atmosphere when it hurls towards Earth, not from the impact itself.

We've been genetically programmed to not want to feel pain, for self-preservation. Fear of death comes from this too.

"This mushroom in our heads is brand new!"

There is no "out there".
"Outsideness is fake".

Observational dualities.
Space and time are opposites.
Gravity= up and down.
Electricity= positive and negative.

A particle moved far away would be wound up against the rest of the universe. (did I jot that down correctly?)
Wound up = "pushing against"

We try to visualize a model and make a place for these things. (is that part of the mistake of seeing things that way?)

The border of the observable universe… that is, the border not as an actual border, but being as far as we can see, and the border shifts when we shift. The background radiation is on our side of the border. (ah but will the background radiation shift when we shift? Would it always be as far away as we detect it, but unapproachable….same as the end of a rainbow might be unapproachable?)

Underneath our observations are the non-dualities of the changeless, the infinite and the undivided.

Advaita Vedanta = "Not Two. Culmination of knowledge" (Advaita = not two)
They were careful not to say "one". Since then there would have to be another "one" to compare it too.

How does it feel to be older than everyone else?: "It's strange". "When I was a kid, the sun was made of iron and rock. Now it's made of hydrogen and gravity".

"I've spent over 30 years working out these problems, and you all are just starting"

Gravity makes the sun hot. The sun doesn't heat the earth, the radiation does. (its interaction with the Earths atmosphere?)

"wound up" = pushing against.

Atomic Table = 1870's
Atoms = 1911, 1916, Neils Bohr.

"The Hurtling Moons of Barsoum" article to find by Carl Sagan.

Frauenhofer, spectral lines. Spectography contributes to identifying gasses.

Neoteny = the postponement of growing up. "We were all neotenized". It contributes to brain growth, humans have brain growth unlike any other species, their brains grow rapidly after birth without much progress beyond that.

Lucy is names from the Beatles tune that was playing when they discovered her age.

The tide affects mealtime in ancient beach culture from whence we came.
We have warm water origins.

Moons of Mars are held in the same orbital track as the planet.
Our moon has its own speed.
Tides. The Earths push on the moon pushes it away a few inches per year. If you haven't seen a solar eclipse, I suggest you get it done soon, since there wont be anymore after awhile.

The asteroids of the asteroid belt are pulled apart by the tidal effect of the Sun and Jupiter (good for us).

Nuclear fusion = dumbs it down. It goes to iron and then collapses.
One cubic inch of a neutron star is as dense as one cubic mile of iron.

Energy = Mass.
We live in a world cooled down enough where we recognize mass more than we see it as energy. It is recognized as Energy at a star.

If we were to wake up with everything increased in size by a thousand, things would not act the same since gravitational and electrical charges would act very differently.

Space and time are opposites.

Why don't we fall through the floor? The atoms don't get smaller, instead they buzz when pressed by our feet. The electron won't sit on the proton in our world. It has in a neutron star setting, where the electrons and protons are pushed densely. (electrons fly off)
If you dropped a few drops of water on a neutron star, it would vaporize a town.

Heisenbergs uncertainty principle. While its found out by the observational, its not about not seeing it if you looked away as if it were reliant on our experimentation. It's a principle.

Q: What happens when the lines are removed between Mass/ Energy and Space/Time?

John Dobson's List of Recommended Reading (December 2006)

Six Easy Pieces by Richard Feynman,
Addison-Wesley Publishing Company, October 1994.
No. 1, if you want to understand the Universe.
What we know, and what we don't know.

QED by Richard Feynman,
Princeton University Press, 1985.
Feynman's "sum-over-histories" quantum mechanics.

Mr. Tompkins in Paperback by George Gamow,
Cambridge University Press, Canto edition, 1993.
Early and charming, but watch out!

The Nature of the Universe by Fred Hoyle,
Harper and Brothers, New York, 1950.
Written before the solar wind was noticed and named.
From hydrogen and gravity to galaxies and stars.

The Immense Journey by Loren Eiseley,
Vintage Books, 1959.
"It began as such things always begin, in the ooze of unnoticed swamps."

The Scars of Evolution by Elaine Morgan
Oxford University Press, New York, Oxford, 1990.
Extremely informative.

The Meaning of Relativity by Albert Einstein,
Princeton University Press, Princeton, New Jersey, 1922.
Early and interesting, but watch out! He didn't take his 1905 geometry seriously, and takes Mach's principle to mean that inertia arises through the proximity of "ponderable masses" rather than separation from them.

"On Being the Right Size" (an essay) by J.B.S. Haldane.
Fortunately, it was required reading for an English course at the university.

Cosmic Beginnings and Human Ends (an anthology),
Open Court, 1994 (From the 1993 Parliament of the World's Religions at Chicago).
The only thing of mine that you'll find in a book store is in Cosmic Beginnings and Human Ends.

Let's Eat Right to Keep Fit by Adelle Davis,
A Signet Book, 1970.

The Relativity Explosion by Martin Gardner,
Vintage Books (A Division of Random House, New York).
Be careful! Nobody seems to notice that space and time are opposites, or that E=m, or that clocks coming toward you appear to run too fast, and that clocks going away appear to run too slowly.

The Center of Life: A Natural History of the Cell by L.L. Larison Cudmore,
Quadrangle/The New York Times Book Co., 1977.

If I didn't like what she had to say, and if I didn't like the way she said it, I wouldn't have read her book five times.

Genius: The Life and Science of Richard Feynman by James Gleick,
Pantheon Books, New York, 1992.

The Beat of a Different Drum: The Life and Science of Richard Feynman by Jagdish Mehra.
Oxford University Press, USA, 1994.
A very interesting biography of Feynman.

If you got this far through my fairly fragmented class notes, you can see the wide ranges that he covered!
Now on to chapter nine.

Dean Gustafson, April 2021