The "Particle Chamber" Theory of Dark Matter

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ABSTRACT

This paper, the "Particle Chamber " theory, examines and identifies microscopic, dust like, matter as the mechanism that causes the gravitational effect known as dark matter. The initial analysis identified how these particles are distributed around our solar system. Minute particles of matter are each contained in cubical chambers one kilometer on a side. This paper employs a mathematical analysis to evaluate its potential distribution of the chambers over the universe based on measurements of particulate matter deposited on earth each year. The mathematics indicate that the universe can easily hold both the existing visible matter, and dark matter with a mass ten times greater that the mass of all the visible matter, and the universe still has vast vistas devoid of any matter. A gravitational effect caused by the accumulation of these particle chambers into cubic light-years calculates to reflect the power of stars.
The paper demonstrates why dark matter can't be seen (in most cases) and shows that this theory doesn't conflict with many of the insights found in the papers on this issue.

1.0 INTRODUCTION

Dark Matter is the title of the great mass of invisible matter, which can be estimated by the effects of gravity but is many times the value of the total matter of the visible stars in the universe. In fact the amount of Dark Matter is estimated to be about ten times the mass of the visible elements of our universe, Dursi 1999, Sadoulet 1999, and WMAP Mission 2006, while some physicists Chase et al 2002 estimate that we only see 0.01M. The rest of the matter, because it is not visible, has been designated as Dark Matter. This paper identifies a physical entity in the universe, which can account for the missing Dark Matter
Dust, the microscopic remains of disintegrated planets, stars and other events are evident throughout the universe Mandelbaum et al., 2006. In some galaxies it clouds the observer's view and is an annoyance.

1.1 DERIVATION OF "PARTICLE CHAMBER"

Initially the author wanted an estimate of the distribution of dust in the immediate vicinity of earth and the analysis progressed from there. To find out the distribution of dust we used Ceplecha, 1996, $1.5X10^{11}\, g/year$ which reports flux rates of extraterrestrial dust onto the earth.

We wanted to find an equivalent distribution in cubic yards around the planet and Sun as a measure.
We decided to use the fact that the earth describes a torus around the Sun within a year and the cross-sectional area of the earth at the equator can be viewed as a plane disc describing the torus by executing the orbit of the earth. This disc acts as a sweeping mechanism.
The cross section for the earth in square yards is $= \pi\ r^2$

$$\pi(3\,958\ mi\ X\ \ 5\,280\ ft/mi\ \ X\ \ 1yd/3\,ft)^2 = 1.5245\ X\ 10^{14}\ yd^2. \qquad (1.1)$$

From Hamilton 2005, the earth's orbital speed around the sun is 66 700 mi/hr.

$$Earth\ orbit = 66\,700 mi/hr\ \ X\ \ 24hr/dy\ \ X\ \ 365dy/yr = 5.8429\ X\ 10^{8}\ mi/yr. \qquad (1.2)$$

Now we calculate the orbit in yards for 1 year

$$5.8429 X\ 10^{8}\ mi/yr\ X\ 5\,280 ft/mi\ X\ 1yd/3 ft = 1.028\ X\ 10^{12}\ yd/yr. \qquad (1.3)$$

Next we calculate the volume swept by the disc of the earth

$$1.028\ X\ 10^{12}\ yd/yr\ X\ 1.5245\ X\ 10^{14}\ yd^2 = 1.5672\ X\ 10^{26} cu\ yds/yr. \qquad (1.4)$$

Earth sweeps this amount of volume while circling the Sun in one year.
The ratio of volume to mass is:

$$1.5672\ X\ 10^{26} cu\ yds/yr // 1.5\ X\ 10^{11}\ g/yr = 1.0448 X\ 10^{15} cu\ yds/g. \qquad (1.5)$$

We assume a particle is a $microgram = 1\ X\ 10^{-6}\ g$.

$$Therefore\ we\ need\ 1.0448\ X\ 10^{9}\ \ cubic\ \ yards\ \ per\ \ particle\ (1\ microgram). \qquad (1.6)$$

$$This\ is\ an\ equivalent\ chamber\ 1\,015 yards\ on\ a\ side. \qquad (1.7)$$

1.2 NUMBER OF "PARTICLE CHAMBERS" IN A CUBIC LIGHT YEAR

Since a Kilometer is 1 094 yards, a "Particle Chamber" is roughly and conservatively defined as a volume 1 kilometer on a side. The particle enclosed is 1 microgram.
But for purposes of consistency we will use a volume 1 015 yards on a side for these calculations and will continue to work this portion of the analysis in English units.
Next we need to calculate the number of cubic yards in a cubic light year (cly) and from that the number of "Particle Chambers" in the same volume. To get the length of one side in yards:

$$186000\,\mathrm{mi/sec}\ X\ 5280\ \mathrm{ft/mi}\ X\ 1\mathrm{yd}/3\mathrm{ft}\ X\ 60\ \mathrm{sec/min}\ X\ 60\ \mathrm{min/hr}\ X\ 24\ \mathrm{Hr/day}\ X\ 365\ \mathrm{day/yr} = 1.0323 X 10^{16}\ \mathrm{yd/yr}. \qquad (1.8)$$

To create a cubic light year (cly) we cube the number

$$(1.0323\ X\ 10^{16}\ yd/yr)^3\ \ = 1.1\ X 10^{48}\ \ yd^3/cly. \qquad (1.9)$$

To find the number of "Particle Chambers"(PC) in a cly;

$$1.1\ X\ 10^{48}\ \ yd^3/cly // 1.0448\ X\ 10^{9}\ yd^3\ perPC = 1.053\ X\ 10^{39}\ \ PCs/cly \qquad (1.10)$$

Each "Particle Chamber" contains 1 microgram $(1\ X\ 10^{-6}\ g)$

1.3 NUMBER OF "PARTICLE CHAMBERS" TO CONTAIN THE EARTH

Initially we will determine how many "Particle Chambers" are required to hold the earth if it were to be pulverized into individual micrograms.
The mass of the earth, from Cutnell 2003,

$$= 5.98\ X\ 10^{24}\ kg\ X\ 1\ X\ 10^{3}\ \ g/kg\ X\ 1\ X\ 10^{6}\ \ micrograms/g = 5.98\ X\ 10^{33} micrograms \qquad (1.11)$$

Each microgram requires a “Particle Chamber”.
Though this is a considerable number of “Particle Chambers,” when they are contained in a cubic light year, there is a lot of excess room. The calculation is

$$1.053\ X\,10^{39}\,PC/cly\,//\,5.98\,X\,10^{33}\,PC/earth = 176\ \ 087\ earth(s)/cly. \qquad (1.12)$$

Placing each microgram in an individual “Particle Chamber“ leaves enough room in a single cubic light year for 176 087 equivalent earth bodies.

1.4 VOLUME TO CONTAIN THE SUN

Now we have to examine our star – the Sun – to see how much volume it would require.
From Cutnell, 2003, we obtain $Sun\ mass = 1.99\,X\,10^{30}\,kg$

$$1.99\,X\ 10^{30}\,kg\ \ X\ 1\,X\,10^{3}\,g/kg\ \ X\ 1\,X\,10^{6}\ \ Microg/g = 1.99\,X\,10^{39}\,microg \qquad (1.13)$$

$$1.053\ X\,10^{39}\,PC/cly\,//\,1.99\,X\,10^{39}\,PC/sun = 0.529\ sun\ /cly. \qquad (1.14)$$

To *accommodate our Sun requires 1.89 cubic light years.* This means that every two cubic light years containing 1 microgram (Dark Matter) in each “Particle Chamber” has the gravitational effect of slightly more than one solar Mass. This is impressive.

1.5 VOLUME TO CONTAIN ALL THE STARS

Finally we need to calculate the number of cubic light years in our universe. To assess this volume we need to use the age of the universe.
Two references, WMAP Mission 2005, and Wright 2006, place the Big Bang from 12 – 14 billion years ago.
Using a conservative 10 billion years for purposes of discussion and assuming the expansion to be spherical, the volume in light years is $4/3\pi r^{3}\ where\ \ r = 10\ X10^{9}\ \ years$ (1.15)
This yields $4.18879\,X\,10^{30}$ cubic light years (cly) in our universe. (1.16)
Since our Sun takes approximately 1.89 cly (1.14), the universe can accommodate
$2.216\,X\,10^{30}$ Suns (stars) each in a “space” of 1.89 cubic light years. (1.17)
This is the number we will use for the next section of the analysis.
All the “Particle Chambers” in the Universe (U) have two conditions. Either they contain matter (m) or they are vacant (V).

$$U = m + V \qquad (1.18)$$

$$V = Um/m - m \qquad (1.19)$$

$$V = m(U/m - 1) \qquad (1.20)$$

According to Whitlock 1997, the number of stars is estimated at $1\,X\,10^{21}$. Assuming “Dark Matter” is ten times the mass of all the visible stars, we have an equivalent of $1\ X\ 10^{22}$ stars. Each requires 1.89 cly. This calculates out to $1\ X\ 10^{22}\ \ stars\ \ X\ 1.89\,cly/star = 1.89\ X\ 10^{22}\,cly$ to hold all the known matter plus Dark Matter. How many light years are vacant?
Specifically in the Universe (U) the volume without matter (V) is:

$$V = m(U/m - 1)$$

$$V = 1.89\ X\ 10^{22}\ (4.18879\,X\,10^{30}/1.89\,X\,10^{22} - 1)\ cly \qquad (1.21)$$

$$V = 1.89\ X\ 10^{22}(2.216\ X\ 10^{8} - 1)\ cly \qquad (1.22)$$

After we have accommodated these thousand times a billion times a billion stars in "Particle Chambers" and have added the dark matter, we still have a massive volume that is vacant. It is $2.216\ X\ 10^{8}$ times the total cly volume containing matter. This indicates there are still enormous vistas of the universe without any mass contained in the chambers.
For purposes of verification we will look at the mass of the Universe using a different approach.

1.5.1 MASS OF THE UNIVERSE

A second way to view the capacity of the theory is to analyze the ability of the "Particle Chamber" theory to contain the mass of universe based on density measurements

References from multiple independent astronomers give different answers to the question "What is the mass of the Universe?" All indicate their estimate includes both dark and luminous matter since the calculations are based on the density of the universe.
Boukalov 2002 employs, $5.7\ X\ 10^{53} kg = 5.7\ X\ 10^{56} g.$
Hopkins 1980 indicates $3\ X\ 10^{53} g.$
Lauroesch 1998 calculates, $2.5\ X\ 10^{55} g.$
Pandian 2005 quotes, $3\ X\ 10^{55} g.$
Peterson 2000, was a little more convoluted,
$100\ (Trillion)^4\ Tonnes\ where\ a\ metric\ Tonne = 1\,000 kg.$
This calculates out as $100\ (1\ X\ 10^{12})^4\ X\ 1\ X\ 10^{6} g / metric\ Tonne = 1\ X\ 10^{56} g$ (1.23)
Sternglass 2000 uses, $1.7 X 10^{56} g.$
Wahlin 1997 was quite specific at, $1.59486\ X\ 10^{55} kg = 1.59486\ X\ 10^{58} g.$

Since $1\ X\ 10^{56}\ g$ is the median for the Density of the Universe, we will employ it in the calculations.
From the thousand billion billion stars + Dark Matter we obtain:
$Our\ star\ the\ sun = 1.99 X\ 10^{30} kg\ X\ 1\ X\ 10^{3} g / kg = 1.99\ X\ 10^{33} g.$ (1.24)
Estimated mass of stars and Dark Matter *is*
$1.99\ X\ 10^{33} g\ X\ 1\ X\ 10^{22} = 1.99\ X\ 10^{55} g.$ (1.25)
The difference is: $1\ X\ 10^{56} / 1.99\ X\ 10^{55}$ *or a difference of* 5.025 *to one.* (1.26)
This difference in estimated mass is small indicating the two approaches are comparable.

This analysis verifies the "Particle Chamber" theory and indicates that the total amount of matter and Dark Matter, as calculated from the density measurements, can be accommodated in the universe and still there are enormous volumes with no matter included.

2.0 RECAP OF THE ANALYSIS

At this juncture a brief recap of the evolution of the theory appears appropriate.
The amount of dust delivered to earth each year is known.
The volume swept by the rotation of the earth around the Sun in a year is known.

The density of the dust surrounding the earth and Sun is calculated as 1 microgram in a "Particle Chamber" of approximately a 1 km cube. This particle meets the criteria of Dark Matter. It is difficult to see, apparently invisible, and yet is a finite miniscule mass.
We expanded our scope and scale and examined a container of 1 cubic light year (cly) in volume. Then, using the observed density, we calculated how much mass is contained. This calculation yielded the fact that the mass, a summation of all the 'Particle Chambers' in a single cubic light year, is equivalent to that of ½ our Sun. This is momentous.
Estimating on a conservative basis the number of cubic light years (cly) in our universe indicates that, employing the "Particle Chamber" theory, there is more than enough volume to hold both all the stars if they were pulverized and the dust equivalent to the "Dark Matter" effect with vast portions of the universe still empty of mass.
The dust as microscopic elements would not necessarily radiate energy but still have a measurable mass to contribute a gravitational force.

2.1 WHY DARK MATTER IS DIFFICULT TO SEE

Dust particles have been ignored as is aptly described in the following quote from Dunne et al., 2003 "Dust has been swept under the cosmic carpet - for years astronomers have treated it as a nuisance because of the way it hides the light from the stars. But then we found that there is dust right at the edge of the Universe in the earliest stars and galaxies, and we realized that we were ignorant of even its basic origin. Now, with these supernova dust factories, we can explain how that dust was made."
Why is it difficult to view or measure the dust particles in a chamber? What minerals do they contain and what is their physical size? A brief series of calculations can illuminate these questions.
NASA scientists have recently obtained Comet dust samples, captured when the robotic Stardust spacecraft flew past the comet WILD 2 in 2004. As stated by Joswiak and Brownlee 2006, "Spectroscopic observations on the circumstellar disks of young stars have shown that amorphous silicates rather than crystalline silicates comprise the bulk of solid materials while in the interstellar medium (ISM), nearly all solids are amorphous." Significantly, amorphous silicates are major components in chondritic, porous interplanetary dust particles (CP IDPs), which may have originated in comets."
Joswiak and Brownlee 2006, state, "Common amorphous silicate grains found in comet IDPs are GEMS (Glass with Embedded Metal and Sulfides) which are Si-rich glassy spheroids."
We decided to use a silicate equivalent for our calculations. Quartz, a silicate, has a range of specific gravities and glass has a specific gravity at the low end of the quartz range so glass was used as our mean specific gravity to calculate physical size.
Dark Matter has obtained its title because it can't be seen. Its existence is recognized only from the gravitational effects it generates. To appreciate the difficulty with viewing or measuring the 'particle' in a chamber, we take a plane through both the chamber and the 'particle'. The plane is a square 1 000 meters on a side and the area equals $1\,X\,10^6 m^2$. The particle will arbitrarily be assumed to be a glass sphere with a known density. To calculate the cross section of the sphere we perform the following calculations. The specific gravity equations are referenced in the SI Metric Tables 2003,

$$Water = 1\,000kg = 1m^3. \qquad (2.1))$$

$$Glass = 2\,579kg = 1m^3. \qquad (2.2)$$

NOTE From Hodgman 1953, Quartz a silicate has a specific gravity range of 2.59 to 2.66. Glass is at the low end of this range and is used for the calculations.
1 microgram of the 'particle' $= 1\ X\ 10^{-6}\,g$.

The spherical volume of the 'particle' (glass)

$$=1\,X\,10^{-6}\,g\,//\,2\,579\;X\,10^{3}\,g\,/\,m^{3} = 3.87747\,X\,10^{-13}m^{3}. \qquad (2.3)$$

$$4/3\pi r^{3} = 3.87747\;X\;10^{-13}m^{3};\;\; r^{3} = 9.25678\;X\;10^{-14}m^{3};$$
$$particle\ radius\;\; r = 45.236\;X\;10^{-6}\,m. \qquad (2.4)$$

$$The\ cross\ sectional\ area\ of\ the\ particle\;\; = \pi\; r^{2} = 6.4287\;X\;10^{-9}\,m^{2} \qquad (2.5)$$

$$Ratio\ of\ particle\ to\ plane\ area = 6.4287\;X\;10^{-9}\,m^{2}\,/\,1\;X\;10^{6}\,m^{2} = 6.4287\;X\;10^{-15} \qquad (2.6)$$

The ratio which can be viewed as a signal to noise ratio indicates that this is truly a "stealth particle"

2.1.1 VISUAL ACUITY OF THE PARTICLE

How easy is it to physically view a particle with the unaided eye? The radius is known and the diameter in inches is: $D = 45.236\;x\,10^{-6}\,m\;\;X\;\;2\;\;X\,39.37 in/m = .00356188\; in.$ (2.7)

Visible acuity limit according to Kaiser 1996 is one minute of arc, which yields:

$$.00349\; in\;@12\; inch\; \text{distance}. \qquad (2.8)$$

Therefore you can just meet the visual acuity limit and see the particle at a *distance of 1 foot*. It is basically unseen at 30 feet. For all intents and purposes the particle would be invisible at any longer distance. However minute it still has mass, and a gravitational influence. It can't be seen but it is definitely felt. A micron is $40\; x10^{-6} inches$. So the diameter of a particle is about 89 microns.

3.0 COMPARED TO OTHER THEORIES

Any new theory must be measured against the observations of other investigators who monitor the universe and record their discoveries.

3.1 DARK MATTER HALO

It is recognized that the distribution of dust through out the universe is a variable. Recent papers by Gates et al., 1995, Ma and Bertschinger 2004, Mandelbaum et al., 2006**,** Sadoulet 1999, Seljak et al., 2005, and Vorobyov et al., 2006, reflect the variation in dark matter distribution inferred by the gravitational influence and attribute it to a "dark matter halo" Chase 1993, discusses the rotational speed of the outer stars in galaxies which "seem to rotate too fast for the amount of matter that we see in the galaxy. Again we need about 5 times more matter than we can see via electromagnetic radiation. These results can be explained by assuming there is a "dark matter halo" surrounding every galaxy"

The concept of a "dark matter halo" surrounding every galaxy would support the "Particle Chamber" theory. In fact the mass of a galaxy would attract the dust particles from surrounding space in such a way that it can be assumed that the density can be expected to increase.

In a paper by Sugerman et al., 2006, he discusses discoveries of massive amounts of dust in supernovas; the paper refers to the phenomena as a 'Dust factory'. These observations show that dust formation in supernova ejecta can be efficient and that massive-star supernovae could have been major dust producers throughout the history of the universe.

Dust, the basis of this theory, is everywhere. Many scientists allude to it in passing while researching astronomical events. Dunne et al., 2003, coalesced the attitude to dust in a cogent paragraph,

“Dust has been swept under the cosmic carpet - for years astronomers have treated it as a nuisance because of the way it hides the light from the stars. But then we found that *there is dust right at the edge of the Universe in the earliest stars and galaxies*, and we realized that we were ignorant of even its basic origin. Now, with these supernova dust factories, we can explain how that dust was made.”
SCUBA detected a dust shell in Cassiopeia A that contains up to four times the mass of the Sun. “This is over a thousand times what’s been seen before,” said study team member Steve Eales of Cardiff University in the UK. “Cassiopeia A must have been extremely efficient at creating dust from the elements available.” All of these observations are in line with the “Particle Chamber” theory.
Another recent paper by Ma and Bertschinger 2004 opens with a telling statement: ”Most mass in the universe is in the form of dark matter, and most dark matter is gravitationally clustered in the form of halos. Dark matter halos are therefore the building blocks of the universe”
This paper examines the haloes of dark matter surrounding galaxies and the gravitational forces acting on them.
This paper supports the “Particle Chamber” theory, which employs dust like particles distributed in space.

3.2 BARYONIC AND NON-BARYONIC MATTER

There are also numerous papers investigating and examining baryonic and non-baryonic dark matter; Bergström 2000, Chase 1993, Dunne et al., Gates et al., 2003, Sadoulet 1999, White et al, 1996. This theory doesn’t contradict or dispute any of these findings. It does not discriminate. It incorporates both without prejudice, only employing their mass as the necessary component of the “Particle Chamber” theory.

4.0 CONCLUSION

The dust in the universe though miniscule and calculated to be distributed around our earth in cubical “Particle Chambers” 1.0 kilometer on a side, can be accommodated in our universe on a scale much larger than the mass of the visible stars. The density of the dust (1 microgram in a 1.0 kilometer cube) explains why it is effectively invisible while the aggregate of these same microscopic particles in a cubic light year has the gravitational effect of about ½ of our Sun. Even with the mass of all the stars and the Dark Matter accounted for by the “Particle Chamber” theory, the math indicates there are still vast regions of the universe that may be empty. This theory, I believe, identifies “Dark Matter”. The particle mass of 1 microgram calculates to a particle so small (*D =.00356188 in)* that at a distance of 1 foot from the unaided eye it is at the limit of visual acuity for a person. Beyond 30 feet it is virtually invisible and can be assumed to be “Dark Matter” (You can see some of it by examining those galaxies where the dust density is much greater so that it obscures the view). Dark Matter is dust, so faint as to be invisible but in the aggregate, over the universe, has a gravitational force greater than all the visible astronomical entities. Gravity indicates that it is there and the mathematical analysis that forms the basis for the “Particle Chamber” Theory supports the observation.

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