

## Gas Laws and Greenhouse Theory

Or

### Back Radiation? What Back Radiation?!

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Every scientific paper tells a story that is based on one or more assumptions and the validity of the conclusions will obviously depend on the validity of the starting assumptions. For example, if one wants to correlate the effect of sunspots numbers on the temperatures observed at ground level on our planet, the validity of that correlation will depend on the accuracy of sunspot count and the accuracy of temperature measurements at ground level. While the sunspots are real and can be confirmed, the use of the so called 'annual global temperature' to represent 'temperatures' is scientifically invalid since it cannot be measured, it cannot be validated and it has nothing to do with the physical reality observed on our planet. It, therefore, follows that the correlation between sunspot numbers and the temperatures that are represented by the 'annual global temperature' values is meaningless and nonsensical.

When it comes to the GHT, the situation is the same. If our planet is assumed to be a black body, a grey body or for that matter, a pink body and then given a full mathematical treatment with reference to the great names from the world of theoretical world of physics like Planck, Stefan and Boltzman, any conclusion based on those starting assumptions have to be wrong since our planet is NOT some sort of black body. In other words, there is no problem with Stefan-Boltzman's treatment of black body, but there is a huge problem with treating the earth's atmosphere as a black body!

Let us now start with the main topic and test whether the GreenHouse Theory, GHT, violates gas laws. To do that we first need to define the composition of earth's atmosphere, and then apply the gas laws to it. The hard (experimental) numbers about our planet are:

1. Everything that has a mass is made of either atoms or molecules
2. 99% of earth's atmosphere is comprised of two molecules, N<sub>2</sub> and O<sub>2</sub> and for simplicity their ratio will be taken as 4:1 or 80:20
3. The behaviour of the molecules depends on their individual physicochemical properties and these are absolute, i.e. they are the same during night and day and, further, are the same whether those molecules exist on our planet or on a planet in different galaxy
4. Our atmosphere's primary surface starts at altitude of +100 km (top of atmosphere or TOA) and ends at sea level which represent the earth's secondary surface
5. The mass of our atmosphere is about  $5 \times 10^{18}$  kg
6. Every molecule has the ability to absorb heat, a property quantified by its heat capacity. Since the mixture that we call 'air' has heat capacity of 1 kJ per kilogram per 1C, i.e. 1C = 1kJ, heat energy from the sun will be **used-up** at the rate of  $5 \times 10^{18}$  kJ per 1C of warming. Please note that statement like "CO<sub>2</sub> has capacity to 'trap' heat" is totally meaningless since every molecule has the capacity to absorb, or trap, heat! Furthermore, CO<sub>2</sub>'s heat capacity is less than those of both N<sub>2</sub> and O<sub>2</sub>. Also note that since CO<sub>2</sub> represents only 0.04% of the total mass of our atmosphere, its contribution towards the 'ability to trap heat' is **exactly** 0.0004 kJ/kg or 0.0004C per 1C of warming. Please also note that to compare planets where CO<sub>2</sub> is a trace gas, like Earth, with planets where CO<sub>2</sub> is the major component (>95%) is both nonsensical and totally irrelevant!

Now that we have all our facts established let us start with the gas law (Eq 1):

$$pV = nRT \quad (\text{Eq 1})$$

where  $p$  = pressure,  $V$  = volume,  $n$  = number of molecules,  $R$  = the gas constant and  $T$  = temperature.

### Gas Law applied to an open system

Our atmosphere is an open system where the gas molecules expand when heated and contract when cooled. For example, if we consider what happens at ground level where pressure is one atmosphere, Eq 1 is reduced to the equation 2:

$$V = nT \quad (\text{Eq 2})$$

If we imagine a virtual cube measuring 1x1x1m and apply Eq 2, we will see that when the temperature increases, the volume will increase as well since the molecules are absorbing heat energy. The kinetic energy goes up, i.e. the molecules become 'excited', and to avoid collisions molecules start to leave the virtual box and so the number of molecules within the box,  $n$ , will decrease. The property of molecules that describes the relationship between the volume and number of molecules within that volume is called density. So, when temperature increases, the density of the starting virtual box decreases. In simplistic terms, when the air is warmed it expands and rises, while when it is cooled, the density increases, it becomes heavier and therefore it falls. The gas law applies to every known molecule in its gas phase without a single exemption!

The conclusion – *gas molecules of an open system are driven by temperature and it is physically impossible for gas molecules of the open system to control temperature in any shape or form.*

### Gas Law applied to a closed system (green house or a gas cylinder)

The closed system has to have the following properties:

- The walls of that system have to be made of the molecules in their solid form or phase, since the internal volume of that system must be constant
- The closed system has to be 100% closed, or 100% sealed, since a single hole in any wall of the system would make it an open system

In case of the 'real' green house, the molecules that form the 'walls' (glass) are based on the element silicon, Si, while in case of gas cylinder they would be based on the element iron, Fe.

Applying the gas law to the closed system leaves us with the Eq 3 below ( $V$ ,  $n$  and  $R$  are constant):

$$P = T \quad (\text{Eq 3})$$

So, if we increase the temperature of the closed system, the internal pressure must increase as well, and, therefore, **even in the closed system** it is the temperature that is driving the behaviour of the gas molecules. In terms of the thermodynamics of that system, the following set of equilibriums would be in operation:

1. The molecules of the walls would be trying to get into thermal equilibrium with the external molecules warming them, say molecules of H<sub>2</sub>O in their liquid state if an external water-bath was used to do the warming of, say, gas cylinder
2. At the same time, the molecules inside the cylinder, like air, would try to get into equilibrium with the molecules of the walls
3. The overall effect would be that the three sets of molecules end up in thermal equilibrium

It is extremely important to emphasise that the analysis so far is based on the findings of the thousands experiments performed under strict experimental protocols upon which the gas laws have been derived and formulated.

***Since we are discussing scientific laws it must follow that there is NOT a SINGLE experiment in existence that falsifies/invalidates any scientific law.***

Let me digress briefly and quote definition of the GHT and GHG: “*Earth’s atmosphere includes some gasses which have a distinctive trait: They let sunlight pass through to heat Earth’s surface, but they capture energy that leaves this sun-warmed surface. These are called greenhouse gasses.*”

If you now look back at the hard facts listed at the beginning of this report, it becomes obvious that if the starting hypothesis/assumption of GHT is wrong, the whole theory must be wrong. First of all, NO molecule in its gas/liquid or solid phase can behave differently during daytime from the night-time. Secondly, and most importantly, terms like ‘surface’, ‘air’ or ‘atmosphere’ are ALL abstract terms that have no physicochemical properties, but they describe the collection of molecules which DO have its own physicochemical properties. The key point is that the Earth’s surface starts at +100 km high and ends at sea levels (0.0 km). That primary surface, i.e. our atmosphere is 100% full of molecules, in their **gas phase**, with the total mass of  $5 \times 10^{18}$  kilograms, 80% of N<sub>2</sub> and 20% of O<sub>2</sub> with both molecules ‘trapping’ the heat more efficiently than CO<sub>2</sub>. So, whatever is left of the sun’s heat energy after warming-up the primary surface, i.e. the atmosphere, it has to then heat up 70% of the secondary surface that is made-up from water molecules in their liquid phase, and 30% of variety of molecules in their solid phase that make-up the land mass. The physical reality is that the heat energy does NOT just ‘pass through’ the atmosphere and that the molecules that make-up our atmosphere must ‘trap’ the same amount of heat energy during day and during night. For example, the rate of a chemical reaction is the same during daytime as it is during night-time and the only thing that matters is the reactivity of the chemical bond that one is trying to break or make.

Let us now put all this together and try to find **single** experimental evidence that would **validate GHT without falsifying the gas law**. Please note that in real sciences it is sufficient to find single evidence that falsifies any given theory for that theory to be abandoned. As Einstein commented “99 experiments can’t prove me right, but 1 experiment can prove me wrong”,

By its name and definition, the GHT defines our atmosphere as a closed system despite the fact that ALL the experimental evidence tells us that it is an open system. Since the open system does not have any physical barrier it is impossible for that system to somehow ‘radiate back’ that extra heat! Furthermore, it is impossible for the same ‘system’ to be open system during daytime and closed system during night-time.

Since our knowledge in field of chemistry is so advanced we should be able to detect this putative closed system using standard and approved instruments:

1. To detect molecules in their solid state that are forming that mystic ‘blanket’ and making part of our atmosphere 100% hermetically closed, but we don’t. All we can detect is that 99% of ALL the molecules in our atmosphere are those of N<sub>2</sub> and O<sub>2</sub>, both in their gas phase. Only molecule present in the atmosphere in its liquid and solid phase is water, H<sub>2</sub>O, as clouds, but clouds constantly move (wind) leaving huge holes between them
1. Physical reality is that it takes  $5 \times 10^{18}$  kJ to warm-up our atmosphere by only 1°C during daytime; it would take the same amount of heat energy to warm-up the same atmosphere by the same amount during night-time. It follows that we should be able to detect this ‘night-time sun’ or night-time ‘hot-spot’ which supposedly generates such a huge energy, by a standard thermometer, but we don’t
2. The concept of ‘up’ and ‘down’ does not exist in the closed system full of molecules since the system reaches internal equilibrium very quickly due to the fast motion of molecules within

the fixed volume. It follows that in terms of say pressure we should measure the same air pressure at altitude at 0 km and at 10 km, but we don't

3. The most important fact would be that any existence of the solid wall surrounding the planet would imply that no physical object could leave the closed system without breaking through that wall and therefore transposing the closed system into the open one. Since we all know that the airplanes are flying at different altitudes during night and day and also from day into night or night into day, without crushing into this mystic CO<sub>2</sub>-blanket it would be safe to conclude that there is no solid wall in existence anywhere in our atmosphere, and, therefore, it is impossible to 'back-radiate' something from nothing
4. If we sample 1 million molecules of air anywhere across the globe, the same results will be observed: 990,000 out of 1 million molecules belong to N<sub>2</sub> and O<sub>2</sub>, while only 400 belong to CO<sub>2</sub> and ALL of them in their gas phase and NOT solid phase

*As you can see, it is impossible to validate and prove existence of GHT by using scientific reasoning since ALL the experimental data and observations using approved instruments are telling us the same story – if our observations, knowledge and scientific laws are right, the GHT is wrong. Alternatively, if GHT is right then all our experimental sciences and observations are wrong.*

The simple and the most important message to take away from this brief report is that if the goal of a scientific reasoning exercise is to discuss a property of the space that is full of real molecules, the first thing to do is to gain the knowledge about physicochemical properties of those molecules **before** starting the exercise. And that is the reason that the scientific competence is the driving force behind all scientific discoveries and why the research scientists spend their working life designing new experiments and extracting new knowledge.