

The wrong climate experiments

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Abstract

In 1827 Joseph Fourier published a hypothesis according to which water vapor and CO₂ would warm the Earth's atmosphere. This thesis, later known as the "greenhouse effect", was controversial from the start. Even the term was wrongly chosen, as the warming effect of greenhouses has nothing to do with the thermal radiation of IR-active gases. So it is not surprising that climate alarmists like Al Gore and Hoimar von Ditfurth wanted to present new "evidence" to convey the dangerous global warming caused by CO₂ to the general public. An extensive examination of their experiments now shows that they examined the wrong object, the air temperature, and in the process they came across the special insulating effect of gas layers unnoticed.

A particularly strong warming of the air is obtained when CO₂ is introduced from below and a gas lake forms, which leads to a stratification effect and heat build-up. If, however, as in the atmosphere, air and CO₂ are mixed evenly, the air is not heated.

The public is manipulated and deceived by these experiments, since the sometimes considerable temperature increases have nothing to do with the CO₂ greenhouse effect. The authors could easily have noticed their mistake if they had only briefly stirred their "gas lake"

Introduction

Following the established mass media, the supposedly man-made climate change is scientifically proven and does not require further research. First of all, a contradiction in itself, because science does not provide absolute truth, laws set in stone, but only assumptions and hypotheses. Even if a thesis has proven itself in practice and has gained general recognition, a critical review is not a sacrilege but an indispensable duty of every scientist. Prohibitions on thinking and muzzles are methods and typical features of an impending dictatorship that degrades science to an unworthy servant of the powerful. How credible is a society that wants to be colorful but suppresses diversity of opinion ([EIKE, 2019](#)).

It is very worrying that only former institute directors, retired professors and researchers speak out on climate change and contradict the doomsday scenarios. When only people resist who no longer have to worry about their career, reputation, or income. When in Germany the older generation is mocked by a public broadcaster ("Meine Oma ist 'ne alte Umweltsau". *My grandma is an old environmental pig*).

For an outsider, it is difficult to impossible to verify the forecasts of drought, heat, floods and species extinction, unless you rummage in ancient newspapers and find dark prophecies in beautiful regularity ([Washington Post 1922](#), [Rückzug der Gletscher 1934](#), [50-years-failed-eco-pocalyptic-predictions, 2019](#)). Perhaps it is the older people's life experiences that they do not fall for the sensational journalism and react rather calmly.

The doom predictions divide society into people who believe everything the media produces and people who prefer to form their own opinions. My experimental investigations are aimed at the latter group. Even if the complex occurrence of weather and climate in the laboratory cannot be reproduced, individual aspects and statements can be checked. The following article deals with spectacular laboratory experiments by prominent climate alarmists that should be critically examined. In the end, it will become clear why their experiments have failed and their warnings about the supposedly dangerous CO₂ are unfounded.

1. The Hoimar von Ditfurth Experiment

There are a number of simple experiments on the Internet that link the CO₂ greenhouse effect with air temperature. According to this, CO₂ should behave like a pane of glass that allows short-wave light to pass through, but absorbs long-wave thermal radiation and warms up as a result. A significant warming after the addition of CO₂ was considered to be proof of a greenhouse effect. The best known experiments are by Al Gore ([2011](#)), Prof. Volker Quaschnig ([2019](#)) and Hoimar von Ditfurth ([1978](#)). They have a very similar experimental setup and can be characterized as follows.

1. An incandescent lamp irradiates a vessel from the outside (simulation of solar radiation).
2. The vessel is filled with either normal or CO₂-containing air (Earth atmosphere).
3. A flat surface or a spherical body simulates the surface of the Earth.

Probably the most spectacular experiment was conducted in 1978 by the author and television presenter Dr. Hoimar von Ditfurth[†]. This demonstration deserves some superlatives: Besides spectacular, it is the largest and most dangerous experiment, with the strongest temperature rise and most physical puzzles.

On a stage were two large cylinders with the approximate dimensions 2 x 3 m made of transparent plastic film. In each of these cylinders there was a test person who observed a thermometer, but only in one cylinder CO₂ was introduced very quickly from below.

The cylinders are irradiated from above with two stage lights, which heat them up. In the end it was found that the CO₂-filled cylinder was 11.3 ° C warmer than the comparison cylinder. The YouTube video, which is still available on the Internet, conveys a message that is easy to understand even for the general public because of its simplicity: "Look, CO₂ can warm our earth by 11 ° C or perhaps even more if you don't act immediately. But is this prophecy true?"

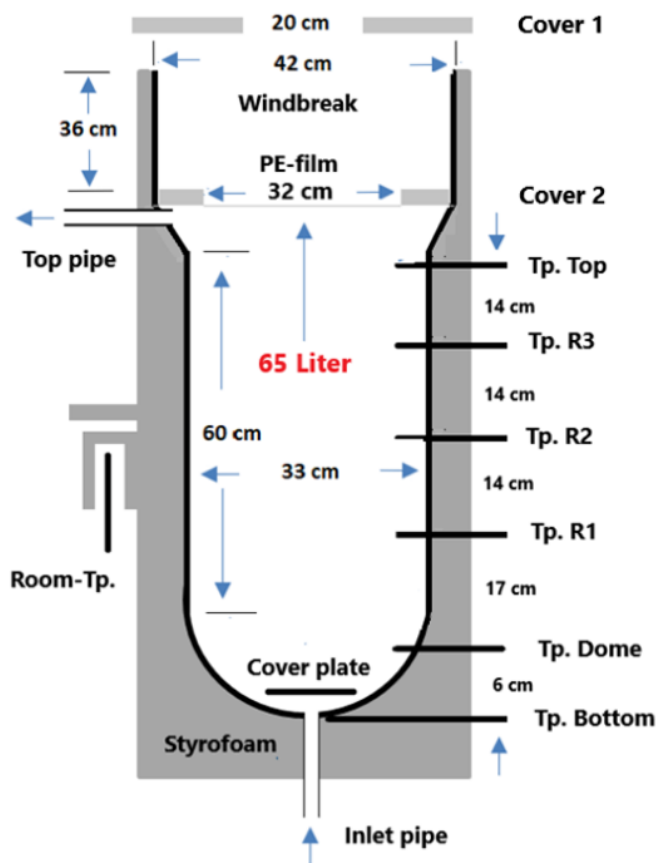
The experiments of the prominent climate alarmists are pure demonstrations. Detailed descriptions, information on CO₂ concentrations and control experiments are missing. Only a before-and-after analysis is provided. These omissions should be remedied by a thorough review.

2. The experimental equipment

The experimental apparatus is a polished aluminum tube with a volume of 65 liters, which can be filled with sample gases from below and is irradiated from above with a 100 W red light lamp from a distance of 60 cm (Fig. 1). The tube can either be left open (cover 1) or closed with a PE film (cover 2).

Seven thermometers connected to data loggers document the temperatures inside and outside the tube every minute. The data recording begins 70 minutes before the addition of the sample gases in order to show the constancy of the temperatures. In order to achieve this constancy, the red light lamp is switched on 5 hours in advance. The test room is also given a constant temperature and is indicated as room temperature.

The sample gases are introduced from below within 15 minutes, whereby the bottom temperature is briefly influenced (Fig. 5, 6). This disturbance is irrelevant for the evaluation of an experiment, since all temperature changes are observed over a very long period of 4 - 5 hours. The evaluation is carried out with Excel charts, whereby five data are always combined to form an average value.



All temperatures are recorded by data loggers at minute intervals. Except for "Tp. Bottom", all sensors measure the air or gas temperatures.

The dome is a stainless steel bowl, the tube and the conical extension are made of polished aluminum (0.6 mm), the windbreak is made of aluminum-coated Styrofoam wallpaper.

Optionally there is a open aperture (cover 1) or closed aperture 2 (cover 2).

The cover plate allows the dome to be filled evenly with different test gases. The top pipe is only open during experiments with cover 2, during gas introduction or pumping over.

The introduction of the gases is monitored with a rotameter. The concrete quantity is determined by weighing the gas cylinders. The pumping out is done with an aquarium pump with 1.5 l/min.

The apparatus is irradiated from above with a 100 W incandescent lamp from a distance of 60 cm.

Fig. 1: Scheme of the test equipment



Fig. 2: Left picture: The radiation apparatus with aperture 1

Middle and right: Radiation apparatus with aperture 2, irradiated with red or white light

2.1 Verification of the Ditfurth experiment

As in the Ditfurth experiment, the air-filled, open apparatus (Fig. 2, left picture) is irradiated with a 100 W red light reflector lamp. The data from 0-70 minutes show the temperatures of the air-filled apparatus before the addition of CO₂. Due to the irradiation, the experimental apparatus is up to 10 °C warmer than the air in the room. This creates an unusual layer of air. In closed rooms, the ceiling normally has the highest temperature, but in this radiation experiment it is the other way round. The bottom has the highest temperature, followed by the dome and each subsequent layer is colder than the previous one (Fig. 3).

The explanation is the Lambert cosine law. The bottom, although furthest away from the lamp, receives the greatest radiation density from the red light lamp because of its parallel orientation to the radiation source. All other surfaces are only illuminated at an angle and therefore heat up less. The heat spreads mainly through heat conduction, as can be seen from the 4 °C difference between bottom and dome air (Fig. 3, Bottom vs. Dome).

After the 70-minute air measurements have been completed, 23 L of CO₂ is introduced into the apparatus from below within 15 minutes. The temperatures in the apparatus react immediately to the CO₂, but very differently. While the bottom and the dome air immediately warm up, the other sensors initially show a cooling down, only to report an increase after a certain delay (Fig. 3).

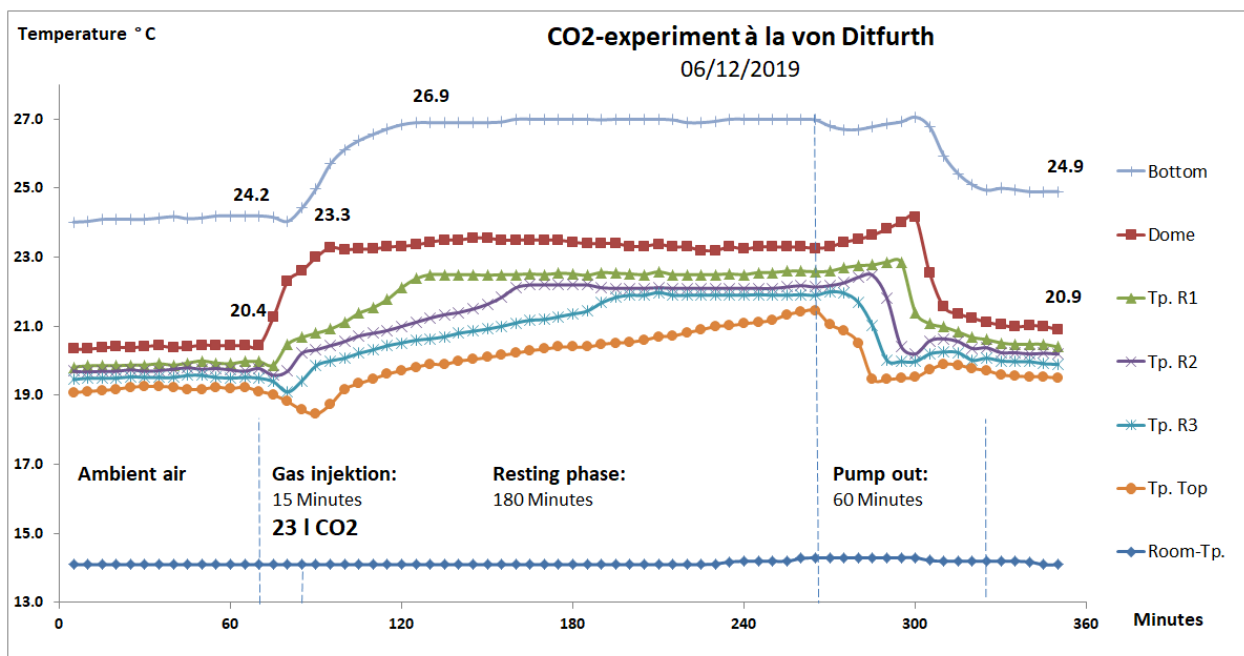


Fig. 3: Temperature data: Verification of the Ditfurth experiment.

The temperatures determined by the data logger are plotted over time in an Excel chart. Each data point corresponds to a time interval of 5 minutes and is the temperature average of 5 measurements.

After an observation period of 180 minutes (resting phase) the gases are pumped out again through the "inlet pipe" in the ground. The pumping was intended as a control to prove that the temperature increases are actually caused by CO₂.

A determination of the pumped-out CO₂ amount showed that only a small amount of CO₂ was present from the original 23 liters. Most of the CO₂ had escaped unnoticed into the laboratory room during the experiment from the above-open apparatus (diffused). The steady temperature increase of the top position (yellow line) shows this diffusion.

2.2 The Argon Control Experiment

At first glance, the previous CO₂ experiment seems to confirm the Ditfurth hypothesis. But doubt is the mother of all science and so this result must also be checked. Argon offers itself as an alternative control gas. Argon is like CO₂ a heavy gas but not a greenhouse gas and should not cause a temperature change when introduced into the tube. However, the control experiment is a big surprise: The IR-inactive argon causes exactly the same temperature increases as the greenhouse gas CO₂ (Fig. 4).

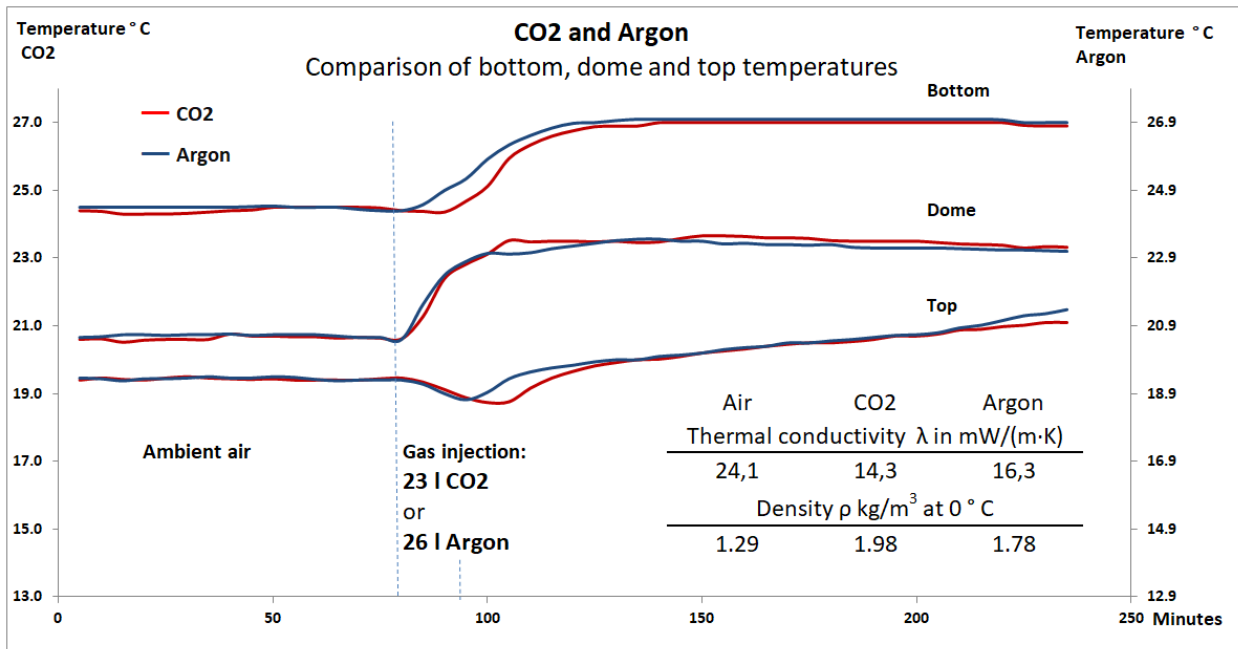


Fig. 4: Comparison of CO₂ and Argon temperature rises

Since argon and CO₂ have different specific thermal conductivities (ratio 1: 1.14), the amount of argon is increased by a factor of 1.14 as a compensatory measure (26 liters of argon vs. 23 liters of CO₂).

2.3. Conclusions of the study

The noble gas argon is an IR inactive gas that can neither absorb nor emit thermal radiation. If CO₂ and argon show the same heating effect, the cause must be sought outside of thermal radiation. Heavy gases have a lower specific thermal conductivity λ than air (the table in Fig. 4). If these gases are injected into the tube, they reduce the heat flow within the apparatus. The heavy gases act as an insulating layer. Thus it can be concluded:

The Ditfurth experiment does not show the greenhouse effect, but is a phenomenon of heavy gases.

This first finding confirms the skepticism of Anthony Watts ([2011](#)) and Helmut Krebs ([2020, pp. 91,98](#)), who doubted the Ditfurth and Al Gore experiments as proof of the CO₂ greenhouse effect.

3. Experiments in the closed apparatus

3.1 Verification of the Ditfurth experiment in the closed apparatus

Since CO₂ could escape during the first investigation, the experiment of chapter 2 was repeated with a closed apparatus. For this purpose, aperture 2 (cover 2) was glued above the conical extension with silicone rubber. Aperture 2 is covered with a transparent PE foil (layer thickness: 11 μ m), which allows thermal radiation to pass

through but prevents CO₂ from escaping (Fig. 1, the picture in the middle). Surprisingly, in this experiment, the temperatures returned to the initial values after only two hours, although no pumping was carried out (Fig. 5).

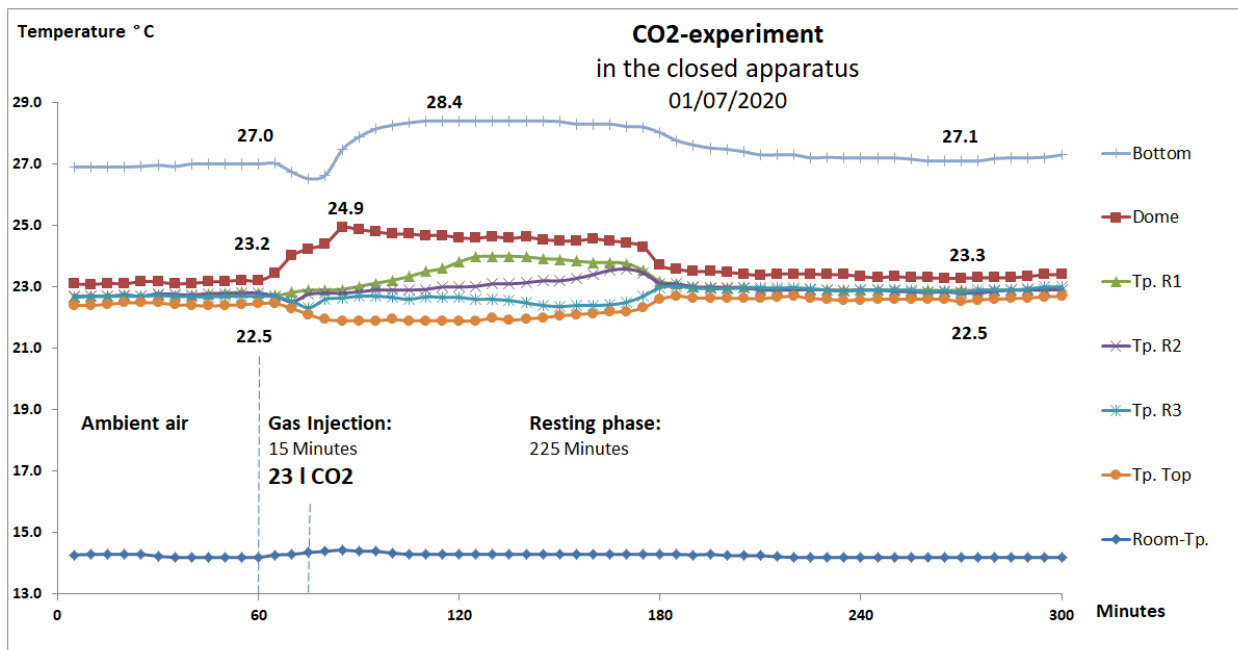


Fig. 5: Temperature decrease during the resting phase

The deviating behavior can be explained by a different course of CO₂ diffusion with an open and closed apparatus.

When CO₂ is injected, a CO₂ "lake" forms in the dome, which is comparable to a liquid that is filled into a bowl (the "cover plate" was installed in the dome for this type of gas filling). The CO₂ then slowly spreads upwards by diffusion. Layers of different CO₂ concentrations are formed, which, like multiple glazing of window panes, considerably reduce heat conduction.

Since the bottom layer consists of almost pure CO₂, this area of the tube is much more affected by heat build-up than the upper sections. This explains the opposite temperature changes between the bottom and top positions in the first few minutes shortly after the injection of CO₂.

Due to the diffusion, the CO₂ approaches the red light lamp and is heated more strongly here than in the lower layers, which accelerates the ascent. With the open apparatus, this leads to an escape of the uppermost layers of CO₂. This reduces the total amount of CO₂ in the tube, but the stratification effect is retained.

With the closed apparatus, the diffusion leads to a mixing, homogenization with the air in the tube. This homogenization process eliminates the stratification effect, whereby the heat build-up is eliminated and the temperatures return to their initial values (Fig. 5).

The strong rise in temperature of the Ditfurth experiment is mainly caused by this stratification effect.

So far, critics of such irradiation experiments have argued that the low specific heat conduction of CO₂ is the cause of such temperature increases. In fact, the heat conduction effect of well mixed gases is only responsible for a minimal warming of 0.1 - 0.2 °C.

3.2 CO2 experiment with accelerated homogenization

The thesis of internal mixing of CO2 and air could be confirmed experimentally. After CO2 was introduced, an aquarium pump sucked off the CO2 in the dome and injected it into the upper pipe. This pumping in a circle accelerated the homogenization and the temperatures fell significantly faster than in the previous experiment (Fig. 6 and Table 1).

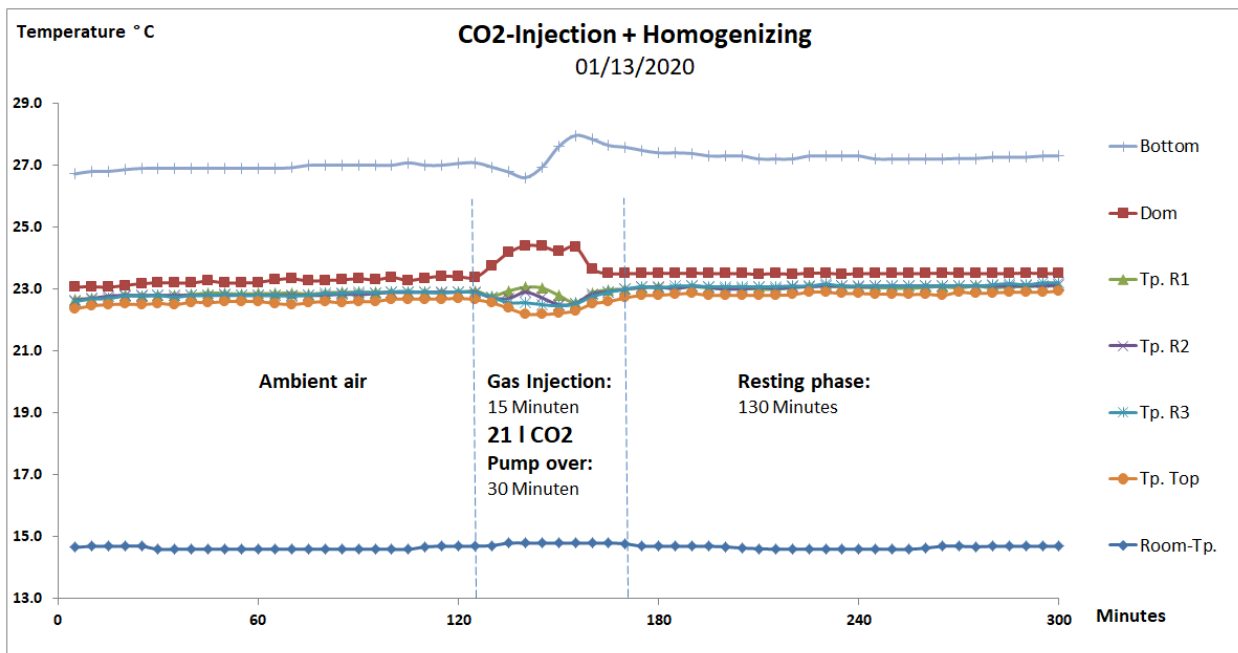


Fig. 6: Temperature curves at accelerated homogenization

3.3 Homogenization experiments with heavy gases

Further homogenization experiments with different amounts of CO2, Freon 134a and Argon always resulted in the same small temperature rises of 0.1 - 0.3 °C (Tab. 1). Even a CO2 control experiment with a colorless 100 W radiator (Fig. 2, right picture) did not lead to a different result.

Gas	Volume Liter	Temperature rise (° C) after homogenization					
		Bottom	Dome	Tp. R1	Tp. R2	Tp. R3	Tp. Top
CO2	21	0.2	0.2	0.1	0.2	0.2	0.2
CO2 *	21	0.2	0.2	0.1	0.1	0.1	0.2
CO2	8	0.2	0.2	0.1	0.1	0.2	0.1
Freon 134a	5	-0.1	0.0	0.0	0.1	0.1	0.1
Argon	27	0.3	0.2	0.2	0.2	0.1	0.1

CO2 * = 100 W colorless incandescent lamp

Tab. 1: Temperature rise of various gases after homogenization in air

3.4 Homogenization experiments in argon

In a final series of experiments, the air in the apparatus (the ambient air) was replaced by argon before the addition of greenhouse gases. This measure should reduce the influence of the heat conduction in the gas phase. In fact, CO2 or Freon 134a did not cause measurable air warming in the dome position, while there was even cooling on the bottom (Table 2).

Gas	Volume Liter	Temperatur rise (° C) after homogenization in Argon					
		Bottom	Dome	Tp. R1	Tp. R2	Tp. R3	Tp. Top
CO2	21	-0.1	0.0	0.1	0.1	0.2	0.2
Freon 134a	5	-0.2	0.0	0.0	0.0	0.0	0.0

Tab. 2: Temperature rise after homogenization in argon

4. The Harald Lesch experiment

Chapter 4 was created and added for current reasons, the open letter from Prof. Döhler et al. to Prof Harald Lesch ([Klaus-D. Döhler, 2020](#)). Prof Lesch's appearance on ZDF is also part of the topic "The wrong climate experiments", but with a different flaw than in the Ditzfurth experiment.

With an IR spectrometer, a sample in a cuvette (with Lesch it is the can) is irradiated with heat radiation of high radiation density (with an IR spectrometer, radiation sources with temperatures of up to 1500 ° C are common). This method is used to prove that CO2 can absorb certain wavelengths of IR light (thermal radiation). However, absorption of thermal radiation means the absorption of energy, which inevitably leads to the heating of the CO2-containing air in the can.

The greenhouse effect in the atmosphere is not about solar radiation^{*)}, as Prof. Lesch falsely claims, but mainly about the IR radiation of the Earth's surface. The question is how this energy is transported from the Earth's surface to the top of the atmosphere. Among other mechanisms, this is achieved through a constant repetition of absorption and emission of IR radiation with components of the atmosphere that have this property. This goes on until the atmosphere is thin enough to finally release the heat radiation into space.

In contrast to the Lesch experiment, the radiation densities are significantly lower and the effect on the temperature of the lower atmosphere is rather small. Whether, where and to what extent a temperature increase occurs is still hotly debated.

Prof. Lesch follows an error of more than a century that cannot be eradicated. Bad if such mistakes should be presented to school and university students as a greenhouse effect.

The manipulation potential is shown in the size and location of the heating. In Lesch's absorption demonstration, air warming of over 10 ° C can be achieved. In radiation exchange experiments (the real greenhouse effect), a simulated Earth's surface is heated by CO2 by a little more than 1 ° C and the air temperatures do not move (I don't want to anticipate, this publication will come later, see conclusion of the study).

**) For the very wakeful among the readers and before another storm of protest breaks out. Yes, the solar radiation also has a high IR content, but that is mainly NIR (near IR). The few relevant MIR content (middle IR) already encounter CO2 in the stratosphere and, curiously, model calculations assess this as a cooling effect, because at this altitude the CO2 radiation can escape unhindered into space.*

5. Conclusion and search for causes

The investigations were carried out with the simplest means and are therefore particularly suitable as experiments for schoolchildren and students. First repetitions of my work by student groups confirm that the gases argon and CO2 produce the same temperature increase ([Axel Jacquin, 2020](#)).

The claims made by Al Gore, Ditzfurth and Quaschnig to have demonstrated the CO2 greenhouse effects by warming the air are wrong. If one eliminates special effects, which are mainly caused by gas stratification and the low specific heat conduction of heavy gases, nothing remains of the postulated warming.

The authors have fallen victim to the false term "greenhouse effect". The term leads to the assumption that this effect can be demonstrated with a model of a greenhouse, with and without CO2. As early as 1909, however, Robert

Wood had found that greenhouses only heat up because they prevent heated air from rising and escaping. In the following years these investigations were repeated several times ([Nasif S. Nahle, 2011](#), [Jan-Eric Solheim, 2017](#)).

The particularly high rise in temperature in the Ditzfurth experiment is due to a layering effect, which, like multiple glazing of windows, leads to extremely low heat conduction, which creates heat build-up. Such stratification occurs when CO₂ is introduced into a device from below. This finding is new, because so far only the different specific heat conduction of CO₂ and air was assumed to be the cause of the temperature rise. If the CO₂ is evenly mixed with the air, as in the atmosphere, there is minimal or no air heating. This resolved a 40-year contradiction in CO₂ experiments that either resulted in a strong or no increase in temperature and a plausible explanation for the different results was found.

This study should not be misunderstood as a rejection of the greenhouse effect. It is undisputed that CO₂ is an IR-active gas and can absorb heat radiation. However, it is disputed how much the greenhouse effect contributes to the warming of the earth ([Hermann Harde, 2014](#)) or the atmosphere ([Ross McKittrick, 2020](#)) and whether CO₂ is a threat to humanity ([Rex J. Fleming, 2019](#)).

Fourier's thesis to define the greenhouse effect as a general warming of the air was a naive idea that does not do justice to the complex interactions between thermal radiation and IR-active substances in the troposphere (warming?) and stratosphere (cooling?). The question of whether and what influence the greenhouse gases actually have on the temperatures of the atmosphere is the subject of current research and is far from being "settled". It is worth recalling the embarrassing "hot spot debate" derived from model calculations in the 4th IPCC climate report in 2007, but which could not be confirmed by measurements ([Kalte Sonne, 2017](#)).

Greenhouse experiments based on the air temperature must fail because these gases only increase the bottom temperature on a laboratory scale ([Michael Schnell, 2019](#)). If this is taken into account, the greenhouse effect can be demonstrated in the laboratory. But that's another story to be reported on soon.