The Space Extension

Our approach to space has from ancient times been geometric. Descartes: space has an extension. When you look at a wall tabula in front of you, you can draw an abstract circle. One turn in the circle you measure symmetric with six straight radius segments. Imagine a Mercedes star support from the center by three radius vectors. You divide into three areas left, right and down. Extend this to the regular *platonic tetrahedron* with four vertex corners supported by four radius vectors from the center of the circumscribed sphere. Then you have a figure I call a regular *tetraon* shown on the front page as a carbon-methane molecule symmetry. I promoted this *tetraon icon idea* to my mascot[3] for understanding the fundamental symmetry of what we traditionally call a three-dimensional 3D space for our classical space for our universal Nature.

The modern mathematic approach to geometry and all its symmetries and interconnections is often so complicated, that it is unaffordable to understand for one person.

We must go back to the natural foundation of mathematics and build it step by step so that each step has an understandable physical foundation in nature. The first time I found this done seriously systematic was when I 2011 found the concept of Geometric Algebra on Wikipedia in a search for knowledge about quaternions. It led me to David Hestenes's Oersted Medal Lecture 2002 [5]. Studying this and other of Hestenes' research papers I was able to start building a new founding epistemology of a space concept of physics for the enlightenment of our universal Nature. The space concept as the geometry of physics starts on page 123. The geometric elements p.137-139. The line p.141. The geometric plane p.153. The idea of geometric algebra starts at p.160, first detailed for the Euclidean plane concept. Inherit qualities p.199 leading to matrix representation p.205. Then the geometric algebra for the anti-Euclidean plane concept p.209.

The idea of a natural Euclidean space founded on three dimensions starts on page 231, and its geometric algebra p.237.

A Space of Relations

When Nature establishes relations across space extension the information signal takes time. Therefore, the traditional Minkowski metric of four-dimensional non-Euclidean founding vector space is used. To establish epistemological enlightenment of the fundamental relations that can measure extensions by one isotropic unit of development we will use ideas from a geometric algebra approach introduced by David Hestenes 1966 in a book named Space-Time Algebra [6]. The goal is to continue this work using a substantial fourth dimension of **one quantum** count of timing-development unit **direction quality** γ_0 orientated into the future.

This development concept makes spatial information relations possible. I believe this is necessary a priori knowledge for us to understand Nature by intuition in the new enlightenment ethic.

Practical Issues of Writing this Book

Starting this research work of developing an epistemology I was not much of a writer. Therefore, the first part page 23-197 was written in Danish. I realised my effort needed a wider audience; therefore, I took the text into google translate to get a version in English. Obvious it was necessary to fit the text to a hopefully understandable level.

In 2017 I started writing directly in English about 3-space in chapter 6 from pages 231-308. After this in primo 2019 pages 199-229 the plane concept was expanded with extra abstract properties in Chapter 5.5; Plane matrix representation 5.6; Non-Euclidean plane 5.7; and Generalised geometric algebraic exponential functions 5.8; to Chapter 5.9.

From June 2019 continued at Chapter 6.6 onto 7.3, pages 309-337.

<div style="text-align:center">Jens Erfurt Andresen the 9th of November 2019.</div>

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[3] This icon idea *tetraon* I found and named in 2003. When I later, at the one-hundredth anniversary of Niels Bohr's atomic model, saw a video made by 'Danmarks Radio' about his work, I found Bohr's drawing of that Methane molecule, that is shown on the frontpage comment of this book. This picture is graphed directly from an appropriate frame cut from this anniversary video.

Research on the a priori of Physics
Geometric Critique of Pure Mathematical Reasoning
Jens Erfurt Andresen
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Prologue

(i)   **An Introduction to Natural Space of Physics**

I live in the middle of a big sphere.

When I look out into the night, furthest away I see the starry sky.

All I see in the world is across. The paper, the screen, the wall, yes even the celestial sky is across. All that is crossed has two dimensions 2D. It has a length (width) and a breadth (height), said otherwise x and y coordinate or when it comes to the celestial (starry) sky the angular coordinates φ and θ. When I look along a straight line in any **direction**, I call a plane perpendicular to that sight a transversal plane, transversal to that aiming line.

When I point my right arm and index finger, I can take my left index finger and move it around the right in a circular cylinder motion. There is something outside my right arm and index finger, which is the physical space. The natural space of physics is, of course, also inside the arm.

The questions then are:

What **qualities** does space really possess? What impact has space on everything?

(ii)   **How Do You Experience the Physical Space Around You?**

When you look at the plane surface the screen, the paper, a wall, or a stone in front of you, you can determine how it rotates. It is not rotating you properly would say. Now you have just measured a physical rotation and found that the relative rotation is zero in this case.

When we see the celestial sky crossing over us, we would see that it is rotating relative to us. We know that the ancient Greek philosophers were able to see and understand that it rotates (1 turn per star night).

To view the light from the paper or screen in front of you, keep it placed transversely (across) in front of you. Today we know about the light that the photons propagate with an invariant (isotropic) speed. The light can only go forward, thus it possesses causality. The light with which we see a thing comes from that thing → into our eyes never oppositely inverted. The space we can look through, and thus perceive the existence of, depends on the propagation of light. This travel of light creates the passage of time. The passage of time comes therefore from this cause. As we though know analytically, time can only go forward. Time with a negative sign corresponds to expectations of something in the future.

We can now understand, that the time and space around us depend on the passage of light. The term "right now and here" we use for our own location in space. The theory of relativity has taught us that the term "right now and there" has no meaning. When we predict something, we can say "right there and then it will happen". We must wait and see if it is a true or a false prediction.

We can meaningfully say "right there and then it happened". When we look at the stars, we know that what we see in the sky happened a long time ago, but to us, it happens now. When we look at other people and objects, we know that is already the past that we see. Even when we see ourselves in the mirror, it is the past we see. In addition, we see ourselves from the outside in the mirror. I am inside myself and can see myself from the outside using the mirror. The light changes **direction** in the mirror and the depth of the image changes sign at the mirror. The mirror image shows the right hand on the right side, just as with the left hand on the left side. We cannot have empathy with our mirror image because we cannot give hand with the right hand. When we give the right hand to another person, our hands meet across. The inner spirit of the other is outer to me, while my inner is the outer of the other. The understanding of this concept is called empathy. The word empathy is usually only used when it comes to a human emotional understanding of the other (or the others). Similarly, when dealing with a physical **entity** (e.g., an elementary particle), we must assume that each **entity** has its own internal, which relates to the outside.