

Dear Prof. Bruhn,

sorry for the delay in our response, but one of us (JH) was on travel for a longer period.

Your comments at your website, <http://www.mathematik.tu-darmstadt.de/~bruhn/IGW.html>, are concerned with the construction process of our poly-metric as published in our papers on Heim theory, which, according to your criticism, leads to a flat metric that does not properly reflect the physics.

In summary, we are considering your remarks unfounded, because they are starting from incorrect assumptions, and ending with the wrong conclusions. In particular, the remarks concerning the construction of the poly-metric tensor, the so called hermetry forms, entirely miss the point.

Please find attached our rebuttal in form of a PDF file.

In case you deem not be able to agree with our arguments and feel unable to modify your website, we would like to ask you to set a link to our rebuttal that we would then post on our website with reference to your remarks.

In any case, thank you for spending your time on investigating Heim theory. We appreciate your comments, since your criticism helped us to sharpen our arguments.

However, we do neither appreciate the way your arguments are posted at your webpage (UFO debunking style) nor is it justified to surmise that Prof. Dr. Resch, who is very well known in his field and has been active as a university professor in Rome for some twenty years, has set up the IGW webpage to deceive other people.

Sincerely,

Jochem Hauser and Walter Dröscher.
7 March 2006

Rebuttal:

Criticism of a Flat Metric by Prof. Bruhn, Technical University of Darmstadt, Germany
(all AIAA papers cited can be downloaded at www.hpcc-space.com)

1. The overall objective of Heim theory as developed in our papers, is to answer the central problem of physics, namely the **number, nature, and origin of the fundamental forces** that do exist in Nature.
2. To this end, we **start from GR (General Relativity) and not from quantum mechanics**, following an idea of Einstein as published by him in one of his last papers in 1950, Scientific American, April, Vol 180, NO 4. Heim expressed this conviction in form of a geometrization principle that should lead to the geometrization of all physical interactions. In order to achieving this goal, the proper metric tensor is needed.
3. Therefore, **spacetime is assumed to be a differentiable 4-dimensional manifold, M^4** , as long as quantum effects are not considered. This manifold comprises a collection of points where each point is specified by a set of four real numbers and has the same local topology as R^4 , i.e., it is locally but not globally (as you wrongly assume) like R^4 . This is why we refer to this spacetime sometimes as R^4 , but from the physics context its meaning is always

clear, see Figs. 1 and 2 on pages 3 and 4 of AIAA 2005-4521. A different question is the embedding of 4D spacetime in an Euclidean space. In GR there exist 10 independent components of the metric tensor, and thus a R^{10} would be needed. Your example is for embedding a 2D manifold that is, a surface of a sphere, in R^3 . But this is not relevant for the construction of the poly-metric tensor.

4. Since there exist more physical interactions than gravitation, a poly-metric must be constructed whose individual parts are describing the individual interactions. To this end, Heim introduced, in the fifties of the last century, an **internal 6 dimensional space** that in terms of gauge theory is called a fiber. This new space, namely 4D spacetime with internal space H^8 , is called a fiber bundle space. In general, there will be gauge potentials that render the path in this internal space non-arbitrarily. As elaborated in our papers the internal space was extended to 8 dimensions, called Heim space H^8 , and comprises four subspaces, R^3 , T^1 , S^2 , and I^2 . The signature of this space is + for the three spatial coordinates, termed energy coordinates, while time, organization, and information coordinates have signature -.
5. In an **extension to GR** there exists now a double transformation namely from 4D curvilinear spacetime M^4 to one or more subspaces of H^8 and to R^4 . If space H^8 were not present, the transformation represented the one used in GR. Thus Heim theory is being reduced to the mathematics of GR. Anything else would not make sense, since GR has been verified experimentally and any theory that wants to describe Nature must include GR.
6. **Poly-metric:** In order to construct the poly-metric two ideas are being used. First, there are selection rules that require for each transformation in order to have physical meaning, either subspace S^2 or I^2 (or both) of H^8 must be present. Of course, it is obvious, that introducing an internal space H^8 , and using a double transformation, does not change geometric invariants in our spacetime. But this is unimportant. The individual metric tensors are constructed using the following idea. Second, the construction of the poly-metric is performed (here your criticism entirely misses the point, because it does not seem to be aware of this process): because of the double transformation the entire metric tensor can be written as a sum of 64 basic metric terms. Using the above mentioned selection rule in combination with *sieve* operators, Eq. (6) on page 8, AIAA 2004-3700, (Heim used the German word *Sieb*), which are simply products of delta functions, a set of 15 partial metric tensors can be constructed by deleting one or more of the 64 basic metric terms, see Eq. (3) on page 7, AIAA 2004-3700. Thus a set of 15 different metric tensors, termed hermetry forms by Heim, is obtained, each having its own internal symmetry space and, therefore, associated symmetry groups. This construction principle is emphasized in all our publications, and is visualized in Fig. 3 on page 4 of AIAA 2005-4521.
7. **New physics in our papers:**
 - (i) The new physics is in the construction of an internal space H^8 , comprising a set of 4 subspaces with a given signature,
 - (ii) The new physics is in the selection rule, i.e., determining physically admissible combinations,
 - (iii) The new physics is in the construction of the poly-metric, leading to 15 different hermetry forms, predicting 6 fundamental interactions, instead of the four currently known ones,
 - (iv) One of these additional fundamental interactions allows the conversion of the

electromagnetic field into a gravitational field (conversion of photons into gravitophotons). Gravitation therefore comprises three interactions and thus three messenger particles should exist. The first one is the graviton (attractive, known since Newton). The two others are the *gravitophoton* (repulsive and attractive gravitational interaction, responsible for interaction between the gravitational and the electromagnetic fields), and the *quintessence particle* (repulsive, dark energy ?).

The conversion from the electromagnetic to the gravitational field is the basis for the novel space propulsion principle that cannot be conceived from current physics.

8. In conclusion we consider your criticism unfounded, because

- (i) Heim theory contains GR, and if there is no internal space it is equivalent to GR. The reason for this is straightforward, since in this case there remains only one metric, which gives rise to the metric tensor describing gravitational interaction. Hence, our metric cannot be flat.
- (ii) The construction of the poly-metric was not understood, and thus lead to the wrong conclusion that the double transformation was meaningless for describing physical interactions.
- (iii) The criticism is not focused on the physics where *we feel* major tasks remain to be done, but emphasizes some marginal issues of mathematical notation. Some of the real showstoppers for the theory, as *we see* it, are listed under topic 9.

9. Heim theory future activities: from our point of view necessary activities are:

- (i) Construct Lagrangians for all physical interactions from first principles using the corresponding hermetry forms,
 - (ii) Associate symmetry groups to respective hermetry form,
 - (iii) Devising experiments to physically realize sieve operators,
 - (iv) Devising an experiment to measure the Heim-Lorentz force, i.e., the conversion of the electromagnetic field into a gravitational field to prove the existence of the gravitophoton particle,
 - (v) Calculating coupling constants,
 - (vi) Providing a derivation for the mass spectrum of elementary particles,
- etc. ...