Preface

Welcome to *Models for Physics of the Very Small and Very Large*.

This is a monograph about math-based modeling.

However, let me start by describing a book I hope this monograph helps enable.

~ ~ ~

Ideally, a book would do the following. List all known elementary particles. List all elementary particles people have not found. Show properties for each particle. Describe interactions in which each particle partakes. Use that information to close gaps between known data and traditional theory. Close gaps regarding particle physics, astrophysics, and cosmology. Predict data people have yet to measure. Point to practical applications. Do all that, based on one model or theory.

That program faces difficulties. For example, suppose someone produced that book. Not enough data exists to verify some aspects of the book.

That program features the following question. To what extent can models correlate with elementary particles?

That is a useful question to explore.

Consider theory. 95 % of the inferred stuff in the observable universe is unknown. To what extent is that stuff made of elementary particles? What properties do those particles have?

Consider practice. Experimentalists look for new elementary particles. What candidate particles might people look for? How might people look for them?

Consider society. Knowing of more particles might lead to useful applications.

~ ~ ~

This monograph may not be that book.

Perhaps, this monograph demonstrates modeling and/or physics that that book might feature. Perhaps, this monograph provides steps toward that book.

~ ~ ~

Models for Physics of the Very Small and Very Large discusses modeling.

This monograph tries to add to the extent models can correlate with elementary particles.

This monograph provides a meta-model. And, uses the meta-model to produce models. And, shows that such models correlate with the list of all known elementary particles. And, shows that the models correlate with some known properties of the particles. And, shows that the models correlate with some known interactions in which the particles partake.

Perhaps, people can use such a meta-model and such models to predict elementary particles. And, predict properties for predicted particles. And, predict interactions in which predicted particles partake. And, use concepts about predicted particles to explain data for which traditional physics theory does not seem to have adequate explanations. Some of this data might pertain to cosmology. Some of this data might pertain to astrophysics.

~ ~ ~

I hope people find value regarding the science and art of modeling.

People might decide to work on meta-modeling. People might hone the meta-model this monograph discusses. People might develop other meta-models.

People might use meta-models—perhaps including the one this monograph discusses—to develop models.

People might use models—perhaps including some this monograph discusses—to gain new understanding regarding known data. People might use such models to make predictions. People might use such models to guide experimental or observational efforts. People might use such models to augment traditional theories.

~ ~ ~

Perhaps, people will find value regarding aspects of nature.

This monograph discusses a meta-model.

The meta-model outputs a list of known and candidate elementary particles. The meta-model outputs some properties for the particles.

This monograph shows examples of producing and using models. Some models output additional properties for particles. Some models output possible interactions in which particles partake.

Each of the next three paragraphs discusses a use of models. The three uses use the list of elementary particles that the meta-model outputs. The uses interpret one symmetry differently.

One use features the following. Interpret the symmetry as not correlating with reuse of particle sets. Add particles, beyond today's Standard Model particles. Perhaps, point to dark matter particles and to dark energy particles. Perhaps, explain the rate of expansion of the universe.

A second use features the following. Add some elementary particles, beyond today's Standard Model particles. Interpret the symmetry as correlating with reuse of particle sets. Reuse the particle set and Standard Model physics five times. Perhaps, explain much about dark matter. Add particles, beyond today's Standard Model particles. Perhaps, point to dark energy particles. Perhaps, explain the rate of expansion of the universe.

A third use features the following. Add some elementary particles, beyond today's Standard Model particles. Interpret the symmetry as correlating with reuse of particle sets. Reuse the particle set and Standard Model physics five times. Perhaps, explain much about dark matter. Add gravitons and some other particles to the particle set. Reuse the cumulative particle set. Perhaps, explain much about dark energy stuff. Add a particle related to photons and gravitons. Perhaps, explain the rate of expansion of the universe.

Perhaps, the first of the three uses dovetails best with some aspects of how people interpret data today.

Perhaps, the meta-model and various models will dovetail with new aspects of how people discuss nature in the future.

~ ~ ~

I hope people will use this work. I hope people will benefit from this work. I hope people will tell me of extensions to this work, shortcomings in the work, and developments to which the work contributes.

~ ~ ~

Finally, I especially acknowledge Keith Jones' efforts in coordinating the reviewing and editing processes for this monograph.

Portola Valley, CA, USA Thomas J. Buckholtz
March 2016

http://www.springer.com/978-94-6239-165-9

Models for Physics of the Very Small and Very Large

Buckholtz, Th.J.

2016, XII, 382 p., Hardcover
ISBN: 978-94-6239-165-9
A product of Atlantis Press