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Biomedical Informatics Needs New Nosology for Collective, Community, Social and Public Health *

Carl Taswell†

Abstract

Pharmacogenomic molecular imaging of neurodegenerative disorders and dementias has served as the motivating problem in precision medicine guiding software development for the past two decades in the PORTAL-DOORS Project (PDP). This work in data sciences, artificial intelligence, biomedical informatics and translational research with clinical trials at Brain Health Alliance has been pursued to support the mission of advancing theranostics with molecular imaging for disorders of the brain and nervous system. The history and published literature associated with PDP for the NPDS Cyberinfrastructure will be surveyed since its inception in 2006. This collection of published work, involving 5 dozen conference and journal papers over 18 years, has always been publicly available at www.PORTALDOORS.org. This review of PDP will highlight PDP-DREAM Software to support truth in science and integrity in research with a call for a new nosology and new metrics to evaluate and measure collective, community, social, and public health.

Keyphrases

Scholarly research, scientific publishing, ethics and integrity, artificial intelligence, precision medicine, public health.

Contents

Truth in Science and Integrity in Research

Founded in 2007, Brain Health Alliance has pursued a research agenda focused on advancing "theranostics (therapeutics + diagnostics) with precision medicine and molecular imaging for disorders of the brain and nerves" as stated in its declared mission. Our clinical trial entitled "Entire-body PET Scans for Multiple Sclerosis (EPSMS)" serves as an example of this research agenda in theranostics for neurodegenerative disorders and dementias with PharmacoGenomic Molecular Imaging (PGMI) of the brain (C. Taswell 2009; C. Taswell 2010). Multi-scalar multi-modal translational research informatics for PGMI of the nervous system must encompass and integrate data from microarray genotypes, imaging biomarkers from PET-CT and PET-MR scans, psychometric biomarkers from evaluations and questionnaires, as well as behavioral phenotypes documented in the clinical trial records that have been self-reported by trial participants or other-reported by expert observers. As a consequence, the analysis and interpretation of genotypic data from PGMI of brain and nerves when combined with phenotypic data from observed and reported behavior remains a challenging data integration and mining problem and important genotype-phenotype correlation problem (C. Taswell 2009; C. Taswell 2010).

However, in the years since 2007, much of American society, culture and politics have changed dramatically. With the anti-education, anti-science, anti-medicine, and anti-vaccination movements, the political use of mis-information, dis-information, anti-information, caco-information, and mal-information has fueled the spread of polarized and extremified propaganda and lies. Analyzing data from the COVID19 pandemic, epidemiologists have concluded that these information wars resulted in many unnecessary excess deaths caused by non-compliance with preventative vaccination practices in public health intended to stop the spread of infectious disease. Such a political climate that fails to differentiate truth from lies and real from fake makes it much more challenging to advance the safe use of theranostics with radiopharmaceuticals for molecular imaging. Thus, Brain Health Alliance must strive to counter not only the historical bias in the lay public against safe use of radioactive materials, but now also these information wars that have become anti-truth and anti-science.

Unfairness by the FAIR Principles Promoters

Unfortunately, this information warfare has spread from the realm of politics and politicians to the realm of science and scientists. Quoting from a recent commentary entitled "Reproducibility, Validity, and Integrity in Scholarly Research: What Accountability for Willful Disregard?" (C. Taswell 2023):

> Brain Health Alliance (BHA) has been studying these ques-

*Presented 2024-07-09 at AIME 2024 with slides and report.
†Correspondence to ctaswell@bhavi.us.

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> tions for the past several years (Craig, Ambati, et al. 2019; S. K. Taswell, Triggle, et al. 2020; Athreya et al. 2020; S. K. Taswell, Athreya, et al. 2021; Craig, Lee, et al. 2022). The BHA Virtual Institute (BHAVI) has now hosted two annual Guardians conferences (Guardians 2022 and Guardians 2023) focused on truth and integrity in science (Craig, S. K. Taswell, et al. 2022; S. K. Taswell and Craig 2023). BHAVI has answered the question "Who are the Guardians of Truth and Integrity?" each of the past two years by honoring Dr. Peter Wilmshurst and Dr. Anthony Fauci, respectively, as the 2022 Guardian and 2023 Guardian.

More specifically, we have introduced the concepts of equivalent entities (Craig, Ambati, et al. 2019; Athreya et al. 2020); idea-laundering plagiarism and idea-bleaching censorship (S. K. Taswell, Triggle, et al. 2020), provided our definitions and criteria for mis-information, dis-information, anti-information, caco-information, and mal-information (S. K. Taswell, Athreya, et al. 2021); and documented the unfairness by the promoters of the FAIR principles (Craig, Ambati, et al. 2019; Craig, Athreya, et al. 2023a; Craig, Athreya, et al. 2023b; C. Taswell 2024). This latter case of plagiarism should not be considered an isolated example. Moreover, the history of this case of idea-laundering plagiarism as documented and explained in detail by C. Taswell (2024) represents only half of the story — for which the other half involves the idea-bleaching censorship by editors and journals which propagated the plagiarism despite multiple repeated complaints submitted by the victims to these journals and editors about the plagiarism and persistent refusal to correct omission of citation.

Indeed, misconduct in academic research has become so prevalent, with most of it either unreported and/or censored rather than investigated and disclosed by the integrity offices, that a new approach must be adopted and implemented by those scientists who remain committed to truth in science and integrity in research. Any such new approach should involve policies and procedures for peer review, and peer review of peer review, with greater openness, transparency, reproducibility, and integrity (Craig, Lee, et al. 2022). This new approach must also explicitly prohibit the conduct of sham investigations that require secrecy and confidentiality by the complainant. Investigations should be conducted openly by independent organizations devoid of any financial conflict of interest (C. Taswell 2023) which necessarily excludes the universities.

The latter are controlled by a definitive financial conflict of interest due to their concern for cash flow rather than ethics or the quality and integrity of their research. University integrity offices routinely disregard their stipulated academic policies and procedures in favor of maintaining their cash flow, summarized succinctly by the phrase *it's all about the money, not the ethics nor the science*. Public scientific debate must continue openly without censoring the truth, without falsifying the historical record of published literature, and without use of the political tactic of excluding participation and censoring debate with the false claim of *out of scope* in a manner that explicitly contradicts the actual declared and published scope for the conference or journal (Craig and C. Taswell 2022).

New Nosology for Biomedical Informatics

At Brain Health Alliance, we promote a multi-disciplinary and trans-disciplinary approach to solving problems that we hope will help to make the world a better place for all of us. As clinicians and scientists engaged in the conduct of clinical trials for patients with neurodegenerative disorders and dementias, we maintain the holistic philosophy that it is not possible to promote brain health without also promoting public health, social health, community health, and collective health. There are many kinds of collectives from families living together in the same home to professional communities of colleagues working in the same research domain on the same research problem. How will we restore communication, cooperation, collaboration and collegiality to the professional conduct of science if we cannot fairly cite one another when engaging in the conduct of scientific research? What will be the new *rules of engagement* for discussions and presentations at conferences and publications in journals?

We cannot promote brain health if we fail to prevent the spread of infectious diseases. We cannot promote brain health if we fail to maintain basic minimal standards for radiation safety, fire safety, and gun safety. We cannot promote brain health if we spread hatred and violence instead of promoting civility, tolerance and respect for each other. In 2018, we introduced our FAIR Metrics as a family of bibliometrics (Craig and C. Taswell 2018; Craig, Ambati, et al. 2019) with the acronym FAIR for the phrases *Fair Attribution to Indexed Reports* and *Fair Acknowledgment of Information Records*. We have now also extended our FAIR Metrics to include those for *peer review of peer review* (manuscript submittted, under review). We will continue to extend our family of FAIR Metrics to address a new nosology for collective, community, social and public health.

There are many questions that we must address beginning first and foremost with measures of integrity, cooperation, collaboration, and collegiality within and between investigators who are within and between departments of schools in universities. Quoting again from (C. Taswell 2023):

> Educators at academic universities in our communities should be leaders and example role models who teach and promote moral, ethical, civil, courteous, tolerant, and respectful behavior between and amongst all members of our communities. How should we heal and cure the worsening triple-G problem in academia of *Grooming, Gaslighting, and Ghosting*?

We must be able to trust the truthfulness, authenticity, and integrity of the data and reports that we share in the medical, scientific, and engineering libraries and repositories of data, literature, and knowledge. Precision medicine with artificial intelligence, data analysis, and results inferencing may incorporate data derived from the entire spectrum of sources with data obtained from the individual trial participant, subgroups of trial participants, or all participants in the trial cohort. This data analysis for the clinical trial, may also incorporate data from historical reference populations of persons and/or patients who did not participate in the designated clinical trial for which the data analysis and results inferencing are completed. These remarks necessarily also apply to routine clinical care. Moreover, even with precision medicine for the individual patient or N-of-1 trials, there will remain the possibility of interpreting results and offering recommendations based on data from historical reference populations. We must therefore necessarily always defend and maintain truth in science and integrity in research — with or without the use of artificial intelligence.

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Contact: ctaswell@bhavi.us
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Affiliations

Brain Health Alliance Virtual Institute, www.BHAVI.us, Ladera Ranch, California, USA.

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