

Transmathematica 2022:
The 4th International Conference
On Total Systems

James A.D.W. Anderson
james.a.d.w.anderson@btinternet.com
88 Lower Henley Road, Caversham, Reading, England, RG4 5LE

Walter Gomide
waltergomide@yahoo.com
Department of Philosophy
Institute of Humanities and Social Sciences
Federal University of Mato Grosso
Brazil, 78060-900

Tiago S. dos Reis
tiago.reis@ifrj.edu.br
Federal Institute of Education, Science and Technology
of Rio de Janeiro
Brazil, 27215-350

Submitted: 22 November 2021
Revised: 24 December 2022

Abstract

Transmathematica 2022: The 4th International Conference on Total Systems was held online, using Zoom, on 29 September 2022 at 14.45 - 18.00, London time. Edited video recordings have been uploaded to the Transmathematica channel on YouTube. We now present the conference proceedings. We note a significant offer of donations to Transmathematica and announce Transmathematica 2023: The 5th International Conference on Total Systems.

1 Proceedings

Transmathematica 2022: The 4th International Conference on Total Systems was held online, using Zoom, on 29 September 2022 from 14.45 to 18.00 London Time. No physical meeting took place because of the Covid-19 pandemic.

1.1 Opening Address

See YouTube for a recording of the [Opening Address](#).

1.1.1 Conference

Participants were welcomed from 15.45 with two talks starting on the hour, followed by a plenary discussion.

Authors who have published a paper in the *Transmathematica* journal, since the last conference, may speak at the online conference, free of charge. This makes these talks much like a workshop but with a high barrier to entry – speakers must have published a journal paper. In addition, anyone may take part in the plenary discussion.

The next annual conference will be [Transmathematica 2023](#).

1.1.2 Society

The *Transmathematica* Society has a [Society](#) page on the *Transmathematica* web site.

The *Transmathematica* Society has a weekly online drop-in meeting on Mondays from 17.00 to 18.00, London time. The meetings take place on [Zoom](#). Meetings have very low attendance.

1.1.3 Journal

In future the *Transmathematica* journal will raise invoices for all charges, including the Article Processing Charge (APC). However, the [Donate](#) page remains open for donations. The journal has received an offer to sponsor a 50% reduction in the APC for authors from low income countries.

1.2 Jan Bergstra - Promise Theory

YouTube recording [Transmathematica 2022 - Jan Bergstra, Promises Accusations Fracterns Transrationals](#)

Jan Bergstra summarised research on Promise Theory carried out in collaboration with Mark Burgess, Marcus Düwell, and John Tucker. He also presented a paper using Promise Theory to analyse the nature of threats made in the conduct of Russia's war with Ukraine.

Bergstra, J. A. (2022). *An Opinion on Promises, Threats, and Accusations In the 2022 Russo-Ukrainian War*. *Transmathematica*.

<https://doi.org/10.36285/tm.73>

1.3 James Anderson - Transets

YouTube recording [Transmathematica 2022 - James Anderson, Transets](#).

A new foundation for transmathematics is proposed using a functionally complete totalisation of Boolean logic to implement the operators of naive set theory.

In order for a logic to be total, it must provide all combinations of its truth values. As usual, t truth values give rise to 2^t combinations. A logic with $t = 0$ truth values cannot make observations about the world. However, zero truth values combine in $2^0 = 1$ ways. A logic with one truth value can make trivially uniform observations about the world but cannot draw distinctions. However, one truth value combines in $2^1 = 2$ ways. A logic, such as classical or Boolean logic, with two truth values – True, T , and False, F , – can draw distinctions in the world and is, for all practical purposes, the smallest useful logic. However, experience teaches that some logical sentences lead to contradictions and gaps. Hence we must account for the four values: Gap, $G = \{\}$; Affirmed, $A = \{T\}$; Denied, $D = \{F\}$; Contradiction, $C = \{T, F\}$. But if we admit these four cases as truth values, we embark on an infinite regress of $t_{n+1} = 2^t$ truth values. We terminate this regress, as soon as practically possible, by admitting G, A, D, C as meta-symbols describing all the combinations of a two valued logic. Henceforth, all of our logical reasoning rests on a foundation of these four meta values that describe all combinations of the usual two values of logic.

Notice a very important consequence – three valued logics are not total and are, therefore, guaranteed to have failure states!

This is as much as we need to establish a schema to totalise mathematics in transmathematics but we now commit to one specific approach by adopting the following truth table for the functionally complete operation Not-Or (NOR).

Definition 1 (Trans-Boolean NOR). *Trans-Boolean Not-Or (NOR), also known as the Trans-Pearce-Arrow, of logical constants, x and y , is written, $x \downarrow y$, and is given by the following table.*

\downarrow	A	D	C	G
A	D	D	D	G
D	D	A	C	G
C	D	C	C	G
G	G	G	G	G

Notice that this table does not explicitly contain a zero-valued logic – but this is just to say that it does, implicitly, contain a zero-valued logic! The table contains a one-valued logic in the last row and column – which is uniformly a Gap. The top-left 2×2 block of truth values – A, D – is the usual two-valued Boolean logic. The top-left 3×3 block of truth values – A, D, C – is Asenjo’s paraconsistent logic. Finally the 4×4 block of truth values – A, D, C, G is our preferred Trans-Boolean logic.

If we now adopt the usual definitions of the connectives of naive set theory but replace the Boolean definitions of the set-theory connectives with their corresponding Trans-Boolean definitions, we obtain a naive transtet theory. In transtet theory we say that when $x \in y$ is: A, then x is inside y ; D, then x is outside y ; C, then x is on the border of y ; G, then x is in the background of y . With this arrangement, every transtet with an empty border is a set.

We adopt this transtet theory as a foundation for transmathematics but we do not, at this stage, commit to any particular method of reasoning over the trans-Boolean truth values A, D, C, G .

1.4 Plenary Discussion

YouTube recording [Transmathematica 2022 - Discussion & Closing Address](#).

Tiago dos Reis spoke about a presentation on transmathematics in Brazil.

Mark Burgess spoke about the application of Promise Theory in physics.

James Anderson thanked participants and closed the meeting.