Refutation that classical logic is a completion of quantum logic

We assume the method and apparatus of Meth8/VŁ4 with `T`autology as the designated *proof* value, `F` as contradiction, `N` as truthity (non-contingency), and `C` as falsity (contingency). Results are a 16-valued truth table in row-major and horizontal, or in repeating fragments from 128-tables for more variables.

LET p, q, r, s;
~ Not; & And; + Or; > Imply; = Equivalent; @ Not Equivalent;
# necessity, □, for all or every; (p@p) `F` contraction; (p=p) `T` tautology.

From: Kramer, S. (2017). Quantum logic as classical logic. arxiv.org/pdf/1406.3526.pdf
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The author above "propose[s] a semantic representation of the standard quantum logic QL within a classical, normal modal logic, and this via a *lattice-embedding* of orthomodular lattices into Boolean algebras with one modal operator. Thus our classical logic is a *completion* of the quantum logic QL. In other words, we refute Birkhoff and von Neumann's classic thesis that the logic (the formal character) of Quantum Mechanics would be non-classical as well as Putnam's thesis that quantum logic (of his kind) would be the correct logic for propositional inference in general. The propositional logic of Quantum Mechanics is modal but classical, and the correct logic for propositional inference need not have an extroverted quantum character. One normal necessity modality suffices to capture the subjectivity of observation in quantum experiments, and this thanks to its failure to distribute over classical disjunction. The key to our result is the translation of *quantum negation as classical negation of observability.*"

We render in Meth8/VŁ4 the equations of the Introduction as keyed to the major numbers.

#p=(p=p) ; `FNFN FNFN FNFN FNFN` (1.1.2)
#(q+r)=(p=p) ; `FFNN NNNN FFNN NNNN` (1.2.2)
#p&#(q+r) ; `FFFN FNFN FFFN FNFN` (1.3.2)

"Notice that the observation of the truth of a disjunction does not imply the observation of the truth of one of its disjuncts. That is,

#(q+r)>(#q+#r) ; `TTTT TTTT TTTT TTTT` (1.4.2)

is *not* a valid principle. This is an essential uncertainty. (On the other hand, the converse

(#q+#r)>#(q+r) ; `TTTT TTTT TTTT TTTT` (1.5.2)

is a valid principle.) Hence, and in fact,

~(#(p&q)=(p=p))&~(#(p&r)=(p=p)) ; `TTTC TCTC TTTC TCTC` (2.1.2) or

~(#(p&q)+#(p&r))=(p=p) ; TTTC TCTC TTTC TCTC (2.2.2)

... the presentation of the experiment concludes that

((p&(q+r))=(p=p)) ; FFFT FTFT FFFT FTFT (2.3.2)
(#(p&q)+#(p&r))=~(p=p) ; TTTC TCTC TTTC TCTC (2.4.2)

That is,

(p&(q+r))@((p&q)+(p&r)) ; FFFF FFFF FFFF FFFF (3.1.2)

Apparently, the distributivity of classical conjunction and disjunction fails! Whence arises the motivation for special *quantum* conjunction and disjunction. ...

That is,

((#p&#(q+r))>(#(p&q)+#(p&r)))=(p@p) ; FFFF FFFF FFFF FFFF (3.2.2)

is false. On the other hand, the converse

((#(p&q)+#(p&r))>(#p&#(q+r)))=(p=p) ; TTTT TTTT TTTT TTTT (3.3.2)

is true, because:

((#(p&q)+#(p&r))>#((p&q)+(p&r)))=(p=p) ;
TTTT TTTT TTTT TTTT (3.4.2)
((#(p&q)+#(p&r))=#(p&(q+r)))=(p=p) ; TTTT TTTT TTTT TTTT (3.5.2)
((#(p&q)+#(p&r))=(#p&#(q+r)))=(p=p) ; TTTT TTTT TTTT TTTT (3.6.2)

(As noticed above, $\Box$ distributes over $\wedge$ in both directions, but over $\vee$ only in one direction.) Thus, and in close correspondence with (3.1.2),

((#p&#(q+r))=(#(p&q)+#(p&r)))=(p@p) ; FFFF FFFF FFFF FFFF (4.1.2)

is false.

Hence, if we **make explicit the fact of observing facts** (for example by means of a modal operator $\Box$) then we do not need to introduce the special purpose formalism of Quantum Logic with special and possibly counter-intuitive quantum operators to account for quantum phenomena (due to the apparent failure of classical conjunction to distribute over classical disjunction), but can get by with intuitive classical (Boolean) logic at the small price of adding a single, classical modal operator $\Box$.

(Consider that

(#%p=p)=(p=p) ; NTNT NTNT NTNT NTNT (5.1.2) is true if and only if

(~#%p=~p)=(p=p) ; NTNT NTNT NTNT NTNT (5.2.2)

is true if and only if

(%~%p=~p)=(p=p) ; NTNT NTNT NTNT NTNT (5.3.2)

is true if and only if

(%#~p=~p)=(p=p) ; NTNT NTNT NTNT NTNT (5.4.2)

is true if and only if

(%#p=p)=(p=p) ; TNTN TNTN TNTN TNTN (5.5.2)

is true.)

[The entire argument above is rendered as "If Eqs. 5.5.2 then if and 5.4.2 then if 5.3.2 then if 5.2.2 then 5.1.2."]

(((((%#p=p)=(p=p))>((%#~p=~p)=(p=p)))>((%~%p=~p)=(p=p)))>
((~#%p=~p)=(p=p)))>((#%p=p)=(p=p)) ; TTTT TTTT TTTT TTTT (5.6.2)

The translation that we have found and shall now present and explicate is to

translate quantum negation ~ as ¬□.

~p=~#p ; TNTN TNTN TNTN TNTN (6.1.2)

That is, we translate *quantum negation as classical negation of observability. ...* Hence, the classical negation of observability is classically equivalent to the possibility of observing classical negation. Thus, we can also view *quantum negation as the possibility of observing classical negation.*"

Eqs. 1.4.2 is a *valid* principle, but 2.1.2 or 2.2.2 are *not* tautologous, nor is 3.1.2. The distributivity of classical conjunction and disjunction does *not* fail; 3.2.2 and 4.1.2 are *not* false. The conclusion to translate quantum negation as not necessity in 6.1.2 is *not* tautologous. This refutes quantum logic as a fragment of classical logic (or vice versa, as others write).