Magnetic monopoles : what did the machine learned?

A coulomb phase of magnetic monopoles a priori exists in (in similar Ho2Ti2O7 and Dy2Ti2O7) between an "ordereing" temperature Td not clearly defined (60mK) and Tp=2K[1, fig 2]. In this temperature range, there a third temperature below which the Monopoles density would deacrease so they wouldn't be screened « freeze » in ways they would be "out of equilibrium" and bring antoher (uncorrelated) physics (below, Tf=600mK).

That said, the experimental confirmation of monopole existence in spin ice came separately from neutron scattering diffuse scattering maps above Tf [2,3] and 'magnetreicity' studies (muons, and squid measurements) effects below Tf [4,5]. The only thing that connect these two works, are key authors, S. Bramwell, connecting [3, 4 & 5] surfing on the theory-born fashion [6], and Alan Tenant connecting, in competition [2, 6 & 7]! The theory that has launched the whole story, is indeed given in ref [6]. The hamiltonian contains fisrt neighbor excanhge, and long range dipolar interactions deemed to be essential.

Neutron scattering studies claimed they could analyse (simultate the patterns observed and compare them to their data) using first neighbor exchange only (i.e restricting the analysis not saying it is a restriction of one typical methodology of Neutron scattering!): the justification that's been given for doing so, is advocated as the most vague "a projective equivalence" [3]; a wording that is so exaggerated, I am quoting here it extensively:

"In the particular case of spin ices such as Ho2Ti2O7 (2, 4), unpolarised neutron scattering has established that the dipolar spin ice model, in which the rare earth ions are coupled by the dipolar interaction and competing superexchange, gives a very accurate description of bulk and microscopic properties (24, 25). However, a projective equivalence between the long ranged dipolar interaction and a near-neighbour ferromagnetic interaction, in which the ice rules alone constrain the ground state spin configurations (14, 26), implies that the spin-spin correlations of Ho2Ti2O7 will be very close to those of the full ice rule manifold of the near neighbour spin ice model (2)"

The other approach that had at least (implicitely!), admited that you cannot such ignore dipolar interaction [2], tried to override the metodological issue by using a trick, an assumption that helps to model the scattering *differently* : in order to overcome the importance of the (« longer range ») dipoar interaction ignored by T. Fennel and co workers, it's attempting here to simulate the scattering of presupposed « dirac strings with monopole at their end », artificially created by an applied field above Tf, a field that's tilted or not from the [001] axis to give here a support for the existence of the Monopoles, which in their paper, is in fact more « directly » corroborated by a heat capacity analysis. In that analysis (which provides by methodology, an indirect proof of momopoles), presupposed "classical Dirac Strings" are generated by random walks, but then, the data analysis is SO complex, nowhere (nor in the text, nor in the supplementary info) the agreement is very convincing (e.g: even in the Fig 4C and D, where I do not see any agreement at all!). And despite this the whole apporoach is taken as granted, despite of pseudo-admitted worries there could be "correlation beween strings", the whole, being claimed to support with therefore the moste wavy argumeents the existence of those strings, hence, the monopole at their end, by giving a typical (arbitrary?) length of those *a priori* COMPUTED uncorelated strings...

My question is : what did the manchine learned (not about the hamiltonian) about the monopoles (and its existence itself!) in the last work (Ref [7]) motivated by Ref [2]. Why, the new approach, never ever question the possibility to infer the Monopoles existence, from the real space spin model that the machine is implicitely creating from the tested hamiltonians, in order to simulate difuse scattering maps measured above Tf, i.e, within the "Monopole Coulomb Phase"?

I am asking this, because strinkingly, the world "monopole" is used in this a priori breakthrough in the Subject, using AI [7] is appearing ONLY ONCE in the body text of the article, whereas the same « Monopole » word can be counted five times in the title of the cited references to all the persons having interest in them...! Evreybody should grant this AI effort, which is not common, but every body should wonder, why it is masquing the main issure (the Monopole existence itself!), as if it is granted, when that particular and rather unique study could in principle, dispute it !

Because beyond the wording inconsitencies, it rather looks like if in the end, it is like if contradictorily, Alan Tenant is working for Tom Fennell & Bramwell (competing team..)! by giving them exactly the further neighbour exchange parameters that were missing in Tom Fennel's analysis to understand his f(Q) function in ref [3] : a scattering, here not due to monopoles (supposed to be « flat » without further neighbor interactions neglected in that work), a work where I recall Tom Fennell, played around with the most "loosely defined argument" ((the « projective equivalence ») to not deal with the admitted importance of dipolar interactions!

In both seminal neutron works, what appears is that there was a definite WHAT YOU SEE WHAT YOU GET (WYSWYG) APPROACH that makes the very original claim they bring for a definite proof of monopole existence, highly disputable.

Especially, if this leads Ref [2] to suggest "Perhaps the most intriguing open issue is the precise connection between these building blocks [the strings] and the low-temperature freezing observed in the spin ice compounds", which is excately what is feeding his « competitor » (S. Bramwell), with the idea of studying the out of equilibrium regime (below Tf)! And thus justify the other approach (magnetricity), which gives a second but totally *uncorelated* argument to Bramwell's Neutron group (Tom Fennell, above Tf not using the essential dipolar interaction), and using *separately* the work of Sean Giblin *below* Tf which advocates a dipolar interaction induced creation of monopoles and/or Coulobic interaction between them [4,5].

I hope you'll notice that *conceptually*, there is a clear messing around here, of a whole community which has been really fooling us all with a pseudo Grail quest (stolen from the Stanford search as mentionned in Ref [6]!): Magnetricity studies are studying a temperature range where neutron scattering carefully stay away from, as for example in the last work lead by Alan Tennant [7]! Sean Giblin analysis and analogy with Onsager theory and/or the Wein effect in real ice are so complex, I will not comment, except but naïvely notice that the log scaling and ticks labelling kappa(B)/kappa(0) between figure 4a and figure 4b (divided in 9, not 10 ticks!) of Ref [10] renders the verification if they are coherent very difficult...

And I say all this, because in the last (and most critical) argument, set in 2019, is appears that whilst confirmations of monopoles have been raising interest for a decade, it is a matter of fact, we had to wait 10 years before that same community, which plays around with an pseudo-emulations, on that (made up?) hot topic, starts to wonder about the « essence » of their study : what is the microscopic spin flip meachanism itself, which could make those monopole move, to START WITH ?

On that fundamental question and here again (like for the importance of dipolar/NN exchange), this came up with two uncorrelated (competing) view points comming *exclusively* one from an experimental perspective Giblin/Bramwell/Louis Neel [8] and the other, from a theoretical perspective with Caltelnovo, teamed with Tomaselllo (theoretician) that like Giblin (experimentalist/phenomenologist), both came to the ISIS (UK) PROVEN thus, the true (POLITICAL) attracting « POLE OF MONOPOLE PHYSICS ! », CORRUPUPTING the ILL that B. Tomasello has joined, by being recruited in their theory group [9]!

And te main problem here is, that Ref [8] extensively relies on ideas of PCE Stamp (the coupling to a « spin bath »). And the problem is that... what you don't know, but I've figured out, is that PCE Stamp had one PhD... the last author of the Ref [11], and that guy ! has betrayed him and all of you, and this can suffice, to explain all the above conceptual discrepancies in « monopole » studies in spin ice, especially that of S. Bramwell which all together, explain the inconsitent support of the "a projective equivalence" view point of Tom Fennell TOGETHER with Sean Giblin approach for untold reasons (the UNTOLD uspport of D-wave by the LCN, not telling to those two avademic scientists and former students, explicitely about the « boss » real motivation !)!

Yes! Analyse well the references and affiliations of authors cited in here! And you'll find, that you've studied and/or advocated « monopoles » without knowing, that was in order to help A. Tennant, S. Bramwell (hence, the LCN & G. Aeppli, cited in [11]), A. Taylor from ISIS employing staff unaware (in addition to S.Giblin, B. Tomasello : there is Tatiana Guidi the molecular magnet ISIS girl ! A field where PCE Stamp is also a specialist, and who get extensively cited in [11]) all those « bosses », with a divide to reign technique all, friends in secret and aware by making you "pseudo compete", in order to support in secret, what's the doggiest company on earth, including the Lobbying with with the Nature journals (with A. Taroni! editor of Nature Physics and who did his PhD at the LCN!), so that D-wave gets the monopole in Quantum Computing whilst you all get the most useless papers thinking you have something interesting to say in the (pyrochlore) matter, out of a "game" in fact meant to prostitute academia to hidden interests no serious academics (me my ex-phd boss and I hope, PCE Stamp will agree!), could ever concieve, so evil is the « game »!

So I hope you understand my title, now! Asking what did AI methods (Machine Learning), have really brought to the MAIN problematic? Why cannot we get insight on Monopole physics, out of it ? Learn instead, about the EVIL Machine, which is the new Monopole, and the dream of AI!

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