Are we today as wrong about any scientific fact that is widely accepted as the belief that the earth was the center of the universe and the like?

http://www.quora.com/Physics/Are-we-today-as-wrong-about-any-scientific-fact-that-is-widely-accepted-as-the-belief-that-the-earth-was-the-center-of-the-universe-and-the-like/answer/John-Ringland

http://anandavala.info/article/Are-we-today-as-wrong-about-any-scientific-fact-that-is-widely-accepted-as-geocentrism.pdf

Yes. There is a profound inconsistency that has been revealed at the core of science. It is very controversial and still being resolved.

I will give a brief overview followed by specific details. The terms used and claims made in the overview are clarified in those details via analysis and quotes from scientific sources.

Overview

The issue is classical objectivism, which is a core belief underlying classical physics, science in general and our common-sense world-view. This has been proven to be false by quantum mechanics, yet the implications of this have yet to be faced and assimilated, when this happens there will be a significant paradigm shift.

> “The reception of a new paradigm often necessitates a redefinition of the corresponding science. Some old problems may be relegated to another science or declared entirely 'unscientific'. Others that were previously non-existent or trivial may, with a new paradigm, become the very archetypes of significant scientific achievement.” (Thomas Kuhn)

Quantum mechanics is a rationalist rather than empiricist science. Both rely on observation for validation, however whilst empiricism relies on observation for its foundational concepts QM relies on mathematical intuition. Because of this it is able to penetrate the veil of appearances and comprehend what is going on underlying the appearances.

Because of this the evidence of quantum mechanics directly undermines the validity of empiricism, due to its assumptions about the unquestionable validity of sense experience as a foundation for scientific knowledge and its resulting interpretation of the observables that arise from measurements.

> "We have no satisfactory reason for ascribing objective existence to physical quantities as distinguished from the numbers obtained when we make the measurements which we correlate with them... we get into a maze of contradiction as soon as we inject into

> quantum mechanics such concepts as carried over from the language and philosophy of our ancestors. . . It would be more exact if we spoke of "making measurements" of this, that, or the other type instead of saying that we measure this, that, or the other "physical quantity"." (E. C. Kemble, The Fundamental Principles of Quantum Mechanics)

Many presume that this applies only to the microscopic realm however:

> “Quantum mechanics is increasingly applied to larger and larger objects. Even a one-ton bar proposed to detect gravity waves must be analysed quantum mechanically. In cosmology, a wavefunction for the whole universe is written to study the Big Bang [and in the many worlds interpretation]. It gets harder today to nonchalantly accept the realm in which the quantum rules apply as somehow not being physically real... "Quantum mechanics forces us to abandon naive realism". And leave it at that.” (B. Rosenblum, Quantum Enigma : Physics Encounters Consciousness)

> " "[W]e have to give up the idea of realism to a far greater extent than most physicists believe today." (Anton Zeilinger)... By realism, he means the idea that objects have specific features and properties - that a ball is red, that a book contains the works of Shakespeare, or that an electron has a particular spin... it may make no sense to think of them as having well defined characteristics." (P. Ball, Physicists bid farewell to reality?)

This brings to light a far-reaching false assumption that underlies the scientific method and impacts on the whole of science, except for the core of quantum mechanics because it is a rationalist science rather than an empiricist science.

This paradigm shift is subtly different to the case of Ptolemaic astronomy, because the falsified and inconsistent world-view isn't deliberately maintained by an authority. Instead it is unknowingly maintained by a persistent and unconscious cognitive habit that we all exhibit (naive realism).

This makes it even more difficult to recognise let alone overcome. When scientific facts clash with our habitual and unconscious paradigm this results in cognitive repression, which manifests as a sense of paradox as well as an instinctual aversion towards many topics and those who enquire into such topics. This response gives rise to a culturally endemic dogma that is invisible to those who subscribe to it. It is instead experienced as "*simply the way things are*".

There are small signs that the evidence is starting to be assimilated.

> "There exists a cognitive repression of the interpretation problem by the majority of physicists... what is evaded is the necessity of a new cognitive structure which differs radically from the existing one. Fox-Keller calls the old structure classical objectivism." (Anton Zeilinger, On the Interpretation and Philosophical Foundation of Quantum Mechanics)

> "There is a major 'dangerous' scientific idea in contemporary physics, with a potential impact comparable to Copernicus or Darwin. It is the idea that what the physics of the 20th century says about the world might in fact be true." (C. Rovelli, THE WORLD QUESTION CENTER 2006)

The details

An example of why quantum mechanics seems so paradoxical.
In simple terms, what does the Stern-Gerlach experiment imply about the nature of quantum systems and observable phenomena?

What is naive realism?
What is naive realism?

What is the current paradigm, its core beliefs and limitations?
Do we have a collective paradigm? Else, is it fragmented?

What is cognitive repression and how does it manifest within physics?
Despite having evidence that contradicts someone's belief, why can't they come to believe something new?

In general how can we recognise and break out of a limited paradigm?
How can one recognise when one is caught within a self-reinforcing delusion?

Why does rationalist science not succumb to naive realism and classical objectivism?
Can it ever be said that Scientific realism takes off from the springboard of commonsense or naive realism?

What has been the affect of cognitive repression on the conduct of science?
Has science become too dogmatic?

What is the emerging paradigm and how can we understand it?
Will we ever be able to truly understand Quantum Mechanics?

What will be the broader impact of the paradigm shift?
The Big Philosophical Questions: Now that naive realism has been disproven by quantum mechanics, how will this impact our collective paradigm?

Comments:

Question:

Say I agree that quantum mechanics somehow challenges the scientific method, how should the method change?

Answer:

There are three main steps that can be taken. This is just a brief overview of my assessment. Obviously a great deal more thought and discussion throughout the scientific community is

required.

Step one - Solid foundation:

The raw data that is collected from observations / measurements, when stripped of all interpretations is reliable; to the extent that the observations were competently conducted and the observational apparatus is taken into consideration (which includes experimental devices as well as the subjective perspective of the observers). What is potentially unreliable is the interpretations of the data. Hence the 'raw' data provides a solid base upon which to operate.

So at first science should become more rigorous in regards to its epistemology. I.e. when making knowledge claims about observations it should only work with what is actually known. Currently, in the form of classical objectivism science routinely allows unconscious and habitual assumptions, which are based upon an unfounded philosophical position, to distort the interpretations of the data and it then treats those interpretations as the raw data. This provides a distorted base upon which empirical science operates. Because of this there are many aspects of reality that are either paradoxical (e.g. quantum mechanics) or incomprehensible (e.g. the hard problem of consciousness).

This suggestion is mentioned by Kemble:

"We have no satisfactory reason for ascribing objective existence to physical quantities as distinguished from the numbers obtained when we make the measurements which we correlate with them... It would be more exact if we spoke of "making measurements" of this, that, or the other type instead of saying that we measure this, that, or the other "physical quantity"." (E. C. Kemble, The Fundamental Principles of Quantum Mechanics)

Thus the first step is for the unconscious and habitual interpretations to be recognised and made conscious so that they can be questioned and we can control when they are applied. For many specific purposes classical objectivism is an adequate approximation, however often it will derail any attempted enquiry and send it off on an unproductive tangent.

For example, the reason why the hard problem of consciousness is 'hard' is because the empirical method (due to naive realism and the resulting classical objectivism) has overlooked the role of subjective experience in the apprehension of observables from the very start. This blind spot is enshrined in the foundations of the scientific method and world-view. Science then tries to factor in subjective experience much later, which leads to numerous problems.

Step two - Exploration of interpretations:

The data does have to be interpreted at some stage for us to derive meaning from it. However we need to be careful about how we interpret it.

The current interpretation (classical objectivism) is inconsistent in numerous ways as I mentioned above in regards to paradoxes and explanatory gaps. Thus there needs to be an exploration of possible coherent interpretations, that can provide a consistent explanatory framework that gives meaning to the raw data at all levels, from the microscopic to the macroscopic, and from all perspectives from personal to public or subjective to objective.

There is an existing alternative that requires serious consideration. It arises from quantum mechanics and also has growing cultural acceptance. To a growing number of people it intuitively makes sense, whilst to those who still think about it via classical objectivism it seems fanciful and unreal. I am talking about information theoretic approaches.

Note: to really understand this approach it requires a reinterpretation of what information processes are, which avoids the assumptions of classical objectivism. From a different perspective we see that information processes are not inanimate mechanical processes, instead information is discernible difference, which requires an experiencer to discern the differences and thereby be informed. Hence

subjective experience of some kind (whether primitive or complex) is intrinsic to all information processes including quantum information processes.

Classical objectivism (due to its naive realist roots) proposes that what we observe is the objective reality. Whereas the information theoretic interpretation proposes that what we observe are the subjective phenomenal contents of our stream of experience and that these arise due to lower level interactions (entanglement) between the 'subject' quantum information process and the 'object' quantum information process. Due to this interaction observables are experienced however these observables are not the true reality of the situation; they are better described as virtual. However the underlying information processes are objectively real; even though they cannot be apprehended via the phenomenal contents of experience because they are that in which the phenomenal contents appear.

The need for this paradigm shift is hinted at in Neils Bohr's comment that "Everything we call real is made of things that cannot be regarded as real."

He was looking at things in terms of classical objectivism. Whilst from an information theoretic perspective there is no paradox because the observables are considered virtual rather than real, and the information processes are considered real rather than unreal.

Step three - Rectification:

Once the first step succeeds and the unconscious habitual interpretations are controlled in our minds, thus allowing us to work with the raw data without making unfounded assumptions, and once the second step also succeeds and a new interpretive framework is found (possibly multiple alternatives).

Then it becomes possible to engage the third step. Note, the process isn't strictly linear however for ease of description I have explained it that way.

The third step involves going through the many fields of empirical science and stripping out the distorted interpretations to reveal reliable raw data, then reinterpreting the data according to the new paradigm (or competing alternatives if there are more than one).

Many perceived facts and open problems will at this point dissolve because they were artefacts of distorting interpretations, whilst many paradoxical facts and unsolvable problems will become sensible and solveable.

“The reception of a new paradigm often necessitates a redefinition of the corresponding science. Some old problems may be relegated to another science or declared entirely 'unscientific'. Others that were previously non-existent or trivial may, with a new paradigm, become the very archetypes of significant scientific achievement.” (Thomas Kuhn)

Navigating the transition:

To be capable of taking these steps and undergoing the paradigm shift we need less of the attitude mentioned in this quote:

“ ... mankind at each period of its history cherishes the delusion of the finality of its existing modes of knowledge. Sceptics and believers are all alike. At this moment scientists and sceptics are the leading dogmatists. Advance in detail is admitted: fundamental novelty is barred. This dogmatic common sense is the death of philosophic adventure. The Universe is vast.” (Alfred North Whitehead)

And more of the attitude mentioned in this quote:

“The old foundations of scientific thought are becoming unintelligible. Time, space, matter, material, ether, electricity, mechanism, organism, configuration, structure, pattern, function, all require reinterpretation. What is the sense of talking about a mechanical explanation when you do not know what you mean by mechanics? The truth is that science started its modern career by

taking over ideas derived from the weakest side of the philosophies of Aristotle's successors. In some respects it was a happy choice. It enabled the knowledge of the seventeenth century to be formulated so far as physics and chemistry were concerned, with a completeness which lasted to the present time. But the progress of biology and psychology has probably been checked by the uncritical assumption of half-truths. If science is not to degenerate into a medley of ad hoc hypotheses, it must become philosophical and must enter upon a thorough criticism of its own foundations." (Alfred North Whitehead)

Question:

Do anybody disagree with this? Is this not what you get applying the scientific process on itself? Is implementation of this not the only problem? Aren't we doing that slowly every day?

Answer:

Re: "Do anybody disagree with this?"

No true scientist would consciously disagree with this. However due to unquestioned subconscious habits scientists routinely fail to abide by this, as I explained above and in the answer details.

Re: "Is this not what you get applying the scientific process on itself?"

Yes, and that is exactly what I am doing; applying reliable aspects of the scientific process (e.g. quantum theory) and the philosophical foundations of science (e.g. epistemology) to analyse the whole of the scientific process. This shows that certain aspects of the scientific process are based on unfounded assumptions and are unreliable.

Such as empiricism and its classical objectivist assumptions about how observational data reveal real observable properties of systems and not just observational data that is in some way correlated with real systems which themselves may or may not be observable. This may seem like a subtle point but the implications are enormous.

Re: "Is implementation of this not the only problem?"

Yes. If this approach had actually been implemented and not just attempted and unconsciously contravened, then there wouldn't be this problem. Once the unconscious habits are recognised and neutralised and the false belief system based on those assumptions is rectified then this problem is resolved.

Re: "Aren't we doing that slowly every day?"

Yes we are, but for the past 80 years it has been a pressing issue in quantum mechanics and progress has been VERY slow, more characterised by cognitive repression and incomprehension than by active paradigm shifting. That is natural in the early stages, however now the pace of change is picking up in recent decades.

This Quora answer and related discussions are a small part of that process. It is happening as we speak. Not just here but in an increasing number of situations.