

HISTOPHYSICS: A NEW DISCIPLINE*

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History is the most important discipline of study. The system investigated in history is a many-body system consisting of biological material bodies, *Homo sapiens*, and hence can be studied scientifically. The unique role physicists can play in advancing the science of human history is presented. We will discuss the methods of study in history; worldviews; modeling history as a complex, dynamical system; predicting the future and retrodicting the past; and artificial history. In particular, active walk is shown to provide the foundation for a new worldview, and found to be widely applicable in modeling history, as illustrated by three examples from economic, evolutionary and social histories, respectively.

Keywords: Histophysics; history; physics; complex systems; artificial history; active walk.

1. Introduction

New disciplines of study are born from time to time, like in the case of human babies, but less frequently. Or, for that matter, like new stars emerging in the sky, being suddenly noticed after a long period in the making.

Historically, when physics is combined with other natural sciences, new disciplines are created and we have astrophysics, biophysics, geophysics, and so on. More recently, econophysics was born when physicists ventured into economics, a branch of the social sciences.¹ (Similarly in the field of biology, in 1975, sociobiology was created when biology was merged with sociology by Edward Wilson.²) In this article, physics is linked to history, giving birth to a new discipline — histophysics.

Since the nineteenth century, history has been treated as a science intermittently through the efforts of Condorcet, Comte, Buckle, Taine, Adams, and others.^{3,4} The progress has been uneven, and there are even doubts as to whether this endeavor is at all possible, given the complexity and the irreproducible nature of historical processes. As argued in this article, the system under study in history is actually

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a classical, stochastic system. It is a very complicated, complex system; but like other complex systems, it can be studied scientifically.

In the following, the unique role physicists can play in advancing the science of human history is presented. Specifically, we will discuss the methods of study in history; worldviews; modeling history as a complex, dynamical system; predicting the future and retrodicting the past; and artificial history. In particular, active walk⁵ is shown to be the foundation for a new worldview and widely applicable in modeling history, as illustrated by three examples taken from economic, evolutionary and social histories, respectively.

2. What Is History About?

The system under study in history is a many-body system, where each “body” is a human being, called a “particle” or an “agent” in this article. Each constituent agent is a classical object (not quantum mechanical) and is distinguishable (i.e. each agent in the system can be identified individually). This many-body system is a heterogeneous system, due to the different sizes, ages, races of the agents.

The interest of historians is about anything happened in the past that is related to these agents (which exist presently or in the past). *The system being investigated by historians is thus a system of material bodies, and thus can be studied scientifically.* But how?

For this purpose, let us examine the constituents more closely. For comparison, a well-studied many-body system in the physical sciences — water — will be used.

1. In water, the constituents are molecules, under the name of hydrogen oxide and represented by the symbol H_2O . In history, the constituents are biological bodies, named *Homo sapiens* and represented by the symbol \odot (or, with more details, by ♀ and ♂).
2. In water, each molecule is itself a composite system made up of two hydrogen atoms and one oxygen atom; each atom is made up of electrons and a nucleus; each nucleus is made up of smaller particles, protons and neutrons; each proton or neutron is made up of quarks (or superstrings). In comparison, in history, each biological body is made up of organs (brain, heart, stomach, and so on — the brain is considered by some historians to be the most important organ of all, but other historians at one time or other considered the heart or the stomach as more important), blood and other liquids; each organ is made up of cells (a total of about five trillion cells in a body); each cell is made up of (mostly organic) molecules, such as DNA; each molecule is made up of atoms — and from this point on, there is no distinction between the two cases of water and history.
3. In both these systems, there are layers and layers of structures, and many *internal states* in each constituent. (Internal states in a human body include memories, thoughts, and so on.) Even though a water molecule is several layers less in structure compared to a biological human body, it is actually quite a complicated system and possesses in fact, as in the case of a human body, an infinite number

- of internal states.
4. The atoms inside a water molecule and a human body were created in the stars a long time ago, and have a long history behind them. The property of a water molecule remains the same since its creation, which makes a scientific study of water “easier” than the case if their properties changed with time. (In the latter case, a scientific study is more difficult but not impossible.) Similarly, because all humans are derived from the same ancestor (the African Eve) only some ten thousand years ago and, according to Charles Darwin’s evolution theory, the human body and human nature take a long time to evolve, they have remained practically unchanged over the last 6,000 years or so — the period in which human history is recorded. It is “easy” for present historians to second guess the works of past historians.
 5. The size of a water molecule is very small, about 10⁻⁸ centimeter; it is a quantum mechanical particle. In contrast, a human body is about 40 cm to 200 cm; it is a classical particle — that is, quantum mechanics is irrelevant to these particles.
 6. The fact that the historian herself or himself is one of, or one similar to, the particles under study in history should make the historian’s job easier, not more difficult, when compared to the study of water.

The reasons that people are interested in history are slightly different from those in studying water. It is true that humans are curious animals and hence should be interested in almost anything, water or history. But history is particularly interesting. We are interested to know what our parents, and great, great, great parents were doing. We want to know where we came from and why we ended up like this. Furthermore, from the practical point of view, knowing the past may help us to understand the present and predict the future. The Chinese say it well:

“Reflection from a mirror enables us to tidy up ourselves; reflection on history enables us to know the ups and downs of our time.”

3. Motivation

There are several reasons behind the undertaking of histophysics.

1. *The human system is the ultimate complex system in the universe.* Complex systems^{5,6} are those systems consisting of a large number of particles, agents or components, which usually cannot be studied by reduction. Examples include the economic system, ant colonies, the brain, traffic, humans, and extraterrestrial intelligence⁷ (if it exist). The study of complex systems is about the real world. Anyone interested in complex systems should be fascinated by humans, the ultimate complex system in the universe.
2. *History is the most important discipline of study.* History as a research discipline, like physics, may be divided into two categories: basic and applied. For example, Karl Marx is in basic research while Vladimir Lenin, applied. In either history or physics, the greatest impact shows up in the applied domain. The beneficial

aspect of applied physics goes without saying. To name just a few, basic physics invented and applied physics developed semiconductors and lasers, which made our lives more convenient and improved our living standards dramatically. The impact of basic history is less clear. However, it is in the applied domain that history outstrips the combined impact of basic physics and applied physics. This can be seen through their negative effects. The one negative incident due to applied physics is the dropping of the two atomic bombs in Hiroshima and Nagasaki in 1945, resulting in a total of about 270,000 deaths, counting the subsequent years. In contrast, from 1975 to 1979, an estimated two million Cambodians were killed under the Pol Pot regime, and this is just one of the many massacres recorded in history. In this sense, history is a far more important discipline than physics; and in fact, history is the most important of all the disciplines.

3. *The time is ripe.* Important advances have been achieved in the study of complex systems and the biology of humans in recent years. Powerful computers are available to do simulations; chaos is understood; the human genome has been decoded; real-time scans of the brain are performed in neuroscience experiments, and so on. The time is ripe to tackle human science from physical and biological perspectives, as recently emphasized by Edward Wilson. In his words⁸: “The human condition is the most important frontier of the natural sciences.”
4. *Physicists, in collaboration with historians, can help turn history into a science.*
 - (a) Physicists know how to deal with many-body problems. In fact, they invented statistical mechanics to tackle these systems one hundred years ago and have used it successfully ever since.
 - (b) Physicists are “licensed” to do history. “Physics is what physicists do,” says *Physics Today*,⁹ the magazine of the American Physical Society.
 - (c) Physicists are urged to do history. “The task of physics is not only to understand the hydrogen atom, but to understand the world,” advocated the Nobel laureate Arthur Schawlow, as quoted in *Physics Today*.¹⁰ The world, of course, includes history.
 - (d) Physicists can read research journals in history, but historians usually cannot read physics journals due partly to the jargon used therein.
 - (e) Physicists have good track records in interdisciplinary studies, as witnessed by many X-physics new disciplines mentioned above. (Here, X stands for astro, bio, etc.) Consequently, in collaboration with historians, physicists can help raise the scientific level of history studies.

4. Methods of Study in History

In any science discipline, the scientific method consists of the following steps:

- (1) Starting from raw data or existing theory, a new hypothesis is proposed.
- (2) Consequences from the new hypothesis are checked with data.
- (3) In agreement, the hypothesis is confirmed and turns into a new theory — new “laws” are discovered; otherwise, go back to step (1).

- (4) New findings from the theory are published in peer-reviewed, research journals.
- (5) In exceptional cases, popular science books are written, by the scientists themselves or, mostly, by others.

In the profession of history, these steps are fragmented.¹¹ The proposal of a new hypothesis, step (1) above, is called constructionism. The “discovery” of new laws, step (3), is called reconstructionism. And, many research results in history, expressed in the narrative form, are published as popular books,⁴ step (5), without going through step (4), peer-reviewed journals. It is not surprising then, that history is not yet a scientific discipline.

Some representative research methods in history^{12,13} are noted in the following:

1. The “internal states” of the brain are emphasized by Robin Collingwood¹⁴ when he insists that historians have to reenact the thoughts of historical figures in understanding history. This approach is called “method acting” in the movie industry; it is very difficult and can only be mastered by a few gifted people.
2. History — like archaeology, paleontology and a large part of astronomy — is about things that happened in the past. Its relationship to things happening in the present is obvious, since there is no discontinuous break between past and present in the flow of history. Much resource is devoted to the understanding of the present state (and welfare) of *single* particles, humans; resulting in various disciplines such as medicine, psychology, art and music. The present state of *many* particles is studied in the social sciences, such as sociology and economics. The importance of social science in history study is advocated by the *Annales* school in Paris, associated with the names of Lucien Febvre, Marc Bloch and Fernand Braudel.¹⁵
3. The objectivity in, and the possibility of reconstructing past “reality” through history narratives are ruled out by Hayden White,¹⁶ and Jacques Derrida¹⁷ and other deconstructionists because, they argue, the meaning of any writing is undecidable. These and other postmodern attacks lead to a crisis in the history profession in the 1990s.^{12,13}

However, as we shall demonstrate below, research in history can benefit from the inclusion of some scientific approaches developed in physics.

5. Worldviews

Worldviews, through the action of powerful political leaders and governments, have tremendous consequence in applied history. The study of worldviews is important to historians.¹⁸

All worldviews, in fact, follow from new advances in basic physics. For example, Newton’s clockwork universe leads to the deterministic worldview, which is appropriate since Newton’s laws of motion govern classical particles and humans are classical particles.

What are inappropriate are the worldviews that “nothing is certain” and “an observer changes what’s observed,” supposedly inspired by quantum mechanics; and the worldview that “everything is relative,” following from the success of Einstein’s relativity theory. Some misunderstanding is involved here. Quantum mechanics is important only in the microscopic world (with the exception of two macroscopic phenomena: superfluidity and superconductivity) while humans are macroscopic bodies which are not known to be superfluid or superconduct. And special relativity is important only if the particle’s velocity is close to that of light, while in general relativity the mass of the object has to be huge. Both these conditions do not apply to humans or human activities. Consequently, historians can safely forget quantum mechanics and relativity; they are irrelevant to the development of human history.

More recently, chaos theory has inspired the worldview that “slight changes in initial conditions can lead to very different outcomes in history.” Books on “virtual history”¹⁹ and “what – if”²⁰ appear, but these attempts focus only on the *qualitative* aspects of chaos and thus have nothing to do with chaos per se. A *quantitative* analysis of real historical data to detect chaos has been tried^{21,22} but the result is indeterminate due to insufficient data points in the time sequence.

Self-organized criticality, after its introduction in physics,²³ has been invoked^{24,25} to be the metaphor for history. The claim is that history works like sandpiles: it builds up by itself to a critical state, crumbles, builds up, crumbles, While there is no denying that someone’s life may work like this, we know for sure not everyone’s life and not everything in history goes through this repetitive and depressing routine. Think Bill Gates, for example.

History, resulting from a combination of contingency and necessity, is a stochastic process with many possibilities. Some aspects of it may appear periodic, sometimes; other aspects, moving in a spiral or chaotically. It may even occasionally build up and crumble like in a sandpile. But it may also go through weird paths in a strange landscape. Active walk, a paradigm introduced by us in 1992 to handle complex systems,^{5,6,26} provides exactly the needed foundation for such a worldview. In an active walk, a particle – the walker – changes a deformable potential – the landscape – as it walks; its next step is influenced by the changed landscape. (In contrast, in a random walk, the particle changes nothing of its environment, and is thus a passive walker.) For example, ants are living active walkers. When an ant moves, it releases chemicals of a certain type and hence changes the spatial distribution of the chemical concentration. Its next step is moving towards positions of higher chemical concentration. In this case, the chemical distribution is the deformable landscape.

Active walk has been applied successfully to a number of complex systems coming from the natural and social sciences. Examples include pattern formation in physical, chemical and biological systems such as surface-reaction induced filaments and retinal neurons, the formation of fractal surfaces, anomalous ionic transport in glasses, granular matter,²⁷ population dynamics, bacteria movements and pattern forming, food foraging of ants,^{28,29} spontaneous formation of human trails^{29,30} and

cart tracks,³¹ oil recovery,³² and economic systems.^{5,6,26,33,34}

In the last two years, the close connection between active walk and history has been suggested.^{5,35} The connection comes naturally. When historians write narrative histories they use such phrases as “leave a mark in history” or “follow in a giant’s footsteps”. It follows that to model these scientifically, one needs a deformable landscape so that marks and footsteps can be left on it. Moreover, one needs a walker to do these things. As noted by the Chinese, through the action of individuals, bad things can sometimes be turned into good things, and vice versa; the walker should be an active walker. The active walk model, then, fits naturally into historical analyses.

6. Modeling History as a Complex Dynamical System

The first step in the scientific study of any subject is the collection of empirical data. This step is followed in both physics and history. The next step is to summarize the data, which leads usually to some empirical laws. For example, for water, we have Bernoulli’s equation, which states that the sum of pressure, kinetic energy per unit volume, and gravitational potential energy per unit volume remains constant along a streamline of an ideal fluid. In history, there are fewer attempts at empirical laws, the existence of which is doubted by some historians. An example of such laws is Michael Shermer’s “model of contingent – necessity,” which states essentially that history results from the combination of contingency and necessity, with the former being more important in the early stages of a historical sequence.²¹

6.1. Three research levels

Beyond the empirical level, research in history and physics differ from each other considerably. For example, physicists go on to study water at three different levels. The first is the *phenomenological* level. Based on a few very general symmetry laws, a phenomenological equation, the Navier–Stokes equation, is written down. The equation does not even require that water is made up of molecules, and is still being used today to understand fluid flows and in the design of airplanes.

After the establishment of the molecular nature of water and the availability of powerful computers, water has been studied at a deeper level — the *realistic* level. In molecular dynamics simulations, the motion of a few hundred water molecules are tracked at every time step, with calculations based on Newton’s second law of motion and pairwise molecular interactions are assumed. Here, simplifications of the molecular interaction are made, and the number of molecules used is far below that in the real case, which is about 10^{23} molecules in one cubic-centimeter volume. In other words, physicists “cheat”. The real details are not needed or used — that is how progress in physics is made and made possible.

The third level is the *artificial level*. In lattice gas automata, very artificial molecules move on a triangular lattice, with oversimplified rules of movement and collision. For example, when two molecules collide head-on horizontally, they move

away from each other at 60° from the horizontal, either to the right or to the left; and they simply move one step forward if they encounter no other molecules. There are no such molecules in the world, but the result from this method is the same as that obtained from the other two levels. This is the ultimate cheating on Nature, and, again, this is how good physics is done.

In contrast, there is no study in history that matches any of these three levels. The problem is that historians tend to believe that to gain a good understanding of history, detailed knowledge about the events or human interactions are required, the more the better. In other words, they aim immediately at the realistic level, and that is very difficult in human affairs. The lessons from physics are: (1) You do not have to know the whole thing in details, and (2) progress can be made by simplifications that still grasp the few essential driving factors. In what follows, history will be studied at the phenomenological level using active walks, and the artificial level using artificial societies.

6.2. *Three stochastic systems*

As stated above, historical processes are stochastic, resulting from a combination of chance and necessity. Chance is another word for contingency; and necessity, rules. The two combine to give rise to historical laws. The situation is like that in a chess or soccer game. There are a few basic rules that the players have to obey, but because of contingency, the detail play-by-play of each game is different, and the outcome of the game could be easily predicted, say, when the two competing persons or teams differ very much in strength. In principle, the rules governing historical processes, like those in a chess or soccer game, can be guessed by someone with sufficient skills and patience.

To gain insight into stochastic processes in general, let us look at three stochastic, physical examples. The first example is balls running through a triangular lattice of pegs on an inclined plane, one at a time. The first ball is released at the center of the upper horizontal line. It hits a peg and has an equal chance of going to the left or right peg one row below. Hitting the second peg, it has an equal chance again of going to the left or right peg on the row below, etc. This is a purely random process; the exact path of the ball cannot be predicted. Furthermore, if a second ball is released from the same spot as before, knowing the path of the first ball does not help us to predict the path of the second ball. On the other hand, if a large number of balls are released one at a time, like the first two balls, we can predict the number of balls landing at a particular location on the bottom line. It is simply a Gaussian distribution, also called the normal distribution. The lesson from this example is that even when it is futile to predict the exact path of each ball, it is still possible to say something about its landing statistically. But history is not a random process; the similarity stops here.

The second example is balls running down a deformable inclined plane (without the pegs), one at a time. Each ball is an active walker. In this case, assuming that

the imprints of each ball rolling on the plane are retained long enough and are accumulative, the path of the first ball will influence that of the second ball, and so forth. Knowing the tracks of the first few balls could lead to prediction of those of later balls. It is a history-dependent stochastic process. And history is like this, an active walk process.

Our third example is a random walk on a horizontal plane. Being a random walk, its exact path cannot be predicted. But we can ask other questions. We can ask, for example, What is the morphology of the tracks? What is the dimension of this filamentary track pattern? Is it a fractal? How does its end-to-end distance vary with time? Physicists, in fact, have asked these questions and found answers to them. The same set of questions can be asked about any track patterns, including those left by active walkers. The lesson here for history is that knowing the historical track, usually a difficult task by itself, should not be the only thing historians should be obsessed about. Here, three examples, all involving the use active walks, are presented to illustrate this point.

6.3. Three modeling applications

Example 1. *Modeling economic history: why an initially disadvantageous product can catch up and win out in the market?* A Florence cathedral clock, designed in 1443, has hands that move “counterclockwise” around its dial.³⁶ Consequently, two types of clocks, with hands moving in different directions, must be on the market in those early years. However, since sundials, the timepiece before the invention of clocks, in the northern hemisphere have the pointer’s shadow moving clockwise, people in Europe are more comfortable with clocks having hands moving clockwise, too. Those clocks, like the Florence cathedral clock, are thus “inferior” products and they are soon run out of the market. That is why we are now left with only one type of clock having hands running clockwise. This is the case of an inferior product losing out, which is not at all surprising. What is surprising is the case of an inferior product winning out. The “QWERTY” keyboard, the type we are using today, is such an example.³⁷ Invented in 1867, this keyboard is designed to slow down our typing so the mechanical parts will not be jammed that easily. Other superior designs, such as the Maltron keyboard — with 91% of the letters used frequently in English on the “home row” compared to 51% for the QWERTY design — coexist in the market but all lose out. Why?

To understand this, an active walk model with a single particle jumping between two sites is constructed. Each site, representing one product, is given a “fitness” height $V_i, i = 1, 2$. When the particle lands on a site, that corresponding product is bought by a customer, and the height of the site is increased by a fixed amount a . The probability that site i is chosen by the particle is proportional to $f(V_i)$, a given monotonic increasing function of V_i . (Note that the particle may stay in the same site.) A particular choice is $f(V_i) = \exp(\beta V_i)$, where the “inverse temperature” β varies from zero to infinity. The parameter β represents the combined effect of

the rationality of the customers and how effective information is passed among the customers (through personal contacts or advertisements). A zero β corresponds to the two products being chosen randomly; an infinite β corresponds to the same product chosen all the time. This two-site active walk model can be mapped to a one-dimensional position-dependent probabilistic walk and is solvable. Solutions of the model depend on the parameter β and the initial height difference x_0 . Our analytic and numerical results show that

- (1) for zero β and $x_0 = 0$, the two products coexist in the market,
- (2) for infinite β , the product first picked by a customer always wins out if $x_0 = 0$, and the one with an initial advantage wins if $x_0 \neq 0$,
- (3) for $x_0 = 0$ and finite β , each product has an equal chance of winning, but which product actually wins out is unpredictable,
- (4) for finite x_0 and β , the product with an initial advantage has a higher chance of winning, but the other product has a non-zero chance of catching up and winning, too.

And there is an optimal time that this chance of catching up becomes a maximum, implying that the initially disadvantageous product should stay in the market should not give up at least until this optimal time.

Of course, the initially disadvantageous product can change the rules of the game by increasing its own a , for example, by improving its quality or starting an advertisement campaign, or both. With sufficient real data, our model can be fitted to describe the competition between real products.

Example 2. *Modeling evolutionary history: rewinding life's "tape," or how important is contingency in survival?* In 1989, Stephen Gould published the book *Wonderful Life*.³⁸ From the fossil record found outside of Vancouver, Canada, it seems that some "advanced" organisms (with many legs, say) that should survive are wiped out suddenly. From this one data point, Gould concludes that contingency is extremely important, that is, not the fittest will survive, contrary to what Darwin's evolution theory asserts. He asks, If life's tape is replayed, will history repeats itself and can humans still be found on earth? His own answer is no. Debates go on but nothing is done seriously and scientifically. Worse yet, there is no second data point forthcoming. Our active walk model⁶ throws light onto this debate. We find that the relative importance of contingency, versus necessity, could depend on where in the parameter space the system belongs. If our world happened to sit in the sensitive zone, in which chance is very important, then history could indeed be very different if life's tape were replayed. Otherwise, history could be repeated, more or less. The problem is to know where our world sits.

Example 3. *Modeling social history: will all societies end up as liberal democratic societies?* Francis Fukuyama, considered one of fifty key thinkers on history,³⁹ published in 1989 an article, "End of History?" He asserts that every human being needs two satisfactions, namely, economic well-being and "recognition," with the

latter meaning respect by others. He argues that since the liberal democratic society is the only one that can satisfy its citizens on these two basic needs, consequently, given enough time, all societies will end up as liberal democratic societies. And that will be the end of history, if history is understood to be directional change in societal forms.⁴⁰ Misunderstandings of Fukuyama's thesis endure and debates go on in the history profession. Nothing is done scientifically to settle the issue.

In our view, the two human needs suggested by Fukuyama should be generalized to "body satisfaction" and "soul satisfaction." After all, body and soul (or spirit) comprise the whole of a human being. And we know for sure, for example, when someone joins a revolution to change the society, the person may give up her or his life before the revolution succeeds, if at all — and recognition is not in the person's mind. The degrees of satisfaction of "body" and "soul" in each society can be quantified by an index, obtained from a survey of its citizens. To test Fukuyama's thesis, one can represent each society as an active walker, a particle, moving in the two-dimensional space of "body" and "soul" indices. At each point in this space, a fitness potential can be defined. The movement of each particle (usually, but not always, up the scales) will change the fitness landscape and influences the movement of other particles. The problem will be to find out, under what circumstances, all the particles will cluster together at the location corresponding to a liberal democratic society. It is thus a problem of clustering of active walkers in a two-dimensional deformable landscape. (The model can be generalized to include the possibility that two particles may combine into one, and some particles may split into two or three — some kind of chemical reactions — corresponding to the case in history that countries may get unified or fragmented in time.)

Such a problem has been studied before in physics in another context, and the clustering of active walkers indeed occurs.⁴¹ The corresponding investigation in history as outlined above will bring Fukuyama's historical study one level up, to the scientific level, and serve as an example in other cases.

7. Predicting the Future and Retrodicting the Past

In physics, the future of a complex system can sometimes be predicted without knowing the nature or mechanism of the system itself. Time series analysis is such a method, which has been applied in predicting the stock market, in particular.

Another possible avenue is to turn the data into tracks in some suitable space and, assuming that these tracks are generated by active walkers, one can then figure out how the landscape is modified and go on to predict the future or retrodicting the past. This approach is encouraged by the success in using active walk to reproduce the patterns in dielectric breakdown patterns.²⁶

It is sometimes believed that due to the intrinsic complexity and the stochastic nature of history, one can never regenerate the historical "tracks". This is not true. Take the human trail formation³⁰ for example. Once the present track pattern is reproduced successfully, through an active walk model in this case, the computer

program can be rerun from time zero to show how the tracks are formed in the past, and how it will further evolve in the future. The same applies to any successful simulations in other systems.

8. Artificial History

Artificial life, as a discipline, was created by Chris Langton in 1989.⁴² Subsequently, artificial societies have been investigated.⁴³ Since human history, by definition, cannot be reproduced, it will be useful to treat the development in an artificial society as some kind of *artificial history*. Ask historians to study it seriously, pretending that they are real, and come up with their summaries and findings, preferably in the form of historical laws. The findings or laws can then be tested against data collected from the many reruns of the artificial society. Lessons learned from artificial history should help in the understanding of human history, in the same sense that artificial life has contributed to the progress in the study of real life forms.

A place to start is use commercially available computer games such as “The Sims,” as an artificial society. Time evolution of data for the characteristics of the players in this community is collected. We are in the process of turning these data into tracks and using active walk models to figure out their history.

Needless to say, the predicting capacity coming from the study of artificial history is relevant in many real applications, such as the writing of better games, movie plots, novels, and military game plays with computers.

9. Conclusion

Historians have contributed significantly in preserving history. But history is too important to be left to historians alone. Physicists can and should go into it. The complexity and stochastic nature of historical processes should not be a deterrent in studying them; we have experience and tools gained from studying other complex systems. It may be difficult for practicing historians to learn advanced mathematics and programming, but the teaming up between historians and physicists should be possible and fruitful. On the other hand, it may be time to make mathematics and programming required skills in the training of historian students in the universities, so future generations of historians are better prepared scientifically. Asking history majors to take a physics minor will help, too. Similarly, it is recommended that physics majors should take a course in historiography if they want to work on histophysics.

History is much, much more than story telling. Narrative history is not enough. Active walk is found useful and natural in the modeling of history. More real data are helpful for sharpening the models and comparing them with the real world. Paraphrasing a famous saying, here is my prediction for the future:

“The future history of science is the story of physics hijacking topics from social sciences.”

This is only the beginning.

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