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African philosophy: a key to African innovation and development[1]

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This essay demonstrates how African philosophy can be a key to African innovation and development. Its first section illustrates how philosophy as a discipline drives innovation in science and technology. The second part proposes a new discipline linking science, engineering and technology to sustainable, ethical development. The third section proposes an ethics core derived from ancient Egyptian and Ethiopian thought. It addresses the fact that non-African principles and personnel have in some measure directed African development, resulting in unsustainable and sometimes destructive outcomes. The conclusion argues that the primary instrument for African development must be a Pan-African curriculum developed through research funded by the African Union. The curriculum's dissemination will depend on widespread broadband internet access throughout Africa. The essay's method is philosophical, deploying conceptual analysis of key terms as well as generalized descriptions of the intersections of science, technology, innovation and development. The essay proposes prescriptions for developing relations among these fields for the theory and policy of African development. This study is empirical in the sense that philosophy offers broad generalizations about experience. However, it does not examine data-sets characteristic of more specifically targeted scientific descriptions.

Keywords: Africa, development, education, ethics, science, engineering, technology, innovation

JEL classification: O30, O31, O38, O39, O55

This essay demonstrates how African philosophy can be a key to African innovation and development. Its premise is that philosophy is the brain's activity at the extreme limits of generalization. Philosophy and science are separated only by their degrees of generalization. Philosophy's primary engine is the imagination. Historically, philosophers have proposed ideas that are first perceived to be preposterous and later regarded as common sense: the earth rotates around the sun even though it appears to be obvious that the sun, the moon, the planets and the stars turn around the earth; human and animal life emerge from the same evolutionary processes; under the right circumstances, humans should sacrifice their self-interest for the sake of their groups; all humans form a single group, united by their African origins.

The essay's first section illustrates how philosophy as a discipline drives innovation in science and technology. Philosophy's task is to re-imagine our conceptions of the universe and our roles in life. Scientific theories translate those imaginative schemes into testable hypotheses. And technology translates scientific theory into practical action.

The second part proposes a new discipline linking science, engineering and technology to sustainable, ethical development. Translating highly abstract theories into practical action in sustainable, ethical ways requires interdisciplinary teamwork combining the research of scientists, engineers, technologists, ethicists and other humanists.

The third section argues that today's dominant Eurasian ethical systems have prescribed actions that may threaten the world with catastrophic loss of life. More particularly, non-African ethical principles and personnel have in some measure misdirected African development, resulting in unsustainable and sometimes destructive outcomes. The section proposes an ethics core derived from ancient Egyptian and Ethiopian thought as a replacement for Eurasian ethics.

The conclusion argues that the primary instrument for African development must be a Pan-African curriculum developed through research funded by the African Union. The curriculum's dissemination will depend on widespread broadband internet access throughout Africa.

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Philosophy defined

Stephen Hawking (2010: 5), renowned Cambridge astrophysicist, claims that physics can now answer cosmological questions about our origins and purpose. He lists a series of questions that philosophers have historically posed: 'How can we understand the world in which we find ourselves? How does the universe behave? What is the nature of reality? Where did all this come from? Did the universe need a creator?'

Hawking then goes on to make the boldest claim: 'Traditionally these are questions for philosophy, but *philosophy is dead*. Philosophy has not kept up with modern developments in science, particularly physics. Scientists have become the bearers of the torch of discovery in our quest for knowledge' [emphasis added].

Stephen Pinker (2013, no page cited), renowned Harvard psychologist, claims that science rather than religion must answer 'the most ambitious, the deepest questions about who we are, where we came from, and how we define the meaning and purpose of our lives'. Pinker is so bold as to claim that 'the belief systems of all the world's traditional religions and cultures' are 'factually mistaken'. What is to replace those belief systems? A 'worldview given to us by science'.

Pinker admits that while 'scientific facts do not by themselves dictate values, they certainly hem in the possibilities'. In his view, the facts of science constrain our values, 'forc[ing] us to take responsibility for the welfare of ourselves, our species, and our planet'. Pinker proposes to bridge the fact/value divide by claiming that facts in some measure dictate values. His overarching value is 'the flourishing of humans and other sentient beings'.

Pinker claims that his value system is a humanism grounded in science, one that is 'becoming the *de facto* morality of modern democracies, international organizations, and liberalizing religions, and its unfulfilled promises define the moral imperatives we face today'.

Against Hawking and Pinker, we argue that philosophy rather than science is our instrument for the creation of new knowledge. It is also the source of our value systems. The highest degrees our universities award is the PhD, the doctorate of philosophy. In its original sense, *philosophy* means love of wisdom. *Wisdom* in its simplest sense means total knowledge, both theoretical and practical. We award the PhD to those who contribute stepping stones on the path to wisdom by solving unsolved problems through their research. Philosophical ideas have helped change the lives of billions, starting in ancient Africa (Verharen, 2012a), moving through Asia, and culminating in the Euro-American traditions that have led to global climate change (Gardner, 2011), weapons of mass destruction and the misery of billions in the Global South.

We require a new philosophy for the twenty-first century. Not a philosophy as the Austrian philosopher Ludwig Wittgenstein (1921/1961) would have it that examines the limits of language, but rather one that examines the limits of life. That must be the vocation of philosophy in a century marked by global challenges to life.

We define *philosophy* through three principles. First, philosophy is the extreme exercise of the brain's capacity to reduce the complexity of experience to simple or single principles. Whoever can capture the greatest range of experience with the least number of symbols is a thinker forever to be venerated by the human community. The greatest philosophers as scientists have captured the essence of life and the universe and how they work through the most economical concepts – gravity/Kepler, Galileo, Newton; evolution/Darwin, Wallace; relativity/ Einstein.

Second, philosophy is the brain's capacity to recognize that its powers of processing information do not dictate the structure of the universe or any reality beyond the universe. The brain's powers develop gradually over time. Its initial attempts to explain what it cannot yet explain map its own processes. This natural flaw is called *anthropomorphism*, from the original Greek, *human-shaped*. Its correlate is the assumption that the purpose of the universe must be its most intelligent product – humanity. This second natural flaw is called *anthropocentrism*, from the original Greek, *human-centered*.

Third, philosophy does not simply describe or explain our experience or reality in the most general terms. Philosophy is prescriptive. It tells us how to live our lives. The greatest philosophers as religious figures or atheists have compressed all rules for life into single principles: meditation/Hindus, Buddhists, Taoists; community/Mo Ti (or Mo Di), Stoics, Christ, Nagarjuna; freedom/Kant, Hegel, Marx, Nietzsche.

Philosophy is the comprehensive vision that tries to fit all of our experience into a comprehensible whole. It is the process of answering all the important questions that we cannot begin to answer with any degree of final certainty: how did we get here, where are we going, and how are we supposed to live.

Philosophy commits itself to a single principle that must never be forsaken. That principle is the idea that all principles must be subject to rational scrutiny and revision. To be *rational* in the most practical sense is to pursue a goal with appropriate means. Human rationality is distinguished in part by the use of reason to connect experiences through concepts. Concepts or ideas are abstractions of patterns or *in-formation* from experience. Rationality's principles are themselves subject to revision over time

How philosophy guides science

Science, too, grounds itself in a single principle that must be unquestioned. That principle is a commitment to finding consensual grounds of experience to support all scientific claims. The term *science* comes from the same root as *scissors* or *schizophrenia.* In its original home the term meant *to cut.* Science is quite literally the process of cutting experience into its manifold parts and then reassembling those parts through networks or patterns of information called *theories.* Science furnishes generalized descriptions of experience. The practical aim of science is to predict *what happens when* …. What will happen when I drop the ball? It will fall. Yes! But how fast will it drop and more importantly, why will it drop?

The best result we have achieved so far is to be able to predict the rate of fall (on the earth's surface) with the equation, $S=1/2gt^2$: It will accelerate at the rate of 32 feet per second or 9.8 meters per second for every second that it falls. However, we do not yet have satisfactory answers to the question, why will it fall? From Newton's research we know that bodies with mass attract each other with a force directly proportional to their masses and inversely proportional to the square of the distance between them. In simpler terms, more massive bodies are more strongly attracted to one another, but the force of attraction falls off as distance separates the bodies.

But why? The *force of gravity* appears to reach out across empty space to compel bodies to act in gravitational ways. Newton said he had no idea how that could be possible. The French philosopher Descartes thought that 'empty' space was really a plenum filled up with an invisible fluid called *aether.* This fluid moves in invisible vortices or tornado-like movements that force bodies into gravitational patterns. Einstein thought that massive bodies curve the shape of space around them to make bodies behave in gravitational ways. However, no one knows why this might be so (Verharen, 2012c). Philosophy's task is to propose highly generalized explanations that can be reduced to empirically testable descriptions.

The hallmark of the mind's sophistication is to separate explanations of our experience from our human-centered encounter with experience. Modern science began its dramatic revolution when anthropomorphic explanations of phenomena were replaced with generalized descriptions. In Aristotle's ancient science, bodies fell from heights to the earth because they 'longed for their resting place'. In our contemporary science, we accurately predict their rates of fall, but we leave untouched the human-like reasons for their falling. We impute their falling behavior to a 'gravitational force', but no one claims to know the mechanism of that force. It is as it ever was, a complete mystery.

A limitation of science is that scientific theories only provide descriptions of *what happens when* …. Scientific explanations for those descriptions simply reduce to more general levels of description (Feynman, 2001/1964). For example, *heat* used to be regarded as a mysterious substance, the *caloric*, that was transmitted by agents such as fire. Now heat is simply described as the *mean kinetic energy* or average motion of the molecules of any substance whatsoever.

A deeper limitation of science is that no matter how useful a scientific theory is for predicting and controlling experience, there is no guarantee that the theory may not be supplanted by a more comprehensive or accurate theory. Physicists were convinced for 200 years that Newton had captured all there was to know about gravitational motion in the universe. Einstein destroyed that conviction when he showed that Newton was able to describe only motions of bodies that were not extremely massive or fast. Newton's generalizations about gravitational motion are still used to calculate the orbits of rockets and satellites. But they can't be used to predict the motions of very fast bodies such as photons or very large bodies such as suns or galaxies.

Like philosophy, science exhibits massive limitations. While science boasts the capacity to achieve consensus about the usefulness of its accepted theories for predicting and controlling experience, that consensus may be proven wrong over time. And science cannot begin to capture the answers to Hawking and Pinker's questions, which are completely beyond the powers of consensus to address: where did we come from, why are we here, and how should we live?

Science's task is to narrow the answers to such questions to the point that they become testable hypotheses. Through Darwin's research, biologists have promising descriptions as to how our life form evolved from other kinds of life. The most speculative science about the origins and structure of the universe offers provocative theories about there being billions of universes beyond the one we appear to inhabit. However, the most that science can do at present is to offer speculation about the origins of those universes. Science (Rundle, 2004) offers no consensual answer to the question, *why is there anything rather than nothing?*

The global history of philosophy shows how 'preposterous' new ideas gradually become the stuff of common sense (Collins 1998). In the beginning we imagine that we on earth inhabit the center of the universe. We imagine that humans and animals cannot spring from the same source. We imagine that length, mass and time are constants that cannot change as a function of observers' relative speeds. We imagine that our primary goal is to survive rather than sacrifice our lives for the sake of a universal community (Christ) or universal freedom (Marx).

Revolutions in the history of thought destroyed all these philosophical assumptions, replacing them with new ones. With the wisdom of Socrates, we cannot imagine that these new assumptions will stand the test of time unchanged. Philosophy's universal descriptions of experience function as rules for the direction of life at the interface of philosophy and science. The enterprise of science rests on the highly generalized and hence unprovable philosophical assumption of the universe's regularity. In Bertrand Russell's (1912) elegant phrasing, we can rely on future futures to

resemble past futures. We can expect the same phenomena to occur under identical initial conditions. Philosophical hyper-generalizations such as this one cannot be proven. Nevertheless, without this critical assumption, the pursuit of science would be folly.

This philosophical directive bedeviled Einstein in his quest to find an underlying mechanism to explain the stochastic or statistical nature of quantum or sub-atomic phenomena. In his famous words, 'God does not play dice with the world'. Other 'philosophers of science' like Bohr and Heisenberg were content to accept the probabilistic nature of sub-atomic phenomena. Einstein appears to have lost this battle – for the moment!

The most powerful demonstrations of the interpenetration of philosophy and science are the hypotheses emerging from contemporary physics and neuroscience. Working within the mathematics of contemporary physics, some physicists (and philosophers) make the claim that there must be multiple universes in addition to our own (Greene, 2011). More far-fetched but proposed as a consequence of string-theory mathematics is the idea that our universe is a computational cloud generated by an intelligent species far more advanced than ours (Greene, 2011). A neuroscientist is so bold as to announce empirical evidence against human free-will, while insisting that belief in free-will must continue in order to insure social stability (Gazzaniga, 2011). These examples show that the borderline between philosophy and science is porous. They also show that philosophy cannot be restricted to individuals whose academic credentials allow them to enter the profession of philosophy.

Rather than thinking of philosophy and science as separate disciplines, it is best to think of them as continua on the spectrum of thinking, distinguished only by their degrees of generality. At the height of its speculative power, science is philosophy. Newton, Darwin and Einstein were *philosophers* who proposed seemingly preposterous theories. Their respective beliefs in the unity of the heavens and earth, all living beings, and mass and energy were unacceptable to their contemporaries. And philosophy becomes science over time in limited cases. The Greco-African thinker Aristarchus claimed more than 2 000 years ago that the planets revolve around the sun. Common sense experience contradicted his belief. We need only to look up to the sky to see the stars, sun and planets revolving around us! Now his claim is demonstrated scientific fact.

Historically the lag between 'preposterous' philosophical innovation and empirical confirmation has consumed millennia. Based on his conviction about the centrality of the sun to the cycle of life, Aristarchus' bold hypothesis had no immediate consequences (McEvilley, 2002). The Copernican revolution in 1543 did not achieve definitive empirical confirmation until instruments powerful enough to detect stellar parallax were available in 1838 (Friedrich Bessel). Historical examples of answers to philosophical questions becoming scientific fact are quite rare, however. We may have to accept the fact that philosophy's deepest questions can never be answered in consensual ways. The problem is that we must have answers to these questions in order to know how to live. Despite its unavoidable uncertainty, philosophy dictates the directions of our lives.

The consilience of philosophy, ethics, science and technology: a model

Philosophy guides science in four quite different ways. First, as we saw above, philosophy proposes very general ideas, often initially regarded as preposterous, that must be reduced to more specific hypotheses that can be tested through shared experience. Philosophy's imaginative power drives scientific innovation.

Second, philosophy governs how research in science is to be conducted. Philosophical principles dictate the kind of work a researcher commits herself to in her field. Philosophy maps the controversies in cutting-edge science. String theorists, for example, insist that their purely mathematical approach to finding a grand theory that unifies the four physical forces (gravitational, electro-magnetic, nuclear weak and strong) may finally be submitted to empirical tests. Einstein spent much of his career in search of the hidden variables that would eliminate the need for purely statistical equations in quantum mechanics.

Third, philosophy also dictates the relations that researchers develop between science and technology. Einstein did not connect his famous 1905 equation of matter and energy with the technology of nuclear weapons. However, subsequent discoveries about the nature of nuclear particles showed that conversion of matter into energy could yield extraordinary force. Einstein co-signed a letter to President Franklin Roosevelt in 1939, recommending the initiation of the Manhattan Project. The lag between science and technology can be extensive. But philosophical commitment drives researchers to connect science with technology – and vice versa.

Fourth, philosophy's most difficult enterprise is the evaluation of applications of science and technology in the field of development in the most general sense of that term. In this broad sense, nuclear weapons constituted an unprecedented *development* in the history of technology. Philosophy's task as ethics is to evaluate that kind of development, whether it has been a force for good or evil. Philosophy has the same task in the narrower sense of *development* as the application of technology in geographical areas that have historically had limited access to state of the art technologies. In both cases, philosophy's evaluative task is identical. The difficulty is finding a rational foundation for this kind of assessment. The success of philosophy's innovations in scientific research can be measured through consensus on empirical confirmation of scientific hypotheses. Philosophy's innovations in technology can be judged by their practicality. Yet philosophy's innovations in the field of development in both the broad and narrow senses have achieved no consensus whatsoever in the 5 000 years since

ancient Africans wrote down the first codes of ethics. When there is no possibility of empirical confirmation of theories as to the best ways we should live our lives, what hope can there be for objective ethical guidelines for development?

Ethics in science and technology

Historically, the most influential generalized evaluation systems have taken the form of commands. *Thou shalt!* These powerful ethical systems stand in stark contrast to the descriptive systems of science and technology that take the form of *This is how things stand*, or, *This is what happens when* …. Science and technology present descriptions of how things are. Ethics presents descriptions of how things *ought to be.* This is the classical gulf between facts and values, between the *is* and the *ought.* Can the gulf be bridged in such a way that consensus can be reached on universal values? Researchers like Pinker (2011) point to the United Nation's declarations of universal rights as bridgeheads for this endeavor.

Researchers divide themselves into two camps. Hauser (2006), Harris (2010) and Joyce (2006) attempt to unite ethics and science by claiming that ethical systems have their origins in the evolutionary process. Blackburn (2001) and Singer (2011) dissuade such efforts. Blackburn's argument is that the mind has two functions: comprehension and will or desire. The former is the province of science and the latter the field of ethics.

While we agree with Blackburn that values are not reducible to facts, we propose a middle ground. Values spring from desires, as Blackburn claims. However, desires are facts. We desire to live, to learn, to love. The science of evolutionary theory appropriately attempts to describe the nature and origin of desires as facts. The point of ethics is to select desires that are to be acted on. That decision process is the heart of ethics and not subject to scientific analysis, except through psychological analysis of why we come to have the desires we have.

What is subject to scientific analysis is the experimental process of determining the most appropriate means to achieve our desires. If humanity can achieve consensus on such ethical proclamations as the UN declarations of universal human rights, then science, engineering and technology must be called into play in order to realize how to ensure those rights. If a community does not have access to the means of survival, for example, then a team of ethicists, social and physical scientists, aid organizations and most importantly community members must collectively analyze the ends/means actions to be taken.

We propose the inauguration of an interdisciplinary field that could be termed *teleonomics* or *teleologistics*. Its function would be the assessment of means/ends relationships in the service of international development (Kher, 2013). The term is taken from the Greek *telos*, meaning end or purpose. The term *teleonomics* is used by some biologists to indicate the study of meaning or purpose in nature. However, few researchers now agree that the imputation of purpose to nature will have verifiable results. Exceptions such as Thomas Nagel's (2012) polemic against neo-Darwinism are duly noted.

Ancient African ethics and contemporary African development

Eurasian ethical systems have accompanied the world to unprecedented crises. Eurasian nations have singled out ethical goods that may challenge the species' survival if they are pursued past the point of moderation. The European hyper-focus on rationality through the pursuit of mathematics and science has yielded extraordinary power. Einstein's $E=mc^2$ is perhaps the single most powerful practical statement ever uttered by a human being inasmuch as it served as the imaginative key to nuclear weapons. The force of those weapons has helped to stave off global warfare for more than sixty years, although local wars and genocide have multiplied. Over 5 million have been killed in the Eastern Congo since 1998 (*New York Times*, 2013). Nevertheless, the proliferation of nuclear weapons poses a grave threat to life. While chemical and biological weapons of mass destruction do not yet have the destructive power of nuclear weapons, they may pose an even greater threat to life in the near future. The Global North's focus on individual freedom as a primary ethical goal has led to a globalized economic model that does not address the misery of billions in the Global South.

On a narrower scale, international participation in development in Africa has in many cases been problematic. Non-African ethical principles and personnel have in some measure directed African development, resulting in unsustainable and sometimes destructive outcomes (Faola and Achberger, 2013). In this section, we examine ancient African ethical principles as substitutes for international principles of ethical development based on Eurasian ethics.

The wisdom of both the ancient Egyptians and Ethiopians is to pursue a comprehensive approach to ethics. While Eurasian ethics tended to single out particular ethical objectives, ancient African ethics sought ways to harmonize sometimes conflicting aims. Ancient African ethics stand out by not ranking a single ethical good over all others. The principles of *Maat* in ancient Egypt and *Naaga* in the Oromo culture in Ethiopia require the harmonization of all ethical goods (Verharen, 2012a). Both terms are translated as *harmony, order, justice, peace, tranquility.*

What separates ancient African ethics from Eurasian and North American ethics is their holistic focus. Both the principle of *Maat* in ancient Egypt and the principle of *Naaga* in Oromia stress the importance of harmonizing all aspects of life without giving overarching emphasis to any one human desideratum or ethical good. Other continental ethical systems focused on the supreme importance of pleasure, meditation, or community bonding. European and North American ethics overemphasized the importance of freedom or creativity in achieving a good life, culminating

in the contest between Marx's socialism and Adam Smith's capitalism.

European cultures more generally concentrated on rationality as life's most important objective. Both Plato and Aristotle believed that the perfect life was one wholly dedicated to school. The purpose of school (from the Greek *schole*, leisure) was the exercise of reason joining experiences together through abstract patterns, concepts or ideas. European cultures capitalized on the power of reason to develop the means of transport and weapons that allowed them to enslave or colonize virtually the whole world.

Several points are critical to defining the uniqueness of ancient African ethics. First, they make no point of separation between human life and other life. The Egyptian gods are theriomorphic, combining the features of both animals and humans (Faulkner, 2005/1972). The Ethiopian Oromo declare that there are laws for humans and laws for animals as well (Lencho, 2012). Both species must strive to work for *Naaga* or harmony throughout their lives.

Second, ancient African ethics do not distinguish between living beings and non-living beings, between humanity and nature. Natural features like the waters of the Nile and fields of grain are the preserves of the gods; they must be treated with the respect that *Maat* enjoins. The Oromo are famous for their attempts to preserve the natural features of Oromia against the depredations of Ethiopian emperors (de Salviac, 2005/1901). The ancient Egyptians anticipated radical developments in contemporary ethics such as biocentrism and ecocentrism by some 5 000 years.

Third, the ethics of the pharaoh Akhenaten (~1350 B.C.E.) specifically proclaim that *Aten*, the god of light, creates both the world and its human inhabitants out of its own substance. All humans are co-equal in *Aten's* eyes (Hornung, 2001/1999). Unlike other ethnic groups, claiming they are god's chosen people, ancient Egyptians recognized the creative hand of god in every culture. While earlier Egyptian texts declare that non-Egyptians are 'sand-dwellers', contemptible and incapable of building the great monuments that characterize Egyptian civilization, Akhenaten's two hymns to *Aten* declare that all humans regardless of language, skin color and monumental achievements, are children of god, created out of god's own substance – light.

Fourth, ancient Egyptian ethics declare that the origin of the universe is not a human-like god with infinite intelligence and power but rather a natural substance like *Nun*, the chaotic water-like origin of the universe for the earliest Egyptians (Faulkner, 2005/1972), or *Aten*, the power of light that is the origin of the universe for Akhenaten (Hornung, 1999/1995). As the first humans on written record to proclaim their origins in nature herself, the ancient Egyptians are the first to renounce anthropomorphism, or the natural conviction that all explanations must take the form of human experience. Virtually all ancient cultures create their gods in the image of human beings, with all their foibles – pride, covetousness, lust, anger, envy, often resulting in wholesale slaughter of innocents. The most ancient Egyptians are no exception to this principle, as is manifest in Seth's murder of Osiris, the eternal struggle for power between Seth and Horus, and the marriage of Isis and Osiris as brother and sister (Lichtheim et al., 2006).

However Akhenaten some 3 300 years ago abandons the natural human tendency to create gods in the image of humans. His god is singular rather than plural. He is the inventor of monotheism in the sense that he believes there must be only one god. However, his monotheism is actually a cosmotheism or pantheism in the sense that *Aten* as light transforms itself into the billions of forms that make up the universe as we know it (Assmann, 1996).

Fifth, the ancient Egyptians are the first to renounce anthropocentrism, or the conviction that the purpose of the universe must be humanity itself. Other cultures imagined that a human-like god created the universe for the sake of humanity, with humans expected to take dominion over the earth, and with god's chosen people to take dominion over all other peoples. The ancient Egyptians transcended both ethnocentrism and anthropocentrism to ascend to acentrism, the conviction that the harmony of all beings, human and animal, organic and inorganic, is humanity's purpose. While their political systems were hierarchical, their underlying philosophical principles were egalitarian (Hornung 1999/1995).

Sixth, the ancient Egyptians were the first to renounce vengeance (Lichtheim et al., 2006). The primary mandate for all beings is *Maat*, the principle, the goddess of harmony. When a community member departs from the appropriate harmony of her community, the first responsibility of the community is to restore that member to the community. Where the community lacks the intelligence or power to execute that restoration, then it may resort to execution or exile for lack of the Maatian option – only as a last resort and only with full recognition of its powerlessness.

Seventh, the Oromo peoples of Ethiopia were perhaps among first to renounce the natural conception that some humans are more fit to rule than others. The Oromo *gaada* system is perhaps the first truly democratic polity that has survived even to the present day (Legesse 2006, 1973). Nevertheless, as perhaps one of the oldest human groups, the Oromo suffered under the constraints of sexism, an overarching characteristic of our species – even to the present moment. The ancient Egyptian concept of flourishing does not in principle privilege men over women. Nevertheless the queen Hatshepsut wore a simulacrum of a beard in her role as pharaoh (Roehrig et al., 2005). Class divisions in ancient Egypt included slavery. However, the empire's embrace of slavery did not rest upon a philosophical dehumanization of the slave. Oromo democracy cannot condone the separation of males into the free and the slave. Nevertheless, the Oromo exclusion of women from democratic processes means that only a combined Egyptian/Oromo ethics can serve as a foundation for contemporary African ethics (Verharen, 2008).

However, this foundation requires a superstructure comprised of research on the full spectrum of African ethics. Ancient African emphasis on harmony is compatible with more recent African emphasis on the networks of mutuality expressed across Bantu ethics. In the best case, research into African ethics will be complemented with that of Africans in the diaspora.

Finally, ancient Egyptian and Ethiopian ethics might inspire researchers to examine ethical principles through scientific as well as philosophical lenses. Both these ancient African philosophies found ethics to be inseparable from the structure of the universe. Contemporary psychologists and biologists imagine that our capacity to be ethical is comparable to our capacities to learn languages and to be rational (Thagard, 2011). Ancient African thinkers speculated that 'doing the right thing' was something that comes naturally to humans. And what comes naturally is in turn a gift of nature. Contemporary research efforts to merge ethics with the sciences of nature may give us an extraordinary impetus to re-examine the experience of our African ancestors in searching for new ways to ensure that we pass the gift of life on to our children's children (Diamond, 2013).

Education as the cornerstone of ethical sustainable African development: a pan-African core curriculum

To be both ethical and sustainable, African development must be guided by African principles. Eurasian ethical systems have precipitated underdevelopment in Africa. Enslavement and colonization of Africa's peoples were somehow seen as compatible with Christian and Islamic ethical principles for nearly half a millennium. Contemporary globalization's ethical principle is the exercise of *rationality* in the pursuit of *freedom*, understood as the global flow of capital unrestricted by its devastating consequences for populations in both the Global North and South (Stiglitz, 2003). While some two billion of the world's seven billion people have ample access to the provisions for survival and flourishing, the rest have descending degrees of opportunity. For the final billion, many of whom are African, even survival is not assured. And flourishing is far removed from consideration.

Because Eurasian ethical principles permeate the world through globalization's devices, the task of linking African ethical principles to African political, economic and social action will be daunting. Grounding African development in truly African ethical systems is a movement that can only take place through education. The first principle of that education must be that African students have access to their own cultural traditions from their first moments of formal schooling. We and our colleagues, Phindile Lukhele-Olorunju, Mammo Muchie (both at Tswane University of Technology), Les Bank (Fort Hare University, East London) and Bekele Gutema (Addis Ababa University) are working toward assembling an international group of scholars who can translate the extant scholarship on ancestral African cultures into K-12 curricula. Our final objective is to extend the quantity and quality of this research all the way to PhD programs offering specializations in those cultures. What's needed is a movement toward a complete account that can serve as the foundation for a Pan-African education grounded in African traditions.

That's not to say that African students will not have access to the world's global store of knowledge. However, the foundational principle of a Pan-African curriculum is first to know oneself through one's distinctive cultural heritage before beginning to encompass the global cultural heritage. As ancestral African cultures are rapidly disappearing, the ethical priorities of African universities should be matters for urgent discussion. The primary objectives of universities with research capacities should be the survival and flourishing of the populations that sustain such institutions (Verharen, 2012b; Gutema, 2012). If the primary justification for universities as research institutions is the solution of unsolved problems, then the problems of a university's supporting populations should take first priority (Sheikh and Bhat, 2013). Nevertheless, there should be no imbalance between theoretical and applied research at African universities. The most abstract theories may in the long run lead to the solutions of the most practical problems. The application of nuclear physics theory to nuclear weapons technology dramatizes this point.

The most urgent need for research in African universities is on the instrument that will give virtually all Africans access to survival and flourishing. Development proposals that are not grounded in the education of community members for whom the development is proposed cannot be sustainable. And development that is not sustainable cannot, except in rare cases of emergency, be ethical. Communities that cannot assume responsibility for their own survival and flourishing must invariably be at risk.

Until this moment in human development of technology, the quality and extent of education was necessarily the unbreachable divide between those who controlled their lives and those who could not. For the first time in our five thousand year written history, we are now able to realize the Pan-African scholar W.E.B. Du Bois' dream: universal university education. Du Bois (2001) believed that the first mission of historically black colleges and universities (HBCUs) in the United States was to train the 'talented tenth' of the African American population to solve the problems of African American communities. Students were to be trained as doctors, lawyers, engineers, architects and the like in order to return to their communities to solve their unsolved problems. That mission was a mission that all universities, whether African American, African or Euroasian have shared.

The second mission for HBCUs was both daunting and unique. It was to motivate their students to teach community members how to solve their own problems. Du Bois was one of the first theorists of education to propound the necessity for service learning.

The third mission for HBCUs only came to Du Bois after his rejection of his initial 'talented tenth' philosophy. His growing embrace of socialism led him to believe that virtually all humans had the capacity for a university-level liberal arts education, one that fully integrated the most abstract sciences and humanities with practical arts disciplines such as engineering and law, medicine and business. In the last years of his life, he took this philosophy of education to Ghana, where Kwame Nkrumah supported his research for the production of an *Encyclopedia Africana*, the work that was to be the cornerstone of a Pan-African curriculum (Lewis, 2000).

In his own time, Du Bois' dream of a universal university education could only be a faint hope for the future. In our own time, however, we have acquired the technology to make that dream come true. That technology coupled with Du Bois' dream must be the foundation for all future African development. The technological innovation that makes this possible is the internet. Just as the invention of the cellphone permitted Africa to 'leapfrog' the many tons of copper and other infrastructure necessary for telephone communication, so broadband offers the promise of universal university education (Sithole et al., 2013). Universal African broadband access will 'leapfrog' the tons of paper that would have been required for the education in survival and flourishing of Africa's billion persons.

The instruments for making broadband as available to Africans as cellphones should be primary targets of research for African universities. International interest in universal broadband access is growing. Facebook founder Mark Zuckerberg claims that it is a scandal that only two billion in the world have broadband access. His interest in universal access is perhaps both ethical *and* commercial (Kizza, 2013).

Out of the same kind of ethical and commercial interests, research universities like Harvard and MIT, Oxford and Cambridge are making their top researchers' lectures available on the internet for free download as MOOCs, or Massive Open Online Courses (Bowen, 2013). Sebastian Thrun, one of the first developers of MOOCs, offered a course in artificial intelligence to 160 000 students from 190 countries (Auleta, 2012). He and others are working to commercialize the MOOCs through corporations such as Udacity and Coursera. These companies enter into agreements with research universities whereby students who pass supervised tests on MOOCs receive credit toward degrees.

The obvious drawback to MOOCs is the drop-out rate. Few students complete the courses they undertake, and even fewer of those can be certified as competent in the course material. One remedy being tried out in universities that wish to take advantage of stellar MOOC lectures is called the 'flipped classroom'. In this model, students are required to watch the MOOC lectures before coming to conventional classrooms in their universities. Rather than spending time on lecturing, instructors engage students in discussions on the MOOC lectures. The aim is to make sure that students have understood the lectures to the point where they are able to practice the skills imparted in the lectures.

The 'flipped classroom' technique is a way of making use of MOOCs that still requires formalized institutions of higher education for its effectiveness. The cost of that kind of education prohibits its use for the realization of Du Bois' dream of universal university education, especially in a continent like Africa that suffers from centuries of political and economic abuse.

However, Sebastian Thrun offers a solution to that problem that may be linked to Du Bois' vision of the mission of HBCUs. Du Bois' breadth of vision as a Pan-African thinker permits a transition from HBCUs to African universities. Thrun asks the question, why should a university's responsibility to its students stop at graduation? Why should not universities commit themselves to life-long learning for their students? Thrun does not detail a plan for how that mission might be carried out, but we offer the following four steps. The first would be to universalize the practices of the most heavily endowed universities' alumni magazines. Harvard's alumni magazine, for example, keeps its graduates abreast of the most important developments in virtually all of the university's research fields (http://harvardmagazine.com). African universities' alumni magazines can be broadly distributed through the internet.

The second step would be a routine online updating of materials students were introduced to in their major, minor and general education courses. Since many African universities follow the British model of inducting post-secondary school students into professional courses such as law or medicine, this step could be problematic for some African students. Wealthier United States universities require a liberal arts education covering the natural and social sciences and humanities as a pre-requisite for professional education in law, business or medicine. Such an education gives students a wide background in problem-solving skills. Adding general education courses to African university students' curricula would be critical to realizing Du Bois' plan for university education.

The third step would be for universities to offer a compendium of free online courses to their alumni. In addition to the MOOCs offered by the wealthiest global universities, each African university should offer its own alumni courses by its most inspiring lecturers. All universities should have a sense that while they are offering universal knowledge to their students, they are at the same time deeply connected to the communities in which they are embedded. Where those communities are responsible for the fiscal health of the universities, the universities have deep ethical commitments to their sponsors. The very best lecturers in each university can make those commitments come to life for their students – and alumni.

As the flipped classroom experiments are beginning to make clear, online courses for alumni cannot achieve

their goals independently of face-to-face communities of learning. While online communities of learning may prove to be successful in the long run, the power of face-to-face discussion groups still justifies the existence of traditional universities. Universities taking responsibility for life-long learning will be responsible for organizing discussion groups for alumni in their respective locations. In the best case, university alumni with professional competence in the field of interest will assume responsibility for guiding the discussion groups.

Once alumni are thoroughly grounded in the skill sets for solving problems both in their professions and their larger areas of interest, then Du Bois' model for service learning can be translated from the university environment to the alumni environment. As we saw above, students are expected not simply to acquire the skills for solving community problems but are more importantly expected to pass those skills on to community members. In the same way that universities will set up life-long learning communities for their graduates with the assistance of MOOCs and other online instruction, so alumni will set up comparable communities of learning for their fellow citizens who have not had the privilege of attending a college or university.

Alumni commitment to life-long learning for their community members can be the bridge to realizing Du Bois' vision of universal university education. This venture will require all the resources of African science, technology, innovation and development. The key here is innovation, particularly in the fields of ethics and education. African ethical principles must be the foundation for sustainable African development. Such development can only be grounded in universal education – in the long run, we may hope, even to the university level. Innovation in education is critical to this goal.

Once again, technological developments in computation and broadband access may allow Africa to 'leapfrog' the heretofore massive costs for such education. An educator is the very best case is a mind-reader, knowing what is going on in a student's mind and able to direct the student's attention to the best purpose. A teacher in a classroom of thirty or forty or two hundred students cannot read her individual students' minds. The best model for education is the tutorial, the one-on-one education taken to its height in the Oxford and Cambridge tutorial systems – or in parents' education of their children one by one.

The tutorial model is prohibitively expensive and hence commonly replaced by the class model. And the class model, driven by economic constraints, lends itself to the perpetuation of classes, divided most broadly between those who know and those who do not know. In the tumultuous 60s when riots and flames enveloped large sections of Washington after the assassination of Martin Luther King, one of us entered his Howard University classroom to find this slogan written on the blackboard: 'No class today, no ruling class tomorrow'. The most important innovation in African technology for the present may be the development of expert tutorial programs. Self-teaching with these programs combined with community centers of learning with broadband access to all the world's knowledge can accelerate Africa's reclamation of her role as the first center of development in the world.

Note

1. Portions of this paper are adapted from Verharen et al. 2013a and Verharen 2012a.

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