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**From Banneker to Best:
Some Stellar Careers In Astronomy and Astrophysics**

by

Robert Fikes, Jr.
San Diego State University

*The heavens declare the glory of God;
The skies proclaim the work of his hands.
Day after day they pour forth speech;
Night after night they display knowledge.*
(Psalm 19: 1,2)

Though nearly 200 years passed between the time self-taught astronomer Benjamin Banneker (1731-1806) accurately predicted solar and lunar eclipses and publishing his almanacs containing astronomical tables, and when Dr. Neil de Grasse Tyson published the first of six books on astronomy and astrophysics in 1988, this fact should not be taken as proof that peoples of sub-Saharan African descent have long manifested a singular disinterest in, or inability to comprehend the intricate order and mysteries of the cosmos.

Studying the alignment of nineteen megaliths near Kenya's Lake Turkana in the Rift Valley, a region inhabited by the ancient Cushites, archaeologists have concluded that, among other things, these basalt columns functioned as astronomical observation tools and that they were key to the plotting of the Borana Calendar circa 300 BC. This stellar-lunar calendar is still used today by the pastoral Borana people of southern Ethiopia and northern Kenya. And although acquisition of knowledge of the existence of the Sirius star-system by the Dogon people of Mali has been the topic of heated debate, pitting Afrocentric proponents against Eurocentric skeptics, the point that is usually overlooked is the vital importance of examining the heavens to pre-industrial societies from one end of the continent to the other who relied on the stars to determine seasonal cycles, timing of festivals and rituals, crop planting and harvesting, and mating intervals.

Even in the slave experience in the United States there is evidence of Black using their familiarity with the night sky to guide them safely northward to refuge in the free states. Harriet Tubman and her escapees traveling the underground railroad memorized the secret song *Drinking Gourd* which instructed them to walk in the direction of the Big Dipper and the north star to freedom. After the Civil War and Emancipation the study of astronomy was not promoted in the new colleges sprouting up mainly in the South presided over by advocates of the kind of practical industrial education inspired by Booker T. Washington who eschewed the liberal arts and the peripheral sciences. On rare occasion do we hear of an African American in the first half of the 20th century with a smattering of astronomy like the enigmatic Robert T. Brown whose widely praised book *The Mystery of Space* (E. P. Dutton, 1919), largely a work of mathematical philosophy buttressing his mysticism and belief in theosophy, but which nonetheless demonstrated an impressive command of higher mathematics and an awareness of astronomical phenomena, all of which he successfully integrated in his book.

In the wake of World War II the number Blacks admitted to study at majority white colleges and universities rose and exposure to a greater variety of academic disciplines, coupled with accelerated advances in science and technology in the post-war era, made it possible for men like Carl A. Rouse to earn his doctorate in particle physics at the California Institution of Technology in 1956. A researcher at heart who avoided the classroom, while working in private industry he branched out into astrophysics and in his writings and lectures challenged mistaken hypotheses concerning intensely hot gases that constitute the sun

and stars. Rouse devised a new method to measure the presence of helium in the sun's atmosphere and he posed his own theories on the matter.

In 1961, Harvey Washington Banks became the first African American to earn the doctorate specifically in astronomy at Georgetown University. His dissertation was titled *The First Spectrum of Titanium From 6000 to 3000 Angstroms*. Unlike Rouse, the late Dr. Banks chose to teach and enjoyed a fulfilling career at Delaware State College and Howard University. His research interests included determination of orbits, celestial mechanics, high dispersion spectroscopy, and the geodetic determinations from the observations of solar eclipse and satellites. At the University of Michigan in 1962, Benjamin Franklin Peery, appropriately named, became the second Black to be awarded the Ph.D. in astronomy. He taught for many years at Indiana University then at Howard University before he retired. Aside from contributing numerous articles to the *Astrophysical Journal*, Peery has the distinction of being the first Black astronomer to be seen and heard by a mass audience thanks to a televised documentary on PBS stations in 1991 called *The Astronomers*. This was a gratifying jolt for one Black viewer who tuned in that night and later wrote:

While watching *The Astronomers* on public broadcasting, I saw something as awesome as the stars and galaxies that flashed across my TV screen. It was a phenomenon I didn't think existed, more intriguing than the most distant quasar. The miraculous sight I saw that evening was the interview of a Black astronomer.

Astrophysics is defined as that area of physics that pertains to the physical and chemical characteristics of heavenly bodies. Arthur B. Walker at Stanford University who started out in nuclear physics, and George R. Carruthers, an aerospace engineer at the U.S. Naval Research Laboratory, both earned their doctorates at the University of Illinois in the early 1960s and have made important contributions to astrophysics. From 1975 to 1985 Walker did pioneering work studying the X-ray spectrum of the solar corona and in the 1990s he led a team of scientists who, among other things, were the first to apply normal incidence X-ray optical systems to astronomical observation. But Walker may be best known as the mentor of Sally Ride, the first female astronaut to orbit the Earth, and for chairing the presidential commission that investigated the 1986 space shuttle Challenger disaster. More than his efforts in the community to encourage young scientists, Carruthers will forever be remembered as principal inventor of the Far Ultraviolet Camera/Spectrograph that accompanied the Apollo 16 mission. Positioned on the moon's surface, the camera allowed researchers for the first time to examine enormous expanses for concentrations of pollutants in the Earth's atmosphere. Other cameras developed by Carruthers and his colleagues have been aboard space shuttles surveying the ozone layer and to transmit photos of distant stars and planets for computer analysis. He is also credited with helping to introduce electronic telescopes on board NASA satellites that transform light into electrical signals which are relayed to Earth and televised.

In 1973 Ronald L. Mallett got his completed his doctorate in general physics with the title *Quantum Theory in a (3+1) de Sitter Universe* at Pennsylvania State University. He has published in the areas of the classic and quantum theory of black holes, relativistic astrophysics, and quantum cosmology. Currently, he teaches as a full professor at the University of Connecticut. He explains to us that his work on gravitational theory is based on the exact solution to the Einstein field equations, and that the solution has been used to study the Hawking radiation of evaporating black holes. In 1979, Gibor Basri received his Ph.D. in astrophysics at the University of Colorado at Boulder, not far from his hometown in Fort Collins. He has been at the University of California at Berkeley since 1982. One of the more inventive classes he has taught there in recent years is called *The Science in Science Fiction*. With a long list of technical publications that would be the envy of any professor in his field, Basri is probably best known for his research on substellar objects known as brown dwarfs or failed stars which emit so little light they were not detectable until 1995 when using the 10-meter Keck Telescope, the team he headed helped to confirm their existence. Basri published an article on the discovery of brown dwarfs in the April 2000 issue of the prestigious journal *Scientific American*.

Rounding out this older group of astronomers and astrophysicists is Charles H. McGruder, the long-time head of the physics and astronomy department at Western Kentucky University who took his doctorate in astrophysics at the University of Heidelberg (Germany). Also an adjunct professor at Vanderbilt University, McGruder has been particularly active in networking with other Blacks in the discipline and coordinating special programs to foster science literacy among minority students via astronomy.

Since writing a 366-page dissertation at the university of Rochester in 1987, Charles E. Chick Woodward has been a Presidential Faculty fellow at the University of Wyoming where he still teaches, and a National Science Foundation fellow. His published research has been concerned with infrared spectroscopy, star formations, novae, and comets. In 1997, he co-authored an article on the baffling halo emission from Galaxy NGC5907 in the revered British science journal *Nature*.

In the 1980s and 1990s nearly as many doctorates in the field were awarded to Black females as to Black males. Graduating from college Phi Beta Kappa in physics, Barbara A. Williams went on to become the first Black female to acquire the terminal degree in astronomy in 1981 at the University of Maryland at College Park. Currently an associate professor at the University of Delaware, she is well published in her primary area of specialization: radio observations of compact groups of galaxies.

Mercedes T. Richards, Professor of Astronomy at the University of Virginia, earned the doctorate in 1986 at the University of Toronto. Born in Jamaica, her many publications have discussed Doppler tomography, close interacting binaries, circumstellar gas flows, optical and ultraviolet spectroscopy, and the magnetic activity of cool stars. Reva Kay Williams has taught mainly at colleges and universities in the southern states and has lectured abroad on black holes and the Penrose mechanism since acquiring her doctorate at Indiana University in 1991. Presently, she is on the faculties at both Bennett College and the University of Florida.

Chantale Damas, arrived in the U.S. from Haiti at age 11 and quickly decided she wanted to join the ranks of scientists like her hero, Albert Einstein. In 1993 she completed her dissertation in space plasma physics at the University of California at San Diego. She has taught at Long Island University and the Cooper Union and has been successful in obtaining grants to make physics and astronomy more accessible to non-science majors and in designing workshops for elementary school teachers who help overcome student reluctance to delve into science.

The next female holder of a Ph.D. in the field, Jarita C. Holbrook, received her degree in 1997 from the University of California at Santa Cruz. A National Science Foundation postdoctoral research fellow at UCLA, her interest is mainly in contemporary and historical African astronomy and cultural astronomy. Holbrook has traveled to Africa and the South Pacific to document celestial navigation techniques there and how new technologies have modified those techniques. Interestingly, she married her classmate at UCSC who is also an astrophysicist and she gave birth last March to a future stargazer, Mirabai Jamilla Dave.

Thus far, Beth A. Brown is the only female to capitalize on her Ph.D. in astronomy from the University of Michigan (1998) to find employment outside of academe. She works in the Astrophysics Data Facility at the NASA Goddard Space Flight Center in Greenbelt, Maryland devoting her time to multiwavelength research on elliptical galaxies and educational outreach targeting middle and high school students. She has co-authored several articles on the Crab Nebula and X-ray emission from early type galaxies.

With more than 60 televise interviews, a regular column on astronomy in the science magazine *Natural History*, six books on astronomy, and in his high profile job as the youngest ever director of the world-class Hayden Planetarium in New York City, Neil de Grasse Tyson has over the past several years become the nation's most recognized astrophysicist. Tall, personable, outgoing and blessed with the ability to translate complex cosmic phenomena into something everyday people can grasp. Tyson's seemingly meteoric rise in his profession actually began at age 9 when upon viewing the night sky at the Hayden Planetarium the Bronx native decided then and there he wanted to become an astrophysicist, though he could hardly pronounce the word. Being a gifted athlete did not sidetrack his childhood ambition as he went through Harvard, Columbia (Ph.D. in 1991), and did postdoctoral work at Princeton where he remains an adjunct professor. In his latest book, an autobiography titled *The Sky is not the Limit* (Doubleday, 2000), he enthralles the reader with his interpretations of the universe, but in the chapter 'Dark Matter' brings us down to Earth reminding us what it is like being a Black male in America where even a highly educated and visible scientist like himself is forced to endure indignities provoked by suspicious cops, shop owners, cabbies, and cocktail party bores who assume he is less intelligent, less law-abiding, and less deserving because of his skin color.

Among Tyson's Black contemporaries are Eric M. Wilcots (Ph.D., 1992, University of Washington) at the University of Wisconsin at Madison who, when he is not researching the chemical evolution of stars and galaxies he is the administrator of a very successful public outreach program that brings people to Wisconsin state parks to hear lectures and participate in observing sessions. Windsor A. Morgan (Ph.D., 1995, Pennsylvania State University) is assistant professor at Dickson College who has researched X-ray-emitting active galactic nuclei, new statistical methods of studying astronomical surveys, and the early formation of hydrocarbons in our solar system.

An intensely luminous star on the horizon is 32-year-old Aaron S. Evans at the State University of New York at Stony Brook who, incredibly, in his young career has published 30 articles since earning his doctorate in astronomy at the University of Hawaii in 1996. Evans' research has focused on supermassive nuclear black holes, ultraluminous infrared galaxies, radio galaxies/quasars, and superburst galaxies.

Finally, in this new generation of Black astronomers and astrophysicists is Jason S. Best at Shepherd College in West Virginia. His 1997 dissertation topic at the Pennsylvania State University was 'Use of Pointwise Dimension in an Analysis of Galaxy Clustering.' He is interested in fractal cosmology and virtual reality and thus far has published four research papers. And a steady, upward trajectory in the number of talented Black male and female astronomers and astrophysicists seems assured as we are aware of at least four Black graduate students set to take their doctorates in the field within the next two years.

Probably at some point in the career of most Black scientists the question is asked, if not by the scientist himself then by some outspoken or inconsiderate non-scientist, about the correctness of his choice of professions vis-a-vis the needs of people, or more bluntly should/could he have better used his brains to uplift his people instead of indulging his scientific curiosity. The question was posed to Benjamin Peery by a reporter for the Washington Post in 1992 and he responded: 'But that doesn't bother me...studying astronomy can change the way we view our human existence. The very reason we have universities is to develop a larger sense of what it is to be alive.'

When a Black school chum abruptly blurted out to Neil de Grasse Tyson that, 'Blacks in America do not have the luxury of your intellectual talents being spent on astrophysics,' he was taken aback. A decade later, after becoming known nationally and sought after as for his expertise on the heavens instead of the usual Black issues, he had reconciled his feelings ignited by the friend's comment. He wrote in his autobiography: 'Who knows when the time will come (when the notion of Black intellectual inferiority is buried). In the interim, I play my part in this journey. It is not that the plight of the Black community cannot afford having me study astrophysics. It is that the plight of the Black community cannot afford it if I don't.' Coming full circle, Tyson expressed sentiments identical to those of Benjamin Banneker who had hoped to influence the racial views of Thomas Jefferson when he forwarded his almanac along with a letter in 1791.