Observational Cosmology: From High Redshift Galaxies to the Blue Pacific

Halton Arp

Max-Planck-Institut für Astrophysik, Karl Schwarzschild-Str.1,
Postfach 1317, D-85741 Garching, Germany

E-mail: arp@mpa-garching.mpg.de

1 Birth of galaxies

Observed: *Ejection of high redshift, low luminosity quasars from active galaxy nuclei.*

Shown by radio and X-ray pairs, alignments and luminous connecting filaments. Emergent velocities are much less than intrinsic redshift. Stripping of radio plasmas. Probabilities of accidental association negligible. See Arp, 2003 [4] for customarily supressed details.

Observed: *Evolution of quasars into normal companion galaxies.*

The large number of ejected objects enables a view of empirical evolution from high surface brightness quasars through compact galaxies. From gaseous plasmoids to formation of atoms and stars. From high redshift to low.

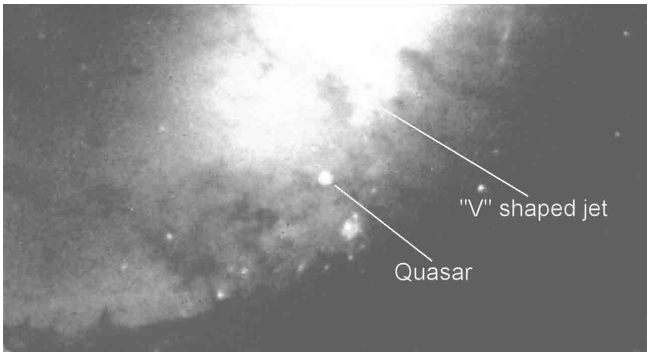

Fig. 1: Enhanced Hubble Space Telescope image showing ejection wake from the center of NGC 7319 (redshift $z = 0.022$) to within about 3.4 arcsec of the quasar (redshift $z = 2.11$)

Observed: *Younger objects have higher intrinsic redshifts.*

In groups, star forming galaxies have systematically higher redshifts, e. g. spiral galaxies. Even companions in evolved groups like our own Andromeda Group or the nearby M81 group still have small, residual redshift excesses relative to their parent.

Observed: *X-ray and radio emission generally indicate early evolutionary stages and intrinsic redshift.*

Plasmoids ejected from an active nucleus can fragment or ablate during passage through galactic and intergalactic medium which results in the forming of groups and clusters of proto galaxies. The most difficult result for astronomers to accept is galaxy clusters which have intrinsic redshifts. Yet the association of clusters with lower redshift parents is demonstrated in Arp and Russell, 2001 [1]. Individual cases of strong X-ray clusters are exemplified by elongations and connections as shown in the ejecting galaxy Arp 220, in Abell 3667 and from NGC 720 (again, summarized in Arp, 2003 [4]). Motion is confirmed by bow shocks and elongation is interpreted as ablation trails. In short — if a quasar evolves into a galaxy, a broken up quasar evolves into a group of galaxies.

2 Redshift is the key

Observed: *The whole quasar or galaxy is intrinsically redshifted.*

Objects with the same path length to the observer have much different redshifts and all parts of the object are shifted closely the same amount. Tired light is ruled out and also gravitational redshifting.

The fundamental assumption: *Are particle masses constant?*

The photon emitted in an orbital transition of an electron in an atom can only be redshifted if its mass is initially small. As time goes on the electron communicates with more and more matter within a sphere whose limit is expanding at velocity *c*. If the masses of electrons increase, emitted photons change from an initially high redshift to a lower redshift with time (see Narlikar and Arp, 1993 [6])

Predicted consequences: *Quasars are born with high redshift and evolve into galaxies of lower redshift.*

Near zero mass particles evolve from energy conditions in an active nucleus. (If particle masses have to be created sometime, it seems easier to grow things from a low mass state rather than producing them instantaneously in a finished state.)

DARK MATTER: *The establishment gets it right, sort of.*

In the Big Bang, gas blobs in the initial, hot universe have to condense into things we now see like quasars and galaxies. But we know hot gas blobs just go poof! Lots of dark matter (cold) had to be hypothesized to condense the gas cloud. They are still looking for it.

But low mass particles must slow their velocities in order to conserve momentum as their mass grows. Temperature is internal velocity. Thus the plasmoid cools and condenses its increasing mass into a compact quasar. So maybe we

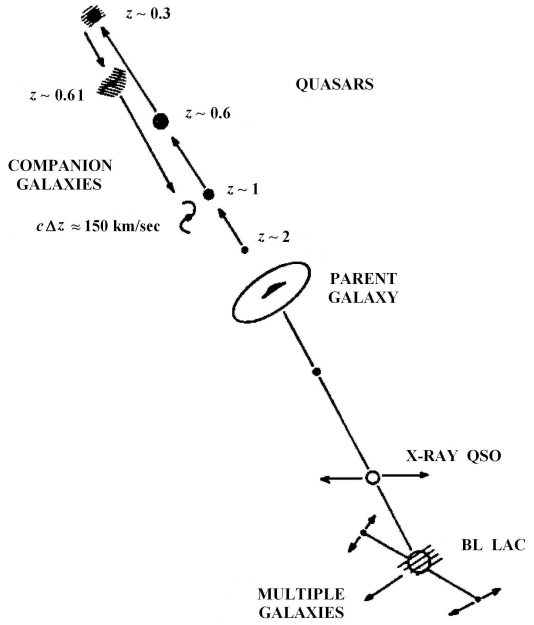

Fig. 2: Schematic representation of quasars and companion galaxies found associated with central galaxies from 1966 to present. The progression of characteristics is empirical but is also required by the variable mass theory of Narlikar and Arp, 1993 [6]

have been observing dark matter ever since the discovery of quasars! After all, what's in a name?

Observed: *Ambarzumian sees new galaxies.*

In the late 1950's when the prestigious Armenian astronomer, Viktor Ambarzumian was president of the International Astronomical Union he said that just looking at pictures convinced him that new galaxies were ejected out of old. Even now astronomers refuse to discuss it, saying that big galaxies cannot come out of other big galaxies. But we have just seen that the changing redshift is the key that unlocks the growth of new galaxies with time. They are small when they come from the small nucleus. Ambarzumian's superfluid just needed the nature of changing redshift. But Oort and conventional astronomers preferred to condense hot gas out of a hot expanding universe.

Observed: *The Hubble Relation.*

An article of faith in current cosmology is that the relation between faintness of galaxies and their redshift, the Hubble Relation, means that the more distant a galaxy is the faster it is receding from us. With our galaxy redshifts a function of age, however, the look back time to a distant galaxy shows it to us when it was younger and more intrinsically redshifted. No Doppler recession needed!

The latter non-expanding universe is even quantitative in that Narlikar's general solution of the General Relativistic equations ($m = t^2$) gives a Hubble constant directly in term of the age of our own galaxy. ($H_0 = 51$ km/sec×Mpc for age of our galaxy = 13 billion years). The Hubble constant observed from the most reliable Cepheid distances is $H_0 = 55$ (Arp, 2002 [3]). What are the chances of obtaining the correct Hubble constant from an incorrect theory with no adjustable parameters? If this is correct there is negligible room for expansion of the universe.

Observed: *The current Hubble constant is too large.*

A large amount of observing time on the Hubble Space Telescope was devoted to observing Cepheid variables whose distances divided into their redshifts gave a definitive value of $H_0 = 72$. That required the reintroduction of Einstein's cosmological constant to adjust to the observations. But $H_0 = 72$ was wrong because the higher redshift galaxies in the sample included younger (ScI) galaxies which had appreciable intrinsic redshifts.

Independent distances to these galaxies by means of rotational luminosity distances (Tully-Fisher distances) also showed this class of galaxies had intrinsic redshifts which gave too high a Hubble constant (Russell, 2002 [8]) In fact well known clusters of galaxies gives H_0's in the 90's (Russell, private communication) which clearly shows that neither do we have a correct distance scale or understanding of the nature of galaxy clusters.

DARK ENERGY: *Expansion now claimed to be acceleration.*

As distance measures were extended to greater distances by using Supernovae as standard candles it was found that the distant Supernovae were somewhat too faint. This led to a smaller H_0 and hence an acceleration compared to the supposed present day $H_0 = 72$. Of course the younger Supernovae could be intrinsically fainter and also we have seen the accepted present day H_0 is too large. Nevertheless astronomers have again added a huge amount of undetected substance to the universe to make it agree with properties of a disproved set of assumptions. This is called the accordance model but we could easily imagine another name for it.

3 Physics — local and universal

Instead of extrapolating our local phenomena out to the universe one might more profitably consider our local region as a part of the physics of the universe.

Note: *Flat space, no curves, no expansion.*

The general solution of energy/momentum conservation (relativistic field equations) which Narlikar made with $m = t^2$ gives a Euclidean, three dimensional, uncurved space. The usual assumption that particle masses are constant in time only projects our local, snapshot view onto the rest of the universe.

In any case it is not correct to solve the equations in a non-general case. In that case the usual procedure of assigning curvature and expansion properties to the mathematical term space (which has no physical attributes!) is only useful for

excusing the violations with the observations caused by the inappropriate assumption of constant elementary masses.

Consequences: *Relativity theory can furnish no gravity.*

Space (nothing) can not be a "rubber sheet". Even if there could be a dimple — nothing would roll into it unless there was a previously existing pull of gravity. We need to find a plausible cause for gravity other than invisible bands pulling things together.

Required: *Very small wave/particles pushing against bodies.*

In 1747 the Genevoise philosopher-physicist George-Louis Le Sage postulated that pressure from the medium which filled space would push bodies together in accordance with the Newtonian Force $=1/r^2$ law. Well before the continuing fruitless effort to unify Relativistic gravity and quantum gravity, Le Sage had solved the problem by doing away with the need to warp space in order to account for gravity.

Advantages: *The Earth does not spiral into the Sun.*

Relativistic gravity is assigned an instantaneous component as well as a component that travels with the speed of light, c. If gravity were limited to c, the Earth would be rotating around the Sun where it was about 8 minutes ago. By calculating under the condition that no detectable reduction in the size of the Earth's orbit has been observed, Tom Van Flandern arrives at the minimum speed of gravity of $2\times10^{10}\,c$. We could call these extremely fast, extremely penetrating particles gravitons.

A null observation saves causality.

The above reasoning essentially means that gravity can act as fast as it pleases, but not instantaneously because that would violate causality. This is reassuring since causality seems to be an accepted property of our universe (except for some early forms of quantum theory).

Black holes into white holes.

In its usual perverse way all the talk has been about black holes and all the observations have been about white holes. Forget for a moment that from the observer's viewpoint it would take an infinity of time to form a black hole. The observations show abundant material being ejected from stars, nebulae, galaxies, quasars. What collimates these out of a region in which everything is supposed to fall into? (Even ephemeral photons of light.) After 30 years of saying nothing comes out of black holes, Stephen Hawking now approaches the observations saying maybe a little leaks out.

Question: *What happens when gravitons encounter a black hole?*

If the density inside the concentration of matter is very high the steady flux of gravitons absorbed will eventually heat the core and eventually this energy must escape. After all it is only a local concentration of matter against the continuous push of the whole of intergalactic space. Is it reasonable to say it will escape through the path of least resistance, for example through the flattened pole of a spinning sphere which is usual picture of the nucleus? Hence the directional nature of the observed plasmoid ejections.

4 Planets and people

In our own solar system we know the gas giant planets increase in size as we go in toward the Sun through Neptune, Uranus, Saturn and Jupiter. On the Earth's side of Jupiter, however, we find the asteroid belt. It does not take an advanced degree to come to the idea that the asteroids are the remains of a broken up planet. But how? Did something crash into it? What does it mean about our solar system?

Mars: *The Exploding Planet Hypothesis.*

We turn to a real expert on planets, Tom Van Flandern. For years he has argued in convincing detail that Mars, originally bigger than Earth, had exploded visibly scarring the surface of its moon, the object we now call Mars. One detail should be especially convincing, namely that the present Mars, unable to hold an atmosphere, had long been considered devoid of water, a completely arid desert. But recent up-close looks have revealed evidence for "water dumps", lots of water in the past which rapidly went away. Where else could this water have come from except the original, close-by Mars as it exploded?

For me the most convincing progression is the increasing masses of the planets from the edge of the planetary system toward Jupiter and then the decreasing masses from Jupiter through Mercury. Except for the present Mars! But that continuity would be preserved with an original Mars larger than Earth and its moon larger than the Earth's moon.

As for life on Mars, the Viking lander reported bacteria but the scientist said no. Then there was controversy about organic forms in meteorites from Mars. But the most straight forward statement that can be made is that features have now been observed that look "artificial" to some. Obviously no one is certain at this point but most scientists are trained to stop short of articulating the obvious.

Gravitons: *Are planets part of the universe?*

If a universal sea of very small, very high speed gravitons are responsible for gravity in galaxies and stars would not these same gravitons be passing through the solar system and the planets in it? What would be the effect if a small percentage were, over time, absorbed in the cores of planets?

Speculation: *What would we expect?*

Heating the core of a gas giant would cause the liquid/gaseous planet to expand in size. But if the core of a rocky planet would be too rigid to expand it would eventually explode. Was the asteroid planet the first to go? Then the original Mars? And next the Earth?

Geology: *Let's argue about the details.*

Originally it was thought the Earth was flat. Then spherical but with the continents anchored in rock. When Alfred Wegener noted that continents fitted together like jigsaw

puzzle and therefore had been pulled apart, it was violently rejected because geologists said they were anchored in basaltic rock. Finally it was found that the Atlantic trench between the Americas and Africa/Europe was opening up at a rate of just about right for the Earth's estimated age (Kokus, 2002 [5]). So main stream geologists invented plate tectonics where the continents skated blythly around on top of this anchoring rock!

In 1958 the noted Geologist S. Warren Carey and in 1965 K. M. Creer (in the old, usefully scientific *Nature Magazine*) were among those who articulated the obvious, namely that the Earth is expanding. The controversy between plate tectonics and expanding Earth has been acrid ever since. (One recent conference proceedings by the latter adherents is "Why Expanding Earth?" (Scalera and Jacob, 2003 [7]).

Let's look around us.

The Earth is an obviously active place. volcanos, Earth quakes, island building. People seem to agree the Atlantic is widening and the continents separating. But the Pacific is violently contested with some satellite positioning claiming no expansion. I remember hearing S. Warren Carey painstakingly interpreting maps of the supposed subduction zone where the Pacific plate was supposed to be diving under the Andean land mass of Chile. He argued that there was no debris scraped off the supposedly diving Pacific Plate. But in any case, where was the energy coming from to drive a huge Pacific plate under the massive Andean plate?

My own suggestion about this is that the (plate) is stuck, not sliding under. Is it possible that the pressure from the Pacific Basin has been transmitted into the coastal ranges of the Americas where it is translated into mountain building? (Mountain building is a particularly contentious disagreement between static and expanding Earth proponents.)

It is an impressive, almost thought provoking sight, to see hot lava welling up from under the southwest edge of the Big Island of Hawaii forming new land mass in front of our eyes. All through the Pacific there are underground vents, volcanos, mountain and island building. Is it possible this upwelling of mass in the central regions of the Pacific is putting pressure on the edge? Does it represent the emergence of material comparable to that along the Mid Atlantic ridge on the other side of the globe?

The future: *Life as an escape from danger.*

The galaxy is an evolving, intermittently violent environment. The organic colonies that inhabit certain regions within it may or may not survive depending on how fast they recognize danger and how well they adapt, modify it or escape from it. Looking out over the beautiful blue Pacific one sees tropical paradises. On one mountain top, standing on barely cool lava, is the Earth's biggest telescope. Looking out in the universe for answers. Can humankind collectively understand these answers? Can they collectively ensure their continued appreciation of the beauty of existence.

References

1. Arp H. and Russell D. G. A possible relationship between quasars and clusters of galaxies. *Astrophysical Journal*, 2001, v. 549, 802–819
2. Arp H. *Pushing Gravity*, ed. by M. R. Edwards, 2002, 1.
3. Arp H. Arguments for a Hubble constant near H0 = 55. *Astrophysical Journal*, 2002, 571, 615–618.
4. Arp H. Catalog of discordant redshift associations. Apeiron, Montreal, 2003.
5. Kokus M. *Pushing Gravity*, ed. by M. R. Edwards, 2002, 285.
6. Narlikar J. and Arp H. Flat spacetime cosmology — a unified framework for extragalactic redshifts. *Astrophysical Journal*, 1993, 405, 51-56.
7. Scalera G. and Jacob K.-H. (editors). Why expanding Earth? Nazionale di Geofisica e Vulcanologoia, Technisch Univ. Berlin, publ. INGV Roma, Italy, 2003.
8. Russell D. G. Morphological type dependence in the Tully-Fisher relationship. *Astrophysical Journal*, 2004, v. 607, 241-246.
9. Van Flandern T. Dark matter, missing planets and new comets. 2nd ed., North Atlantic Books, Berkely, 1999.
10. Van Flandern T. *Pushing Gravity*, ed. by M. R. Edwards, 2002, 93.