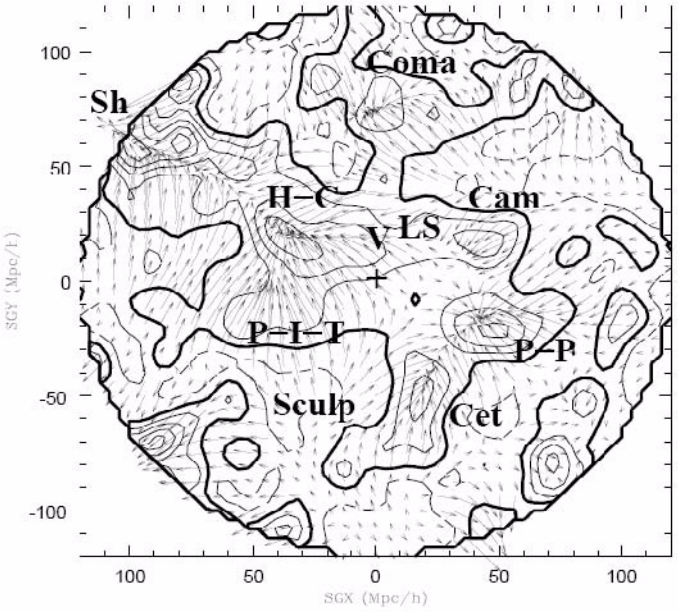
So, if the big-bang cosmology is not the cause, “what is the origin of the recessions of galaxies around us?” I have shown that around the centres of cosmic structures, most motions appear, as if they are caused by explosions. I have illustrated this both for the centres of galaxies, and the clusters of galaxies. With the knowledge that the universe follows a universal way of building cosmic structures at different scales, it is reasonable to believe that this process does not stop at the scale where we observe the universe. With it the same dynamics also remains active at the central part of the universe, where we happen to find ourselves.

MOTIONS OF LARGE SCALE STRUCTURES IN THE NEARBY UNIVERSE

The image shows the distribution and the directions of motions estimated from the study of the peculiar velocities of the superclusters in the universe near us. The Local supercluster of galaxies, to which the Local group of galaxies belong, appears close to the centre of the observed universe. The Local group of galaxies, to which our galaxy is a member, is moving towards the upper left side in the direction of Virgo (V), which in turn is moving towards the Hydra-Centaurus (H-C) supercluster. This is usually interpreted as the proof of existence of a “Great Attractor” towards which the surrounding superclusters are streaming. On the lower right side is the Perseus - Pisce supercluster (P-P) acting like the center of another attractor. The directions, in fact, indicate much similarity with what one should be expecting if the universe is a vortex and we are inside the core of the vortex structure. The streaming observed from the centre towards Hydra - Centaurus, Perseus-Pisce and the Great Wall in the direction of Coma supercluster can be explained from the dynamics observed in the vortex core. They are mostly outflowing structures except in the direction of the lower left side. The galaxies in Cetus (Cet) and Sculpture (Sculp) superclusters are moving towards the centre. However, from our position near the center all galaxies will appear as receding from us.



The motions of the galaxies, clusters and superclusters do not fit into the simple scenario of the Hubble flow. Some clusters and superclusters have been observed to move in peculiar directions deviating from the paths one should expect in an expanding sphere. The Local cluster of galaxies, to which the Milky Way belongs, is moving towards the centre of the Virgo Supercluster. The Virgo supercluster itself is streaming in the direction of Hydra and Centaurus supercluster. It resembles a phenomenon which can be explained by the model of gravity if one assumes an unseen great mass is pulling the supercluster towards it. This unseen mass is called the “Great Attractor”. It is believed that such attractions will be

slowing down the expansion of the universe. As I have shown, there is no necessity of invoking such “Great Attractor”. The motions of galaxies, clusters and superclusters can be explained from the dynamics of the vortex.

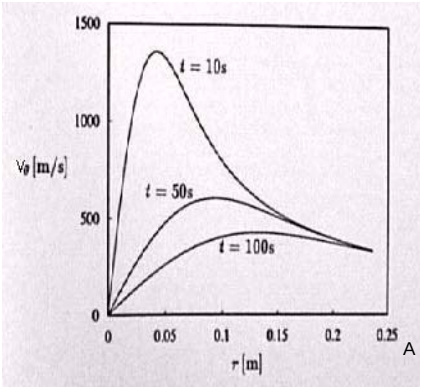
The belief in the gravitational theory, and the idea that the cosmic structures have formed as the results of the gravitational collapse of the clouds, have achieved such an acceptance in the scientific community that very few dare to doubt its truthfullness. However, the observed motions of the cosmic objects do not follow the paths one expects. The motions of the stars and the gases in the galaxies, or the motions of the galaxies in the clusters, or the motions of the clusters in the superclusters do not follow the gravitational model. In contradiction to the theory the rotational velocities of the bodies increase with the distance from the centre. If the motions were caused by the gravitational attractions they should indeed decrease. In many galaxies the rotational velocities are seen to flatten out after increasing from the centre. This has led the scientists to believe that there must exist hidden dark, matter haloes, which envelop the galaxies causing the peculiar motions. Likewise the motions of galaxies in clusters, or the clusters in superclusters can not be explained without the assumption that the most of the matter in the universe should be hiding as dark mystery.

The idea of the existence of dark matter has injected immense enthusiasm in the modern astrophysics and astronomy. There has been an inflation of observations and explanations regarding the dark matter during the last few decades. The enthusiasm is driven to the point that it will be hard to find daring souls who will doubt its existence. The fate of the expanding big-bang universe is dependent on the nature and the amount of dark matter present in the universe. Whether the universe will expand forever, or will contract one day depend on the amount of the dark-matter. When, and how the cosmic structures will take place also depend on the type and the amount of such hidden matter. And here, the modern cosmology, based on the big-bang model, has got stuck. Until now there has been no satisfactory answer how the structures in the universe have to be created from the hydrogen clouds, that once came into existence in the recombination era after the primordial explosion.

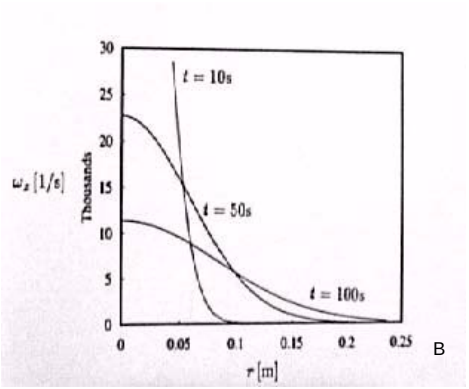
EVOLUTION OF VORTICES AND VELOCITY CURVES

A) The temporal evolution of vorticity is shown. With the passage of time viscosity disperse the vorticity from the centre.

B) The evolution of the tangential velocity corresponding to the evolution of the vorticity. The peak of the velocity occurs at the place of the vortex wall, which surrounds the vortex eye.



A



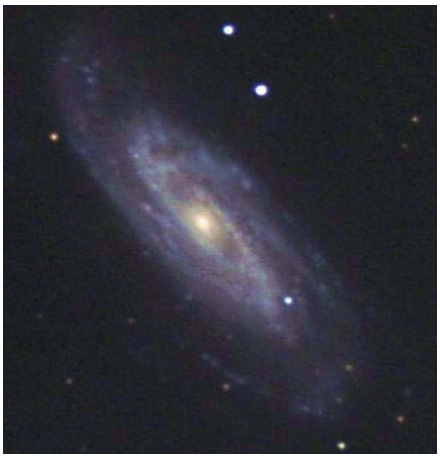
B

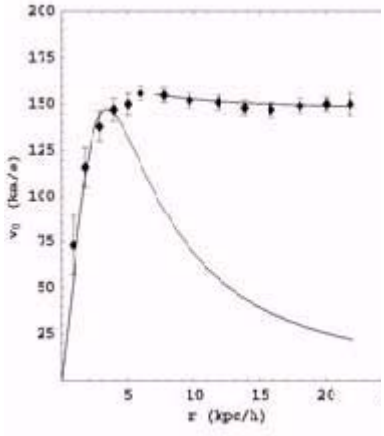
GALACTIC ROTATION CURVES

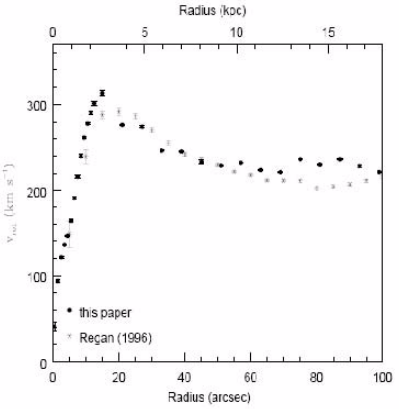
The rotation curves of the galaxies show very clearly the rotation curves of the vortices. The images in the second row are for the barred spiral galaxy Ngc 1530. The spiral galaxy Ngc 3198 and its rotation curve are shown in the first row.

The velocity curves in galaxies seem to follow the dynamics determined by the vorticity dispersion seen in the case of the evolution of the vortices.

The Keplerian velocity curve is drawn to compare it with the actual rotation curve of the Ngc 3198. Such discrepancy has led one to speculate about the existence of the dark matter.







The rotational curves seen in the cosmic structures seem to follow the same pattern as observed in the vortex structures. They rise from the centre, then flatten, or decay, after the core of the vortex is crossed. The velocity curves depend on the evolutionary stages of the vortices. More the vorticities are spread from the centre, more the rotational velocity becomes flatter after crossing the boundary which define the core. This is exactly what one observes in galaxies. The velocity curves follow the nature of the vorticity structure. Similarly, the peculiar velocities, which one observes in the clusters and the streaming motions of the superclusters towards different “attractors” in the nearby universe, can be explained by the dynamical motions occurring in the vortex cores.

The other main question to be answered is the question of the Cosmic Blackbody Radiation (CMBR). The discovery of the CMBR in 1965 brought a quantum leap in the modern cosmology. With it the faith in the big-bang cosmology increased and the evidence in support of the theoretical model was considered irrefutable. The big-bang theorists explained the CMBR as the relic of the hot ball of radiation, which rose at the beginning of time. With the expansion of the universe this primordial fireball cooled and after undergoing expansion for many billions of years it has now turned as cold as the emission coming from a blackbody at 3 degree Kelvin. First it was thought that the radiation was the same in whatever directions one observed it (means isotropic). Soon it was found that the radiation possesses a dipolar anisotropy. This anisotropy could be explained as resulting from the motion of the Milky Way through the background space. It was moving in the direction of Virgo and Hydra-Centaurus supercluster. In that direction the radiation got blue shifted and in the opposite direction it was redshifted (known Doppler shift). After subtracting the dipolar anisotropy, resulting from the motion of our galaxy, it was found that there were some fluctuations left in the CMBR.

The big-bang theorists had been looking for such a fluctuation in the CMBR. It helped them to explain the way the cosmic structures have appeared from an initially homogeneous and isotropic state. Without the presence of fluctuations at the time of the primordial explosion it won’t be possible to explain the creation of the clumpy structures like galaxies, clusters, and superclusters. In the big-bang model, an initial tiny fluctuations in the radiation ball in the homogeneous and isotropic universe at the beginning of time had grown bigger and bigger with the passage of time as the universe had become larger and larger. The fluctuations had caused the break up of the original homogeneous large cloud into clumpy structures. The CMBR was expected to carry the signature of the primordial fluctuations and be correlated to the clumpiness seen in the cosmic arena.

In pursuit of testing the idea of the primordial fluctuations in the large scale universe more detailed and refined observations have been made recently. The observations during the last three years have brought many surprises. The results are not what one had been expecting. Instead of an isotropic universe, on which the foundations of the modern cosmology is based, the measurements indicate anisotropy. There exists a preferred direction in the sky along which the CMBR fluctuations are strongest. Moreover there exists many puzzling

features in the data, which can not be explained from the point of view of the theories, which one has constructed during the last century. Among others, the CMBR fluctuations, instead of being of primordial origin, seem to be tightly correlated with the local structures in the nearby universe. No one seems to know how to digest these observational facts which strike blows to the model, which the big-bang theorists have painstakingly built for nearly a century.

This crucial blow has come from the observational attempt to confirm the model of structure formation in the universe with the help of the big-bang theory. About forty years ago the detection of the CMBR heralded the jubilation of triumph. Now it seems that the anisotropies observed in CMBR fluctuations have brought its death throe.

The surprises started when Wilkinson Microwave Anisotropy Probe (WMAP) began to bring to light some unexpected data since 2003. The biggest surprise was the temperature anisotropy in the largest angular scale in the sky, which meant that the fluctuations were not coming from the large scale. Moreover there existed a clear anisotropy between the southern and the northern hemisphere in the sky. The contributions from the large angular span of the sky are known as dipole, quadrupole and octopole contributions. As I have said before, the dipole contribution is interpreted as resulting from the motions of Milky way galaxy through the space filled with Microwave radiation. The quadropole and ocotopole contributions are not only very low, but they are planar and highly correlated with each other. According to the big-bang theory the fluctuations originating at a time before the first stars were born should be highly isotropic and one should be able to observe in this isotropic fluctuations the codes which have generated the observed clumpiness of structures. Instead of showing such an isotropy the fluctuations indicate a preferred axis in the direction of motion towards Virgo and Hydra-Centaurus supercluster (the so-called Great Attractor) and give indications that they might arise from the local superclusters existing in the nearby universe.

The defenders of the big-bang theory still argue that the anisotropy seen could be due to errors in the data, or some foreground effects caused by our Milky Way galaxy, which one has not been able to eliminate completely. However, the alignment of the quadrupole and the octopole correlations and their low values unmistakably point towards a great flaw in the big-bang theory.

In fact, the quadropole contributions have a clear association with the local superclusters in the nearby universe. The warmer spots trace the distribution of the high-velocity clouds, which have been observed near our galaxy. The colder spots have very clear association with the local superclusters like Shapely, Hydra and Centaurus, Coma, and Perseus-Pisce and the “Great Attractor”. The coldest spots have clear association with the “Great Attractor”. Thus the anisotropy seen in the WMAP data seem to be dominated by the structures in the local universe.

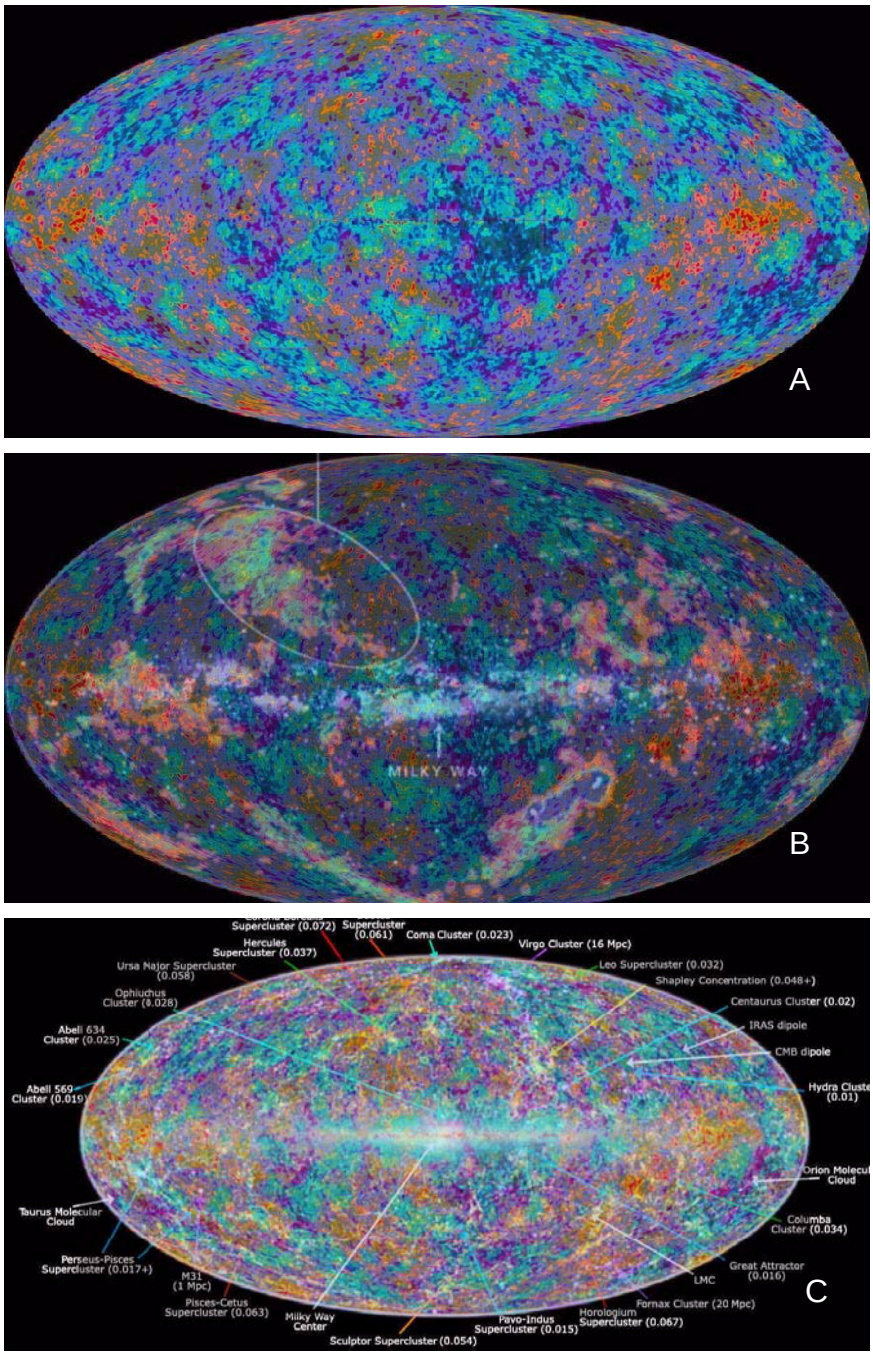
CMBR FLUCTUATIONS HAVE LOCAL ORIGIN

In the big-bang theory the CMBR temperature fluctuations are believed to carry the fingerprints from the origin of creation, which has caused the cosmic structures to form. However, the recent WMPA data tells us the contrary. The fluctuations are nothing but caused by the structures in our local universe. The hotter spots arise locally from the so-called high-velocity clouds, which one observes around our galaxy. The colder spots are associated with the nearby superclusters, like Hydra-centaurus, Great Attractor, Perseus-Pisce, Virgo etc. The largest cold spot corresponds to the “Great Attractor” region.

A) The COBE and WMAP of the CMBR fluctuations overlaid

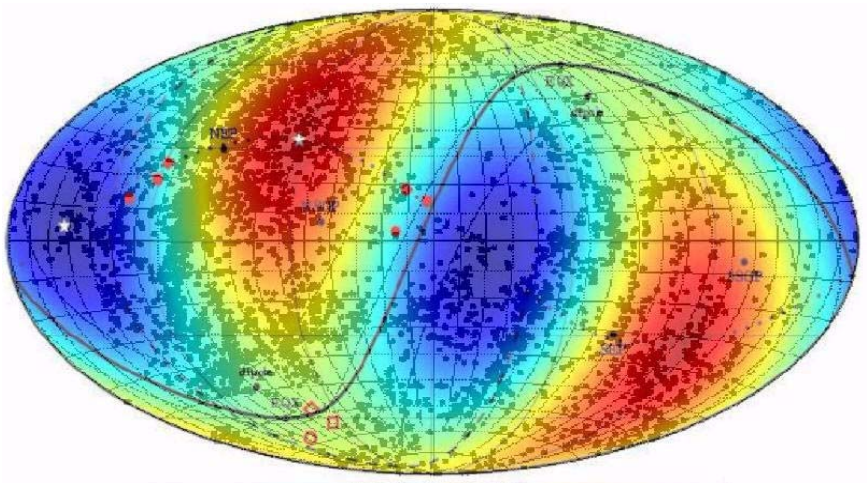
B) The high-velocity clouds are overlaid over the CMBR fluctuations. It clearly shows the origin of the hotter spots.

C) The nearby superclusters are overlaid over the CMBR fluctuations. The colder spots fall exactly at the regions where the superclusters agglomerate.



QUADRUPOLE AND THE LOCAL SUPERCLUSTERS

The images shows how the local superclusters contribute to the observed quadrupole. The yellow to red are increasing warmer spots contributed by the galaxy distributions in the local universe (black dots)



However, the question remains: What causes the emission of the microwave radiation at 2.7 K in the superclusters?

The clear spatial correspondence between the colder spots and the superclusters indicate that the microwave radiation must be coming from the local structures around us. Dark cold matter is believed to comprise most of the Inter Cluster Matter (ICM) in the universe. The ICM has been observed to be made of multi-phase components including the hot ionized gases radiating x-rays and cold and very dense molecular gas, which is not penetrated and heated up by the x-ray component. Cold molecular gas have already been observed in several clusters.

In the big-bang theory, these cold molecular gases have been seen as the most promising candidates for the so-called missing dark matter. In the haloes of galaxies and clusters they are believed to exist in thermal equilibrium with the CMBR temperature. In fact, the so-called microwave background could be nothing but the radiation from the cold molecular gases at 2.73 K, which dominates the amount of matter in the nearby universe. May be, there exists no such thing as the Cosmic Microwave Background Radiation as proposed by the big-bang model.

The cold molecular gas, emitting the radiation, could be the molecular hydrogen, which is the coldest component of all the dominating gases in the universe. The neutral hydrogen is warmer, and the ionized hydrogen is hot. What causes the molecular hydrogen to emit the radiation at this temperature?

In environments where cold dust grains exist, like in the ICM, gas-phase molecular hydrogen may freeze out onto the dust grains, and H_2 -snow may grow at the nucleation site. These H_2 -containing ices could be very common in the dense molecular clouds. There is a

critical temperature below which the H_2 molecules can stick to H_2 ice surface formed on the top of the dust grain. For the number of molecules in the cloud around 10^9 cm^{-3} the critical temperature for snowflakes to develop turns out to be close to the CMBR temperature. The molecular gas densities in the ICM could be favorable for creating the H_2 ice at the microwave radiation temperature which one observes in the sky. These H_2 ice can absorb or radiate as blackbody. So there is no need for a big-bang model to explain the CMBR temperature.

Another issue which has challenged the big-bang cosmology for the last few years is the observed discrepancies of distances measured by using two different methods. The usual method in the big-bang theory is to calculate the distance of a cosmic object from the redshift value. The higher the redshift the father away should be the object. Lately another method to determine the distances of galaxies have been proposed. It is done by using a particular type of supernova, called Type I, as the standard candle. The Type I supernova are believed to have similar maximum brightness wherever they may occur. Therefore, by observing these supernova occurring in a galaxy one can find out the distance of the galaxy. These two distance measurements are not in agreement with each other. The supernova occurring in galaxies with higher redshifts turn out to be closer than supernova occurring at lower redshifts. Only way to understand this discrepancy without abandoning the big-bang theory is to hypothesize that the universe is accelerating rather than slowing down. This has caused a new wave of speculations about an accelerating universe. However such acceleration can only be caused by a repulsive force. It has been proposed that there must exist not only dark matter but also dark energy in the universe which is causing this repulsive force. The most mass is assumed to be lie as dark energy. So the universe has become a fertile ground for scientists to speculate over the dark energy, the dark matter and the black-holes, none of which can be seen or detected. On such ground the big-bang theorists claim the validity of the standard cosmology.

The big-bang model has been implanted in the scientific community with such dogmatic faith that even if the theory is sinking in a deep state of coma, the supporters coming from the biggest and the most powerful scientific institutions, still claim that it is a living incarnation of an irrefutable truth.

How can one understand the high-redshift supernova to lie closer in the framework of the vortex theory? If the entire universe is a vortex, like our own Milky Way galaxy, with high vorticity inside its core, the velocities of the cosmic objects far away from the core will go down and therefore the distant cosmic objects will show slower motions, which means, lower redshifts. Only in the region beginning in the centre to the core wall, the velocity will increase with the increasing distance, like in the Hubble law.

By now, I have gone through the major observational issues, on which the foundations of the big-bang theory have been erected, and with it I have also indicated the defects of the standard theory. I have also shown how the vortex model may explain most of the

observational findings in a consistent manner without introducing dark matter, dark energy, or black-holes.

The readers may have already noted that in this new vortex-cosmology model the so-called gravitational force does not play an important role. In the next chapter I shall discuss in more details how turbulence and magnetic fields dominate over gravity in forming the structures in the universe.