



The Earth From Afar: Image Review

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Old Moscow, From Afar

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Moscow, Russia's largest city, reflects its historical development through a series of concentric ring roads. Each ring road delineates the city at a different growth period. Figure 1, a SPOT near-infrared image taken on November 4, 1992 with a 20m x 20m pixel resolution, provides an overview of the spatial patterns throughout the city. The ring roads radiate out from the center of the city with the Moscow Ring Road being the farthest out. The area beyond this road is primarily a greenbelt, which has been designated as a Forest-Park Zone. Within this road the city covers an area of about 878.7 square kilometers (386 square miles). This paper concentrates on the urban patterns associated with the city's earlier (inner) ring roads as observed from high-resolution satellite imagery. These inner ring roads were originally walls built around the city in different stages.

Moscow's existence was first noted in 1147, although a settlement at this site was present well before this date. Archaeological findings indicate that the city was well established by the beginning of the 12th century and represented an important focal point in the trade routes of western Russia. Rivers formed the best routes at the time for trading between places throughout the region. The Moscow River through its tributary, the Yauza, had portage access to the Volga River. The Volga flowed into the Caspian Sea and introduced Moscow to central Asia. Within easy reach of the city were the headwaters of the Western Dvina, Don, and Dneper Rivers. The Western Dvina linked Moscow to the Baltic Sea and Scandinavia. Viking traders and explorers used the Dvina as a gateway into the region. From the Moscow and Oka rivers, and by portage, the Don was reached which provided contact to the Azov and Black Seas. Again

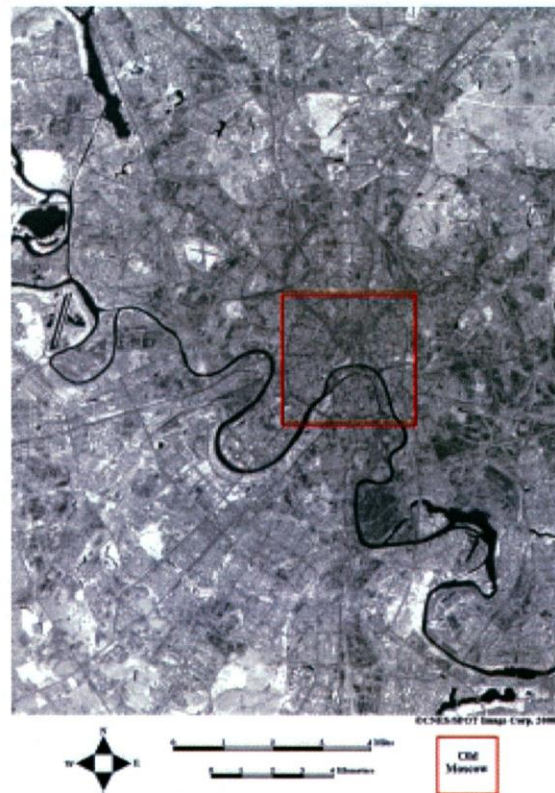


Figure 1 SPOT Satellite Image of Moscow.

through a system of portages and tributaries the Oka led to Dneper River and the Black Sea. The wide plains of the Don and Dneper Basins were open to Moscow. This large and complex river network played a key role in the early and rapid growth of the city. See Map.

Kremlin

Figure 2 identifies and delineates the major sections of Old Moscow. The hub and heart of Old Moscow as well as present day Moscow is the fortified enclosure of the Kremlin. It was originally built in 1156 as a wooden palisade on Borovitsky Hill, 40 meters (130 feet) above the Moscow River "at the mouth of the Neglinnaya (Neglinka River), above the river Yauza." In 1367 it became a stone fortress. The present Kremlin was constructed between 1485 and 1495 with new red brick walls and expanded to its existing size. The northwest section of the wall was extended to the Neglinnaya, which is now covered over and not visible. The northern and southwestern corners of the fortress were pushed out. The new wall, which was 4.5 meters (14.7 ft.) wide, extended 2.25 kilometers (1.8 miles) in length creating a massive triangular structure. The new Kremlin was built under Ivan III, the Great when he invited various Italian architects and builders to Russia. Inside the Kremlin the old, decaying buildings related to the earlier periods of the city were replaced with an outstanding collection of churches and palaces that can be detected on Figure 3.

Figure 3 is a 1.5m x 1.5m panchromatic image taken on

May 27, 1992 using a KVR 1000 camera system on a Russian Cosmos spacecraft. The Kremlin and its major buildings can be easily identified. The buildings, a combination of churches and palaces, represent an outstanding collection of Russian architecture from the 15th century into the 20th century.

Three magnificent cathedrals, constructed in the late 15th and early 16th centuries, are clustered around the area referred to as Cathedral Square. The oldest, built in 1475-79, is the Cathedral of the Assumption. Its simple proportioned lines and beautiful arches are crowned by five golden domes, which makes it easy to identify on the image. Situated diagonally across the square is the Cathedral of the Annunciation. Built in 1484-89, burned in 1547, and rebuilt in 1562-64, its golden roofs and domes create a high reflectance condition on the image making it hard to delineate. The third cathedral is Archangel. Built in 1505-08 it is the burial site of the princes of Moscow and tsars of Russia (except Boris Godunov) until the founding of St. Petersburg. Just adjacent to the square stands the white bell tower of Ivan the Great, which was originally built in the 16th century, damaged during the War of 1812, and later restored. It is difficult to define on the imagery due to its high reflectance.

On the west of Cathedral Square is the Kremlin Great Palace, built in 1838-49 as a royal residence and later used by the Supreme Soviet of the U.S.S.R. Its long, yellow-washed facade overlooks the Moscow River. This structure incorporates the Palace of Facets of 1487-91 and the Terem Palace of 1635-36. The Terem Palace contains several older churches including one from 1393, the Resurrection of Lazarus. The other major buildings within the Kremlin are:



Map Western Russia and Neighboring Countries.

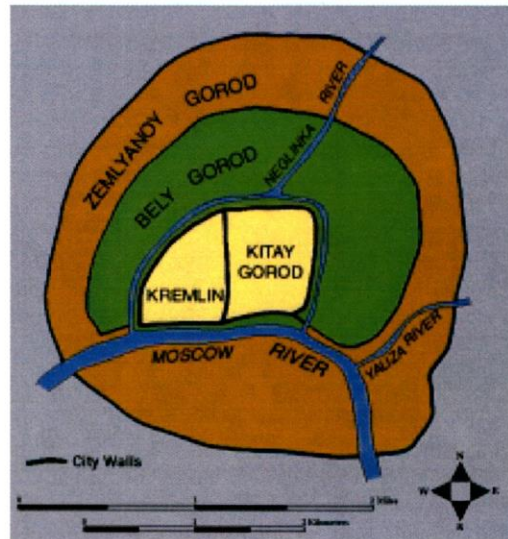


Figure 2 Old Moscow. (Source: Modified from W.H. Parker. (1969) *An Historical Geography of Russia*. p. 96. Chicago: Aldine).

the Arsenal (1702-36), the former Senate building (1776-88), the School for Red Commanders (1932-34), and the Palace of Congresses (1960-61), which contains a huge auditorium used for political gatherings and as a theater. Figure 4 provides a panoramic, ground view of the Kremlin showing some of the buildings identified in Figure 3. Figure 4 also shows the Moscow River and the elevation difference between the river and the Kremlin.

Kitay Gorod

Immediately east of the Kremlin, an area later called Kitay Gorod was established in the 11th-century. This area prospered and became the hub of the powerful merchant and artisan classes. By the 14th-century it became the center of trade and was called Bolshoi Posad (Large Merchants' Quarters). Fortified by brick walls in the sixteenth century, the name

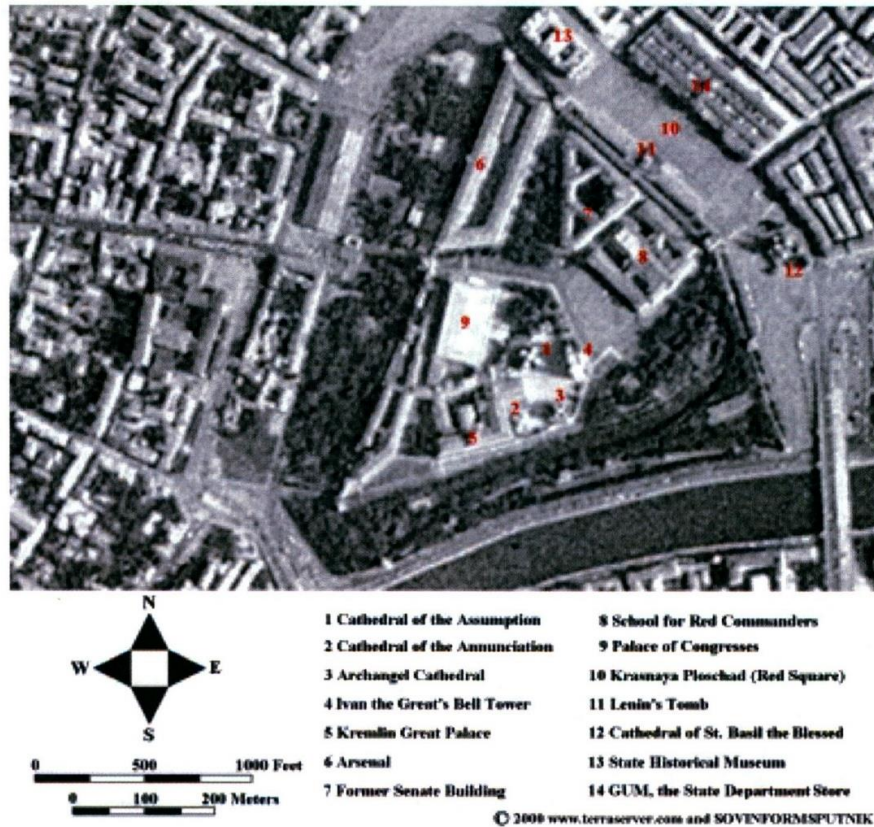


Figure 3 Satellite Image of the Kremlin with Major Buildings Identified.

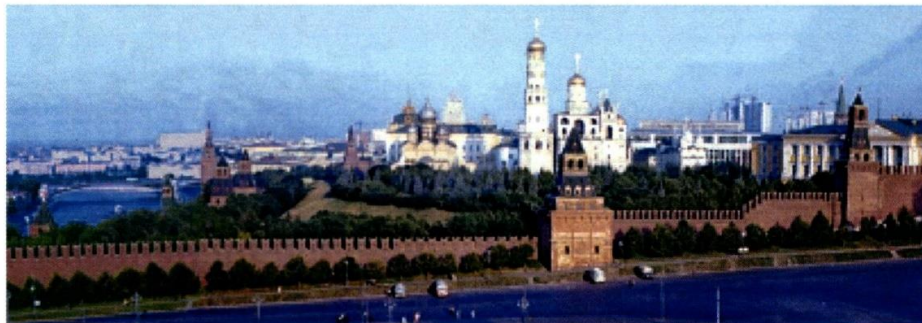


Figure 4 Panoramic View of the East Side of the Kremlin. Photograph provided by Dr. Martha L. Corry.

changed to Kitay Gorod, which is likely derived from the Tatar word *katay* (fortress) and the Russian word *gorod* (city). Most of the brick walls no longer exist but by comparing Figure 2 and 5 one can determine through the street pattern the outer limit of this area. Figure 5 is taken from the same satellite image as Figure 3 but at a different scale and aerial coverage it provides a synoptic view of Old Moscow.

Most of the structures in the Kitay Gorod were initially constructed of wood but after a major fire in 1610 many stone buildings started appearing. A large open marketplace was established where merchants and artisans from throughout Russia and neighboring lands came to sell their products. By the 17th-century this marketplace was known as *Krasnaya Ploschad* (Red Square). Although it remained a marketplace for several centuries, it later became more of a political center where parades, demonstrations, and other gatherings occurred.

Today, Red Square is Moscow's major tourist center. On the west side of the square is the Kremlin with Lenin's tomb. The northeast side is dominated by GUM, the State Department Store (1889-93), that continues to provide the market component of the square. At the south end is the well-known, eight-towered Cathedral of St. Basil the Blessed (1555-60). See Figure 6. The State Historical Museum (1875-83) defines the northern end of the square. In 1990 the Kremlin and Red Square areas were added to UNESCO's World Heritage List.

Beyond the square a number of old churches are found throughout the Kitay Gorod, including the Church of the Trinity (1628-34) in Nikitniki, the 15th-century Church of St. Anne of the Conception, and the Epiphany Cathedral (1693-96). Its narrow, crowded streets still contain former banks, the stock-exchange building, and warehouses, which



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Figure 5 Satellite Image of Old Moscow.

again represent the long commercial nature of the area. In the 1960s many old buildings adjacent to the Moscow River were demolished for the construction of the Rossiya Hotel. This huge building with its two inner courtyards can be seen in Figure 5. Just north of the hotel several buildings have been preserved, including the 16th-century house of the Romanov boyars and Old English Embassy and the 17th-century Monastery of the Sign.

BELY GOROD

In the sixteenth century the area west, north and east of the Kremlin and Kitay Gorod developed and became known as Bely Gorod, the White City. It contained the homes of merchants and nobles and several churches and shops. Due to repeated raids by the Crimean Tatars a new fortification was constructed between 1584 and 1591 around the city including the Bely Gorod. It was a white stone wall, 9 kilometers (5.6 miles) in length, which had twenty-eight towers. Today, the wall has been replaced by what is called the Inner Boulevard Ring. This ring can be identified on Figure 5 by the dark line encircling the city north of the Moscow River. The dark conditions along the boulevard reflect the trees and parks along the road.

Situated within the Bely Gorod are the Bolshoi Theater, Pushkin Museum, Moscow Art Theater, Moscow

Conservatory, and Maly Theater. This is the cultural center of Moscow. On the west side of the Kremlin lies the Aleksandrovsky Garden, across from which is the old Moscow University building (Figures 3 and 5). Russia's first university, it was founded in 1755. Today the building is the Lenin Library. The university has been relocated to the southwest, across the Moscow River on Lenin Hills.

At the west end of the boulevard, near the Moscow River is a circular structure. The site of this structure was originally the site of the Convent of St. Alexius the Man of God. Founded at another location around 1350 the convent was the oldest of Moscow's convents. In 1514, the convent was destroyed by fire and moved to this site to form part of the wall around the Bely Gorod. Convents and monasteries were sometimes used as part of the fortification system around Moscow. After much protest, the convent was demolished in 1837 to provide space for a huge new cathedral, the Cathedral of Christ the Savior. Started 1838, it took 45 years to complete. Although enormous when compared to the churches within the Kremlin, it was smaller than originally planned. In 1931 the cathedral was demolished by the Communist government, which destroyed, closed or converted to other uses forty-eight percent of the churches in Russia. Plans were developed to use the site for Stalin's Palace of the Soviets. This structure was to be 415m (1362 feet) tall, dwarfing the former cathedral and taller than the Empire State Building and the Eiffel Tower. The structure was never built due to World War II and post war reconstruction. The pit left by the initial construction of the building was converted in 1960 to an outdoor steam-heated winter swimming pool. See Figure 7. Its 100m (328 feet) wide circular shape made it one of the world's largest pools. It is this structure that appears on the 1992 image. It remained a pool until 1993 when the new Cathedral of Christ the Savior replaced it.

Zemlyanoy Gorod

Simultaneously with the construction of the Bely Gorod fortifications was the building of the Zemlyanoy Gorod (Earth City) wall. Built in 1592 as earthen ramparts surmounted by wooden structures, this wall extended 16

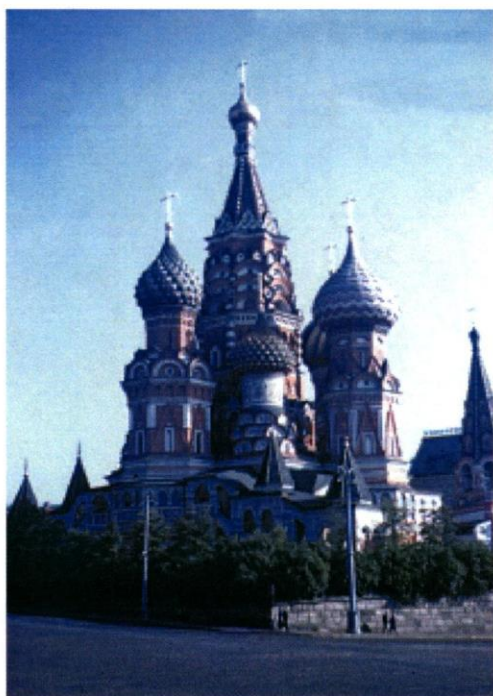


Figure 6 Cathedral of St. Basil the Blessed near the Southeast End of Red Square. *Photograph provided by Dr. Martha L. Corry.*

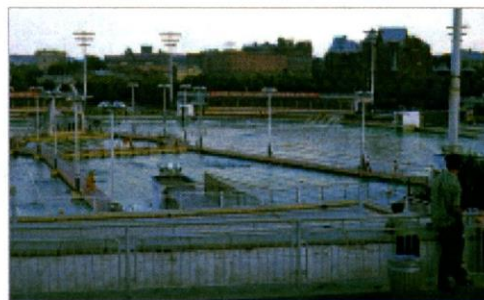


Figure 7 Large Heated Swimming Pool in 1967. Replaced by the Cathedral of Christ the Savior. *Photograph provided by Dr. Martha L. Corry.*

kilometers (10 miles) in length with 50 towers and 34 gates. The wall also crossed the Moscow River and incorporated a section south of the river within the city. The wall was taken down in the 19th century and became the Sadovoye (Garden) Ring Road. It is the outer circular route on Figure 5.

A population redistribution occurred shortly after the construction of the Zemlyanoy Gorod wall. The boyar families and the upper levels of the military displaced the merchants and the artisans from the Kitay Gorod and later from the Bely Gorod. The area between the Bely Gorod and the Zemlyanoy Gorod walls became the new homes and shops for the merchants and artisans. Certain sections within this area specialized with respect to trade. Districts of coach drivers, dealers in sheepskins, gardeners, and weavers were established. An especially large weavers district developed south of the river. In addition to the merchant and artisan districts, other districts associated with the defense of the city occurred. Cannoneers', harquebusiers', and gatekeepers' districts were established. Several large harquebusiers' districts were in the southern portion of the city, an area frequently hit first by Crimean Tatar raids.

Except for the radial roads leading from the city's center, streets and city blocks in this section of the city were generally narrow and small. On Figure 5, compare the street patterns between the Inner Boulevard Ring and the Sadovoye Ring Road to the patterns within the Inner Boulevard Ring. These patterns reflect what was a class difference. The poorer classes were kept away from the city center and placed in a position of encountering greater destruction from any attacks on the city than the wealthier classes located nearer the center of the city.

Final Comments

The ring roads beyond Zemlyanoy Gorod were planned roads. They were not initially developed as walls, which were later removed and converted into roads. This difference in how the ring roads were developed forms a logical division between Old Moscow and New Moscow.

This article illustrates how satellite imagery can be used to identify historical patterns within a city. Much of the current morphology of a city relates to its street patterns, which can be easily detected on satellite imagery. Street patterns frequently reflect the historical growth of a city. Thus, the growth and development of cities such as New York, Paris, and Tokyo can be traced through their street patterns. Satellite imagery can provide a nice means for seeing a street pattern, and thereby, studying a city.

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