Fig. 1. Sigiriya. Excavated garden architecture

J. W. E. Fassbinder, H. Becker

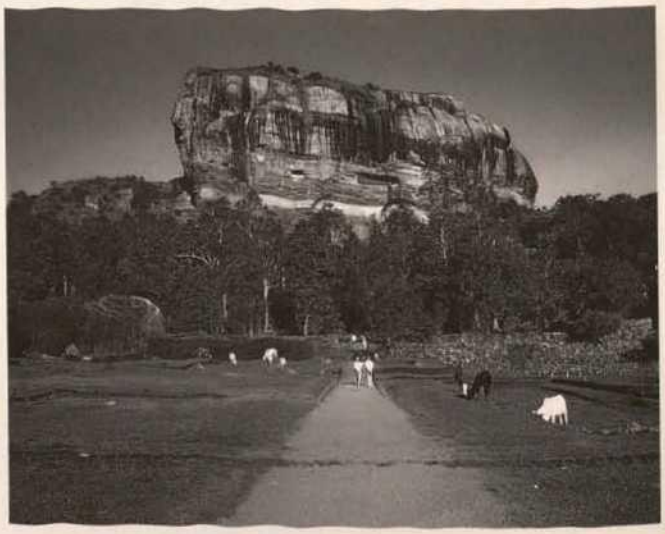
Magnetometry in the Garden of the Sigiriya Rock Fortification (Sri Lanka)

In a cooperation between the Bavarian State Conservation Office, the Kommission für Allgemeine und Vergleichende Archäologie (KAVA), the Unesco (Sri Lanka cultural Triangle Sigiriya Project, and the Archaeology and Research University of Kelaniya Archaeological Team.

Introduction

The old rock fortification Sigiriya consists of a large gneiss-rock 200 meters high which is surrounded by a fortification from the 4th to 5th century (Fig. 2). The name Sigiriya is probably a composition of the word "giri" (rock) and "sinha" (lion). Another explanation would be "mouth of the lion". This could be because of the entrance which forms an huge lion. The rock forms the middle of a park landscape with artificial lakes which is surrounded by an 2,400 meter long wall on both sides with an water filled ditch. The area west to the rock is composed by three

Fig. 2. Sigiriya rock from the west



complexes which are separated by brickwalls. The outer part was used as a garden measuring 500 x 120 meters. From the garden there is broad avenue 240 meters towards the rock and to the former city which is located in front of the rock. To the right and left of the avenue there are little lakes. The survey area was located in the north-west quarter of the garden (Fig. 3, 7). The south-west and southeastern quarter are completely excavated, as well as parts of the northeastern quarter. However, these results are not yet published.

Instrumentation and Results

For the survey we used the cesium-magnetometer system from Varian/Scintrex (V101, Canada) in a gradiometer configuration. This instrument consists of two magnetometer probes with an automatic data log on a handheld computer (Epson HX20), the sensitivity of ± 0.1 Nanotesla and give 10 readings per second. The intensity of the total earth magnetic field at Sigiriya varied from 36,000 by ± 1,000 Nanotesla. We used the gradiometer configuration for the same reason as at the site Ibbankatuwa. The underlying granite/gneiss rock caused magnetic anomalies of a soft shape (some of them where 40 x 40 meters) but with a field intensity of > 200 Nanotelsla. By using the ± 0.1 Nanotesla sensitivity, the limitedness of the software however allowed only anomalies of ± 99.9 Nanotesla to be measured.

Readings were taken on a 0.5 meter traverse and a 0.5 meter sampling interval at a sensor hight of 0.3 meter and 1.3 meter respectivly. The grid size was 20 x 20 meter blocks. The magnetic

Fig. 4. Sigiriya rock art: fresco of the cloud girl

Fig. 3. Sigiriya rock fortification: 1 enclosure wall, 2 water basin, 3 small hill, 4 water pond, 5 old monastery, 6 the Sigiriya Rock with Cobra Hood Cave, Asang Cave, Audience Hall, Cistern Rock and the frescos with the Cloud Girls, 7 survey area

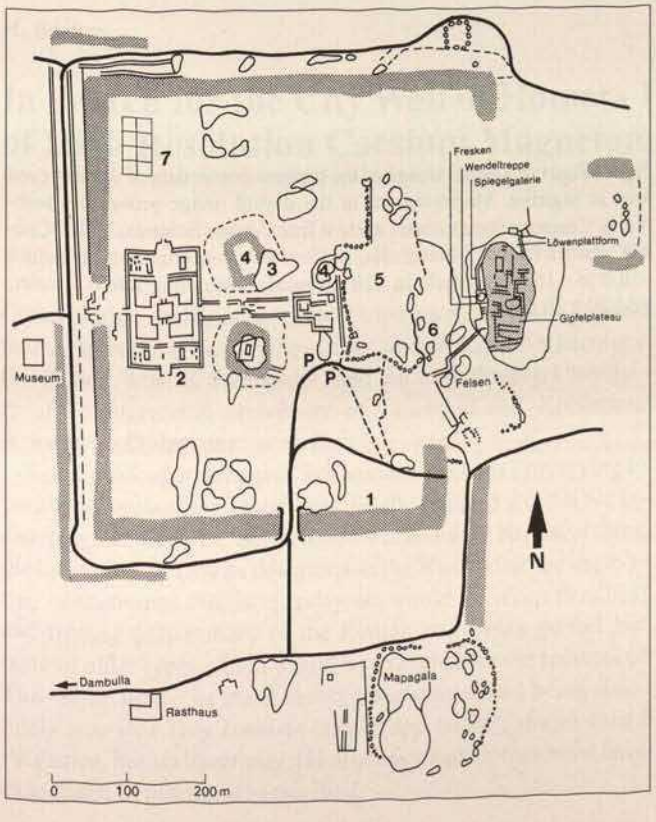
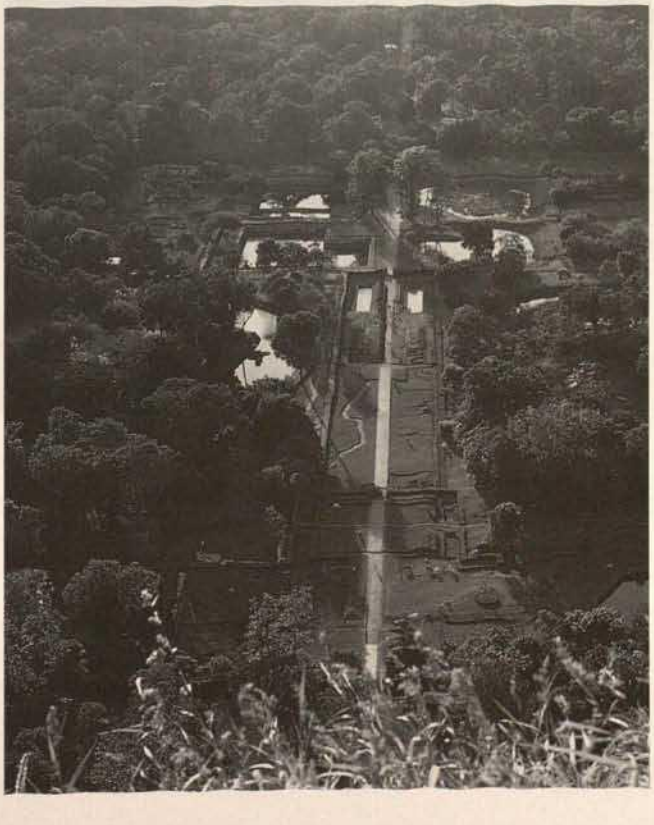
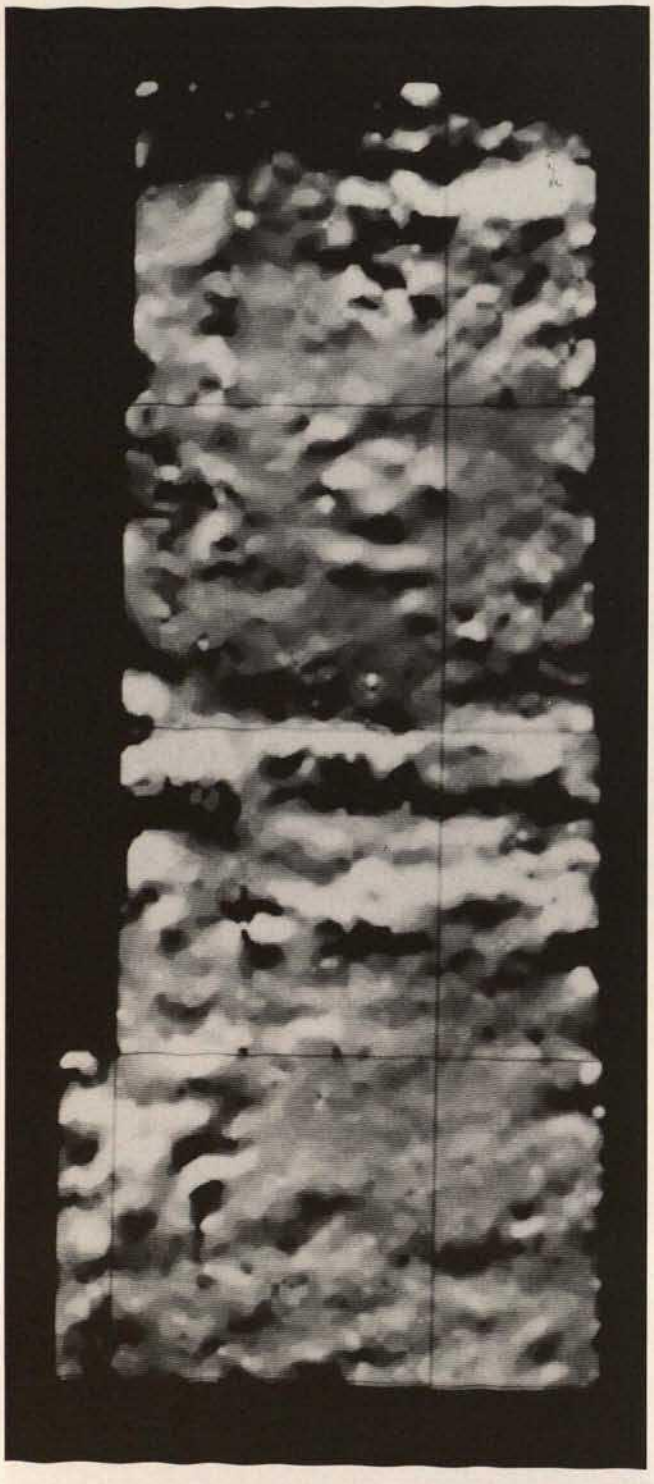


Fig. 5. "Aerial view" of the Sigiriya garden





intensity values are transformed to gray values ranging from 0 (black) to 255 (white). The dynamics of the original field data is in the range of ± 99.9 Nanotesla. After statistical analysis and depending on the intensity of the magnetic anomaly, we choose a window from -10.0 to +15.5 Nanotesla for a linear transformation of the magnetic intensity value into the gray value of the digital image to preserve the high sensivity (± 0.1 Nanotesla) of the survey. All data corrections and enhancements were done in the interactive digital image processing technique. Filtering procedures, contrast enhancement and false color transformation allow easy identification of the archaeological features in the magnetic image.

Because of the low geographical altitude a tilt correction of the probes of about 45° to the north was necessary. Finally the magnetic data are presented as a digital image (Fig. 6). The result of of the image is the clear anomalies caused by the burned brick construction of the garden architecture. The anomalies can be compared to the excavated garden architecture as it is visible on the other side of the garden.

The archaeologicaly relevant structures are marked by hand on a transparency over the hardcopy (photograph of the screen) and are transformed as vectorial data to the graphic computer.

References

H.-J. Aubert, 1984. *Sri Lanka,* Stuttgart

Fig. 6. Sigiriya. Digital image of the magnetometer data of the surveyed area at Sigiriya. Magnetogram in the digital image processing technique. Cesium magnetometer system from Varian/Scintrex, V101, Canada, sensitivity ± 0.1 Nanotesla, gradiometer configuration, dynamics –10.0 to +15.0 Nanotesla in 256 grayscales, sampling rate 0.5 meter, grid 20 x 20 meter