

Preface

Queen Hatshepsut—or sometimes “King” Hatshepsut, in formal circumstances—was the daughter of Pharaoh Thutmose I, the wife (and half-sister) of Pharaoh Thutmose II, the stepmother and co-regent of Pharaoh Thutmose III. She ruled Ancient Egypt in her own right as the fifth Pharaoh of the Eighteenth Dynasty of the New Kingdom, approximately from 1473 (perhaps 1479) to 1458 BC, with the throne name of Maatkare. She is regarded as one of the most successful Pharaohs, preserving power longer than any other woman of an indigenous Egyptian dynasty. Hatshepsut is known to have been engaged in military campaigns early in her reign, but generally is credited to be a monarch who initiated a long era of peace. She re-established international trading relationships, disrupted during the Hyksos occupation of the country, and brought great wealth to Egypt.

During her reign, Hatshepsut organized and funded several missions to foreign lands, the most famous being that to the Land of Punt. This region, also called Pwenet or Pwene, was located to the southeast of Egypt, on the littoral of either, or both, the Horn of Africa and Southern Arabia (most likely Eritrea and neighbouring Ethiopia). The expedition was very ambitious—Hatshepsut sent a fleet of five ships, each measuring about 25 m length, 7 m beam and 2 m draft, bearing several sails and 30 rowers, which left Kosseir, on the Red Sea, with a total crew of about 250–300 men—and turned into a remarkable commercial, as well as diplomatic and scientific success. Many invaluable goods were bought back—Hatshepsut herself informed us in lengthy inscriptions that “*the ships were laden with the costly products of the Land of Punt and with its many valuable woods, with very much sweet-smelling resin and frankincense, with quantities of ebony and ivory*”—including precious myrrh and 31 live myrrh trees, the roots of which we know were kept in baskets for the duration of the voyage.

While the trees were planted in the courts of her mortuary temple complex at Dayr el-Bahari, near Luxor in the Valley of the Kings, Hatshepsut had all stages of the expedition commemorated on the walls of her tomb’s Djoser-Djeseru, the Holy of Holies, the Sublime of Sublimes—a colonnaded structure of perfect harmony designed and implemented by Senemut, royal steward and architect (probably royal lover as well) to serve for her posthumous worship and to honor the glory of Amun. A full account of the expedition returned treasures and findings was recorded in the

wall reliefs, showing scenes of village life, exotic plants, birds and animals, and men carrying off heaps of goods. Elaborately rigged sailboats are shown, getting ready to bring the tribute back to Egypt. . . while many types of fish swim in the water below!

While other voyages to the Land of Punt had preceded, and others followed later, over the centuries, only the remaining accounts of the expedition set forth by Hatshepsut describe in detail the flora and fauna typical of the Red Sea and Indian Ocean (i.e. saltwater species such as turtles, parrot-fish, scorpion-fish, soldier-fish, trigger-fish, wrasse, squid and spiny lobster) collected on that occasion. The rich details of these pictorial descriptions are so accurate that—as reported by oceanographer Sayed El-Sayed—the late Carl Hubbs, famed ichthyologist of the Scripps Institution of Oceanography, claimed he was “able to identify the fish to the species level” from the carvings.

Given the mixed commercial and non-commercial scope of the enterprise, and the resulting (quasi) scientific reports above, the one organized by Hatshepsut can be considered as the first real oceanographic cruise ever to be sent into the African Seas. The ensuing accurate knowledge of geography, hydrography and meteorology, derived from precise observations of the environment, enabled ancient Egyptians to undertake long seafaring ventures. After Hatshepsut, other Egyptian monarchs reached southern Africa and beyond. Herodotus informs us that Necho II, King of Egypt (circa 600 BC) sent Phoenician sailors down to the Red Sea and along the coast of Lybia, modern Africa¹. After 3 years, they returned through the Pillars of Hercules, the Strait of Gibraltar, and reached Egypt via the Mediterranean Sea. According to William A. Herdmann, author of *The Founders of Oceanography and Their Work* (1923), it is doubtful that the circumnavigation of Africa was repeated again, until Vasco da Gama rounded the Cape of Good Hope (from the west) 2000 years later, in the fifteenth century.

This Volume, focusing on the marginal, semi-enclosed and enclosed water bodies of Africa—herein referred to as the “African Seas”—is dedicated to the extraordinary achievements of Hatshepsut’s original, albeit embryonic, oceanographic mission. However, it is on modern expeditions, which use Earth orbiting satellites to map the waters surrounding the African continental landmass, that the present review concentrates. The following collection of topical papers span the vast potential of remote sensing techniques to tackle the issues, peculiarities and special challenges posed by the African coastal and enclosed water bodies. The assessment of surface parameters by means of both passive and active techniques is addressed, focusing on the use of reflected visible and near-infrared sunlight, of surface emissions at thermal infrared or microwave frequencies, or again of the return of transmitted impulses of microwave radiation.

¹ Libya clearly is bounded by the sea, except where it borders on Asia. Nekhau king of Egypt first discovered this and made it known. When he had abandoned the digging of the canal which leads from the Nile to the Arabian Gulf, he sent Phoenicians in ships, with orders to sail on their return voyage past the Pillars of Heracles until they came into the northern sea and so to Egypt. *Herodotus, Histories* 4.42

Studying and understanding the natural history of the African Seas requires integrated observation systems, which ought to combine up-to-date remote sensing techniques with thorough *in situ* observations. As the latter are frequently lacking, due to the continent's sheer size and continuing socio-economic plight, quite often satellite remote sensing from Earth's orbit is the only choice available to environmental scientists. The peer-reviewed papers collected in this volume provide a summary of the most recent results achieved in this field, and of the new scientific ground broken by some of the observations, offering an unprecedented insight into some of the dynamical and bio-geo-chemical complexity of the African Seas.

This book—which targets researchers working in the Earth and Marine Sciences, but also teachers, as well as students, in the same fields, particularly in Africa—includes a brief overview of the African marginal seas, followed by general papers on Visible, Infrared and Microwave (passive and active) remote sensing applications, focussing on African waters. In depth assessments of the main African marginal basins, in both the Atlantic Ocean and Indian Ocean, their prevailing currents and resulting key environmental traits, are grouped in two dedicated sections. Several examples are provided of multi-sensor techniques, which exploit the synergies of complementary sensors and enhance the value of their combined views. In the section on marginal and enclosed water bodies, the Red Sea is discussed, while for the Mediterranean Sea (already covered, at the basin scale, by several papers appearing in a previous volume² of this series) only near-coastal and lagoon waters have been considered. A final review paper is dedicated to the African Great Lakes, in order to complete the spectrum of presentations on the most relevant water bodies of the continent. The breath of the environmental themes covered, and of the diverse techniques dealt with, required the collaboration of a truly international (global in fact) group of scientists. Their fundamental contributions, their patience and endurance in resisting the editors' constant harassment is acknowledged by the inclusion of all authors' and reviewers' names and affiliations in the list of contributors. Sincere thanks are due to all of them.

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Vittorio Barale and Martin Gade

² Barale V, Gade M (2008) Remote sensing of the European seas. Springer Science+Business Media BV, p 514.

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Barale, V.; Gade, M. (Eds.)

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