

A Pale View of Shizuo Ishiguro's Research —*Abiki*, the 1953 North Sea Flood, and Beyond—

Syuji Miyazaki

Graduate School of Informatics, Kyoto University, Kyoto 606-8501, Japan
E-mail address: miyazaki.syuji.8m@kyoto-u.ac.jp

(Received May 23, 2019; Accepted November 10, 2020)

Shizuo Ishiguro, the father of Nobel Prize-winning British novelist Kazuo Ishiguro, studied various sea-level changes, such as seiche, also known as *abiki* in the Nagasaki dialect, and the 1953 North Sea Flood, with his pioneering use of an analog computer in the 50s and 60s. Note that pioneering studies by Lorenz and Ueda using digital and analog computers were also performed in the 60s. Based on a retrospective review, it is discussed whether nonlinear phenomena, such as chaos, can be observed in line with his pioneering studies. His studies are also reconsidered in the context of advanced education for high-school students.

Key words: Abiki, Seiche, Secondary Undulation, 1953 North Sea Flood, Shizuo Ishiguro, Kazuo Ishiguro, Nagasaki Marine Observatory

*I had a rather precarious feeling, perched on the edge of that mountain looking out over such a view; a long way below us, we could see the harbor looking like a dense piece of machinery left in the water. Across the water, on the opposite bank, rose the series of hills led into Nagasaki. The land at the foot of the hills was busy with houses and buildings. Far over to our right, the harbor opened out on to the sea. So Nagasaki Bay is described in the seventh chapter of Kazuo Ishiguro's first novel: *A Pale View of Hills* (Ishiguro, 2010). This scenery from the hilltop of Inasa, located 333 meters above sea level, is also shown in the photo in Fig. 1.*



Fig. 1. Nagasaki Bay, viewed from the hilltop of Inasa, suffers occasionally from *abiki*.

Shizuo Ishiguro, whose son, Kazuo Ishiguro, received the Nobel prize in Literature in 2017, wrote a dissertation on

modeling ocean wave dynamics with an analog computer, and received a Doctorate of Science from the University of Tokyo in 1958. As an oceanographer, he was in 1948 assigned to the Nagasaki Marine Observatory (present: Nagasaki Meteorological Office), which is located *on the opposite bank* in the previous quote, after serving at the Meteorological Research Institute. He lived until 1960 in Nagasaki, which was a venue of the *Symposium on Form*, where the present topic was contributed in the *Forum* category.

Large oscillations in the water level in Nagasaki Bay which occur not very regularly, but may put human lives at risk in some situations, are called *abiki* in the Nagasaki area. Quite recently, on March 21, 2019, the city center of Nagasaki suffered damage from a flood despite fine weather, caused by *abiki*, which was analyzed and reported promptly by the Nagasaki Meteorological Office (Nagasaki Meteorological Office, March 2019). The Nagasaki Meteorological Office has always been keenly interested in *abiki* and illustrates this phenomenon on its Japanese website (Nagasaki Meteorological Office, May 2019).

At the Nagasaki Marine Observatory, Shizuo Ishiguro started to study *abiki*, also known as secondary undulation, using analog computer simulation as early as in 1949 (Ishiguro, 1950, 1959). A similar phenomenon called *seiche* occurs in Lake Geneva, Switzerland. This study received recognition and brought him to England. A similar analog computer simulation was performed for the North Sea flood of 1953 by him (Kennard, 2016; Science Museum, 2018). The natural voice of Shizuo Ishiguro was recorded during a lecture under the title of *Storm Surges in the North Sea* (Ishiguro, 1968). Later he was also engaged in research on North Sea oil fields. This time of his studies on *abiki* and the North Sea flood coincided with pioneering works on chaos using analog and digital computers by Lorenz (Lorenz, 1963, 1993) and Ueda. Around this time