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OBJECTS FROM INDIGENOUS AND WORLD CULTURES

The Bisj Pole Conservation Project at the Tropenmuseum: Pesticide mitigation during conservation treatment

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Abstract
In 2018, a project was started at the Tropenmuseum in Amsterdam (Nationaal Museum van Wereldculturen in the Netherlands) to conserve ten *bisj* poles from western New Guinea. Due to the size of the objects, the conservation treatment took place in the central hall of the museum, which is open to the public. The presence of white crystals on the surface of the objects indicates the toxic pesticide dichlorodiphenyltrichloroethane (DDT) or lindane. After analysis of the crystals with gas chromatography–mass spectrometry, the presence of DDT was confirmed. An occupational health and safety plan was established to reduce the exposure of the conservators and the public and so that the conservation treatment, which included mechanical removal of the DDT, could be continued.

INTRODUCTION

In 2018, a project was started at the Tropenmuseum (Nationaal Museum van Wereldculturen in the Netherlands) to conserve ten *bisj* poles from western New Guinea.[1] *Bisj* poles are ancestor or spirit poles made by the Asmat people as part of memorial feasts for the recently deceased. Due to the size of the objects (over 6 meters long), conservation treatment took place in the central hall of the museum, which is open to the public. However, prior to treatment, white crystals from the pesticide dichlorodiphenyltrichloroethane (DDT) were found on the surface. A safety plan was established in line with the Dutch Occupational Health Regime to reduce exposure and avoid contamination. The conservation treatment involved mechanical removal of the DDT, cleaning of the surface, and consolidation of the surface finishes.

Historical background

The Nationaal Museum van Wereldculturen in the Netherlands resulted from a merger in 2014 of the Tropenmuseum in Amsterdam, the Museum Volkenkunde in Leiden, and the Afrikamuseum in Berg en Dal, in close collaboration with the Wereldmuseum in Rotterdam. These collaborating museums together house 34 *bisj* poles, the largest collection in the world (van der Zee 2007). Dutch New Guinea, the western part of the island of New Guinea, was an overseas territory of the Kingdom of the Netherlands until 1962. Afterwards, it became two provinces of Indonesia, currently named Papua and West Papua.

Most of the *bisj* poles were bought by the collector Carel Groenevelt (1899–1973) on behalf of the Tropenmuseum and the Wereldmuseum. Groenevelt travelled to New Guinea in 1951–56 and 1957–62 to collect objects from the region, including *bisj* poles (Figure 1) (Hollander 2007). The Dutch intensified their collecting efforts as the Indonesian government's 1963 ban on local carving and culture in Papua drew near (Hoogerbrugge and Kooijman 1977, 8). There was a revival of the *bisj* feast in the Asmat culture after 1971 but without the "headhunting" part, which was suppressed due to Christianization in the 1950s.

The *bisj* feast

The Asmat culture consists of various cultural groups and is an umbrella term for the shared Asmat identity. The *bisj* poles were carved in a relatively small stretch of land on the Casuarina Coast as part of the complex *bisj*

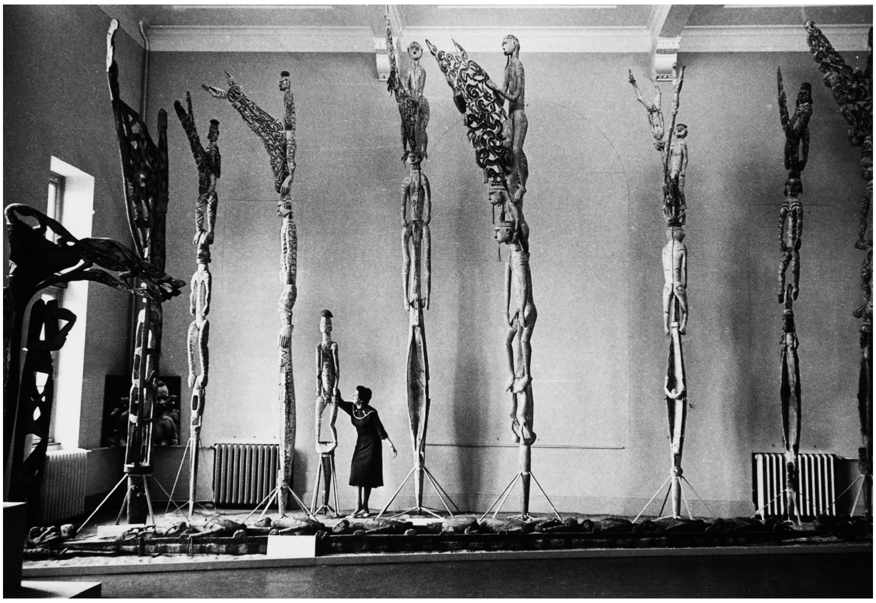

Figure 1. A Tropenmuseum employee standing between *bisj* poles from Dutch New Guinea in the museum. Photo by Mellema, 1959, Collectie Stichting Nationaal Museum van Wereldculturen, Coll. no. TM-60059483

Figure 2. (a) The shape of the *bisj* pole is cut with an axe (Coll. no. RV-10388-24); (b) Ndojokar, a woodcarver, uses a paring chisel to smoothen out the markings left by the axe (Coll. no. RV-10388-31); (c) excess chalk is removed from the grooves with a stick before applying red earth with water (Coll. no. RV-10388-68); (d) the completed Omadesep village *bisj* pole, depicting the Awun en Kiwir men (Coll. no. RV-100390-19). Photos by Professor Gerbrands, 1961, Collectie Stichting Nationaal Museum van Wereldculturen

ritual. The name derives from the word *mbi* ("spirit of the dead") (van der Zee 1996, 13).

The *bisj* feast was originally connected to the ritual procurement of human heads and therefore part of the male rite of passage into adulthood (Pouwer 2010, 224). The collection of "trophy heads" avenged the dead and restored the balance of spirit power in the village, as spirit power is manifested in the head. When the Asmat noticed an imbalance in the supernatural, such as death or disease, a *bisj* ceremony was held by the community (van Kessel 1961, 291). The *bisj* poles depict and commemorate the recently deceased members of the community.

The multifaceted feast is described by Kuruwaip (1974) who observed the steps involved in creating a *bisj* pole and the accompanying ceremonies. In general, a tree is felled in the mangrove forest and taken to the men's house, where the woodcarving begins. After a *bisj* pole is carved and painted, it is placed against a scaffold (Figure 2 a–d). After a cycle of feasts, which takes months, the *bisj* pole is left to decay in the mangrove forest. The power of the pole seeps into the earth and strengthens it (Kjellgren 2007).

The *bisj* poles are carved from an entire tree and can be over 8 meters high. The wild nutmeg tree is chosen because the felling and carving produce a scent that lures the ancestral spirits into the wood and the trunk becomes covered in a blood-red sap, which symbolizes the ancestors (van der Zee 1996, 21). The (male) carvers mainly work in the men's house, where the master carver, *wow ipit*, trains the novices (Kjellgren 2007, 26).

One of the buttress roots—the *tsjémen* (protrusion)—is kept and carved out. Standing for fertility and vitality, this protrusion stands at the top of the *bisj* pole and depicts symbols of the afterlife and warfare. Other parts of the pole are the *bisj anakat* (the main section with carved figures), *ci* (canoe), and *bino* (sago bowl), which form the lower section (Kjellgren 2007, 28). The figures on the *bisj anakat* represent the village's dead and

Figure 3. Conservation laboratory in the gallery, during paint consolidation (2018)

Figure 4. Dust on the surface (2018)

Figure 5. Part of the *tsjémen* with red and white paint layers after completion of the treatment (2018)

the person for whom the *bisj* pole is erected. The *ci* is how the souls are transported to the spirit world (Pouwer 2010).

Originally, local materials and traded tools were used to create *bisj* poles. The type of tools used for the carving changed around 1940 when metal became available to the Asmat through trade with the Europeans (van der Zee 1996, 29). *Bisj* poles were painted with red, black, and white pigments—red ochre, carbon black, and ground shells, respectively.[2] Hoogerbrugge (2011) suggests that the red paint was also made from the inner bark of the mangrove tree, with water as a binding medium and applicant. Furthermore, it is mentioned that the blood of someone who had been killed was applied to the surface before painting (Pouwer 2010).

THE BISJ POLE CONSERVATION PROJECT

A total of ten *bisj* poles underwent conservation treatment as part of the Bisj Pole Conservation Project (BCP) at the Tropenmusem due to changes in the galleries and a loan to the Royal Academy of Arts (London) and Musée du quai Branly (Paris) for the *Oceania* exhibition (2018–19). Because of their size, the objects could not be treated in the conservation laboratory. This resulted in a workspace that was open to the public in the museum gallery where six *bisj* poles had been displayed originally for decades. In this workspace, general equipment was installed and a Dino-Lite microscope set up and connected to a screen on which detailed visuals of the treatment could be shown to the public (Figure 3). The conservation treatment was introduced by the conservators and curator through short films. Films by artist Roy Villevoye were screened on site to show the public what an Asmat *bisj* feast looks like.[3]

During opening hours, visitors were able to ask the conservators questions at any time, creating an educational and personalized experience for the public. No glass was placed between the workspace and the public to enable better communication. A perimeter of two meters was placed around the objects. Oral exchanges gave visitors an insight into the practice of conservation in general and the treatments being used as they could be explained and shown at the same time. A diverse number of conversation subjects were addressed that were tailored to the interests of the public. For example, conservation ethics were discussed as many visitors thought the conservators were repainting the objects.

Six conservators worked in teams of two for ten weeks. During a kick-off meeting, the conservation methods and plans were discussed. The history and use of the objects were reviewed with the curator. A journal on daily progress and new findings was kept by the conservators for better communication. Every morning, the new team would read these entries and adjust the methods accordingly.

Condition of the *bisj* poles

The condition of the *bisj* poles was examined and a conservation plan established prior to treatment. The main damage was dust and dirt (0.3–2 cm thick), loose and powdery paint particles, cracked and unstable wooden parts, insect damage, and broken and torn plant fibers (Figures 4–5). During

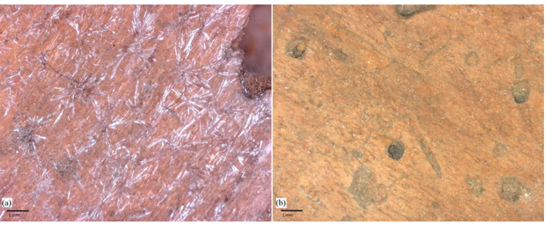

Figure 6. (a) Before and (b) after mechanical removal of the DDT crystals on the wooden surface of the *bisj* pole. Microscopic photos

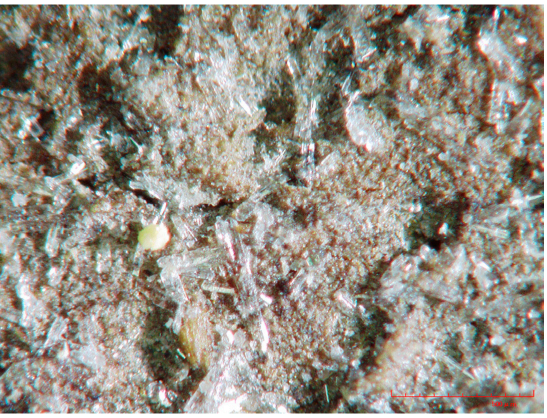

Figure 7. DDT crystals on the painted wood. Hirox photograph, 160×

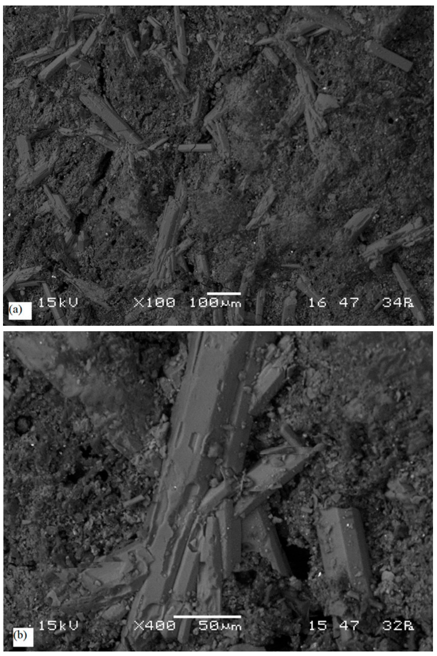

Figure 8. SEM images of the DDT showing the needle-shaped crystals on the painted wood at (a) 100× and (b) 400×

the condition check, colorless crystals were noted locally on the surface, with a larger number of crystals on older restoration fills, in woodworm holes, and in cracks in the wood.

HEALTH AND SAFETY

Pesticides were often used on ethnographic collections in the past. It is possible that Asmat objects were treated with DDT in Papua (Kuruwaip 1976). It is known to have been used as a spray in the Tropenmuseum, although no treatment records confirm this. Recent pesticide mitigation projects in the Tropenmuseum were concerned with the management of objects in the storage facilities. During the BCP project, a procedure was established for the cleaning of objects treated with pesticides and this research aided the identification of DDT on objects in general.

DDT analysis

White and colorless crystals were observed when moving a flashlight across the surface of the *bisj* poles.

Twelve samples of crystals were collected from six poles. These samples were analyzed using gas chromatography–mass spectrometry (GC–MS) by the company RPS Analyse. The results showed high amounts of p,p'-DDT on all samples, as well as negligible amounts of o,p'-DDT and cyclohexane (lindane), respectively.

The crystals were examined and photographed with a microscope (Dino-Lite and Hirox, Figures 6–7). Scanning electron microscopy–energy-dispersive X-ray spectroscopy (SEM–EDX) showed needle-shaped crystals containing chlorine (Figure 8).[4] Further analysis was performed on other museum objects with a portable X-ray fluorescence (pXRF) spectrometer to detect chlorine on the surface, the part of DDT that can be detected by XRF. Sea water was also suggested as a source of the chlorine, but the lack of bromine excluded this.

Bare samples of wood with surface gloss and the wood with paint layers from objects with DDT crystals were analyzed by SEM. Chlorine was not detected within the wooden matrix of the samples, but it was found on the surface of wood with a satiny gloss.

Occupational health and safety

In order to conduct safe removal of the DDT, the health risk was explored (Odegaard and Zimmt 2008). The risk to health is determined by the nature, length, and frequency of exposure. The health risk relates to the chance of exposure and the effect of that exposure. Therefore, the occupational health and safety regime in the Netherlands stipulates that the toxicity risk is determined by the nature of the toxic substance, the exposure time, and the control measures in place (Visser 2009). These are discussed below for the BCP.

DDT and its toxicity

According to the National Institute for Occupational Safety and Health (NIOSH 2019), dichlorodiphenyltrichloroethane ($C_{14}H_9C_{15}$) is acutely toxic to humans and hazardous to the aquatic environment. In 1948, the Nobel Prize was awarded for the discovery of the applicability of DDT as an insecticide. In the 1960s, the environmental and health hazards became apparent, which led to a ban on DDT in 1973 in the Netherlands.

DDT exposure is toxic via inhalation, skin absorption, ingestion, and skin and/or eye contact. This exposure can result in acute or chronic toxicity. Symptoms of acute and chronic toxicity include irritation of the eyes and skin; paresthesia of the tongue, lips, and face; trembling; anxiety, dizziness, confusion, malaise (a vague feeling of discomfort), headache, and lassitude (weakness and exhaustion); convulsions; hand paresis; and vomiting. DDT is probably carcinogenic to humans (IARC 26 June 2020, classification 2A 2018; ILO/WHO 2017).

Implementation of a health and safety plan

The exposure of the conservators or visitors to DDT was not measured so no comparison could be made with the recommended exposure limit and no actions taken accordingly.[5] Due to the presence of DDT, a health and safety plan was implemented to reduce exposure for both the conservators and the public. This protocol involved multiple steps and derived from a general occupational hygiene protocol (Visser 2009), which was implemented during conservation work (Hensel 2013).

The first step in the general health and safety plan was to remove the source of the toxic substance, which in this case meant removal of the contaminated part of the object. This was not suitable for the *bisj* poles due to their cultural and historical importance. For the same reason, applying a surface coating was not considered. It was possible to avoid conservation work to prevent exposure, but this would have excluded the objects from the museum collection, terminating accessibility and readability. Therefore, it was decided to go ahead with the conservation work.

The second step was to control and reduce exposure through organizational and technical measures: ventilation, working method, and workspace. Cleaning objects in a closed environment with a ventilation system, such as a fume cupboard, was the preferred approach, but a portable air ventilation unit was used instead due to the size of the *bisj* poles.

The conservator was also able to limit exposure by using a cleaning method that reduced the production of inhalable airborne particles. For DDT, such a method could involve liquid and supercritical carbon dioxide or wet cleaning with solvents (Odegaard and Zimmt 2008, Tello and Unger 2010). However, due to the size of the objects, the availability of resources, the time constraints, and the properties of the surface of the *bisj* poles, a dry mechanical cleaning method was chosen.

Making the workspace smaller would have limited the contaminated area and this would have been easier to ventilate and clean. However, as the idea was to show the treatment to visitors and enable conversation, the workspace was not closed off.

The third step to reduce exposure was to limit exposure time. If the working hours per conservator are reduced, the exposure per person is lowered.

In the BCP, a conservator worked for three days per week. The cleaning procedure was planned on Mondays and Tuesdays, and the museum was closed on Mondays, which reduced exposure to the public.

The fourth and last step involved the use of appropriate personal protective equipment (PPE). Wearing PPE is the least desirable method for reducing exposure, because it will not minimize the amount of toxic material in the air and it can worsen working conditions. The following PPE were used: FFP3 facemasks, nitrile gloves, glasses, and working clothes.

THE CONSERVATION TREATMENT

The conservation treatment started by dry-cleaning the surface with a soft brush, followed by cleaning with a smoke sponge. A portable vacuum cleaner and a mobile extractor with an H13 high-efficiency particulate air (HEPA) filter were used during dry cleaning and removal of the DDT crystals. The matte paint was consolidated with Culminal 2000–3000 methylcellulose (0.5–1% in demineralized water). An ultrasonic humidifier with demineralized water was used to prevent tidelines. The fibers were consolidated with wheat starch paste or methylcellulose in combination with color-matched Japanese paper. Some small unstable wooden parts were adhered together using animal glue and balsa wood.

Results of the treatment

During the conservation treatment, most of the dirt and dust were removed from the surface. Removing the dust and dirt improved visibility of the paint layers and thus the readability of the object. Treatment of the matte paint was successful, as the consolidant did not change the characteristics of the material, such as the gloss, although a slight saturation of the red color was noted. Microscopic images were compared before and after cleaning. Most of the superficial DDT crystals were removed; however, some crystals remained on the surface and in the pores of the wood after cleaning (Figure 6).

DISCUSSION

Identification of the DDT

In the museum collection, not all of the objects with DDT were labelled. Classifying objects with a high risk of contamination of DDT was done by the conservators using accessible methods: visual analysis, sorting of objects by high probability, and pXRF analysis. The crystals and surfaces with a satiny gloss were visible with a moving flashlight and the needle-shaped structure was recognizable with a portable microscope. Objects at risk of DDT are wooden objects or organic materials with (or without) biological damage. Portable XRF is a quick method of identifying the presence of organochlorine insecticides (together with other toxic elements) and will be a focus point in the future. The Beilstein test (1872) is a quick but dated method to detect chlorine on an object. It was disregarded for a large survey as it requires the use of an open fire and results in a toxic gas after the pesticide is burned off.

DDT on the object

Mechanical cleaning of the surface reduced the amount of DDT on the object, even though crystals remained within the matrix of the object. Analysis with SEM suggested the DDT had not migrated through the whole object. On recently cleaned surfaces, the re-crystallization of DDT crystals was noticed within two months. This crystallization occurred locally, on areas with biological damage where (more) DDT had most likely been applied. Both phenomena, mechanical cleaning and crystallization, left the surface of the objects contaminated with DDT and sparked debate about future cleaning procedures and installation parameters. The museum aims to complete the survey of contaminated objects, constantly evaluate current cleaning treatments, and monitor the re-crystallization of DDT after cleaning bearing in mind surface, time, and climate. The future cleaning methods and installation parameters will be determined by the size and materials of the object.

Exposure to DDT

If the chance of exposure to the toxic substance is small or if it has little effect, the risk is considered small (Visser 2009, 104). To reduce visitors' chance of exposure, a perimeter was placed around the workspace. Potential loose crystals were filtered out of the air with the HEPA filters and removed from the ground in the workspace by daily wet cleaning.

Communication and discussion between the members of the conservation team were vital to avoid exposure. The safety plan and DDT material safety data sheets were discussed frequently. Changes were made to the cleaning of the workspace by adopting a more thorough approach (daily wet cleaning with water and disposable towels), chemical waste was stored separately, PPE and ventilation was improved, a new cleanable floor was installed, and the workspace was better organized (with clean and contaminated areas). Each conservator had to be alert constantly. Efforts were made to change habits in order to maintain a safe working environment. By alerting each other actively and maintaining a strict regime with regard to the clean and contaminated work areas, the risk was reduced.

Although exposure to a certain level of DDT is safe, it is difficult to argue in favor of minimum exposure levels, since it could be reasoned that there are no "safe" levels of exposure to any possible carcinogen. As levels of exposure to DDT have decreased over time, it is possible that they will also decline in the future.

CONCLUSION

Conservation projects involving treatments and hazardous materials often take place behind closed doors. The Bisj Pole Conservation Project allowed the public a peak behind the curtain of conservation at the Tropenmuseum. Conservation of objects in a publicly accessible laboratory proved to be an interactive and educational experience for visitors. The implementation of the health and safety plan necessary to reduce exposure to DDT for conservators and the public was challenging. A protocol was established and followed to reduce contamination of the workspace. Thanks to these procedures, the conservation treatment of ten *bisj* poles could be carried out and the presence of DDT on the surface was reduced. The Bisj Pole Conservation Project sparked ongoing research on DDT in the collection and pesticide mitigation will remain a focal point for the museum laboratories.

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NOTES

[1] The team: Jessica Hensel and Martijn de Ruijter (Tropenmuseum). Freelance conservators: Heleen van Eendenburg, Charlotte Lammers, Silvia Schmedding-van de Goorberg, and Lise Wolfert. Objects: TM-573-64, TM-2787-1, TM-2445-30, WM-51690, RV-3242-2, WM-46823, TM-2357-77, WM-48962, TM-3648-1, and TM-3229-1.

[2] Pigment analyses with SEM: ochre, carbon black, and lime were confirmed.

[3] Villevoye (2007), *Film voorstellende verloop en betekenis van het Bisj feest* (Tropenmuseum).

[4] SEM JSM-5910LV (JEOL).

[5] Exposure could be measured with a personal air sampling device during work and compared to permissible exposure limits.

REFERENCES

Beilstein, F. 1872. Ueber den Nachweis von Chlor, Brom und Jod in organischen Substanzen. *Zeitschrift für analytische Chemie* 12, 95 (1873). https://doi.org/10.1007/BF01462970

Hensel, J.V. 2013. Conservation of an historic interior containing the pigment orpiment: Health concerns. Paper presented at *PREV-LABOR 2013. International Conference on Conservation-Restoration and Health/Security of People and the Environment, Draguignan-Figanières, Provence, France, 17–21 June 2013.* Laboratoire de Conservation, Restauration et Recherches de Draguignan, France.

Hollander, H. 2007. *Een man met een speurdersneus: Carel Groenevelt (1899–1973), beroepsverzamelaar voor Tropenmuseum en Wereldmuseum, en Wereldmuseum in Nieuw-Guinea.* Amsterdam: KIT publishers.

Hoogerbrugge, J., ed. 2011. *Asmat: Arts, crafts and people.* Leiden: Zwartenkot Art Books.

Hoogerbrugge, J. and S. Kooijman. 1977. *Asmat Kunt. Asmat Art. Kesenian Asmat.* Breda: Rijksmuseum Volkenkunde.

International Agency for Research on Cancer (IARC). 26 June 2020 [last update]. IARC monographs on the identification of carcinogenic hazards to humans. https://monographs.iarc.fr/agents-classified-by-the-iarc/ (accessed 31 October 2019).

International Labour Organization (ILO)/World Health Organization (WHO). 2017. Material Safety Data Sheet: DDT. www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=0034 (accessed 31 October 2019).

Kessel, C.H. van. 1961. De Casuarinenkust. *Nieuw Guinea Studiën* 5(4): 277–300.

Kjellgren, E. 2007. *Oceania: Art of the Pacific Islands in the Metropolitan Museum of Art,* 26. New York: Metropolitan Museum of Art.

Kuruwaip, A. 1974. The Asmat bis pole: Its background and meaning. *Irian, Bulletin of Irian Jaya Development* 3(2): 32–87.

Kuruwaip, A. 1976. Letter. *Pacific Arts Newsletter* 3: 4–6.

The National Institute for Occupational Safety and Health (NIOSH). 2019. NIOSH pocket guide to chemical hazards, DDT, CAS No. 50-29-3, last revised 30 October 2019. www.cdc.gov/niosh/npg/npgd0174.html (accessed 21 October 2019).

Odegaard, N. and W. Zimmt. 2008. Pesticide removal studies for cultural objects. In *Preserving Aboriginal Heritage: Technical and Traditional Approaches. Proceedings of a Conference Symposium 2007, Ottawa, Canada, 24–28 September 2007,* eds. C. Dignard, K. Helwig, J. Mason, K. Nanowin, and T. Stone. Ottawa: Canadian Conservation Institute.

Pouwer, J. 2010. Asmat headhunting and the initiation of male adolescents. In *Gender, ritual and social formation in West Papua: A configurational analysis comparing Kamoro and Asmat*, chap. XI, 207–30. Leiden: Brill. https://doi.org/10.1163/9789004253728_012

Tello, H. and A. Unger. 2010. Liquid and supercritical carbon dioxide as a cleaning and decontamination agent for ethnographic materials and objects. In *Pesticide Mitigation in Museum Collections: Science in Conservation. Proceedings from the MCI Workshop Series,* eds. A.E. Charola and R.J. Koestler, 35–50. Washington, D.C.: Smithsonian Institution Scholarly Press. https://doi.org/10.5479/si.19492359.1.1

Visser, R. 2009. *Arbo Informatieblad 31. Richtlijn voor de Arbocatalogus. Gezondheidsrisico's van gevaarlijke Stoffen,* 19. The Hague: SDU Uitgevers.

Zee, P. van der. 1996. *Etsjopok: Avenging the ancestors. The* bisj *poles of the Asmat and a proposal for a morphological method.* Working papers in Ethnic Art. Gent: S.E.A. Department Ethnic Art.

Zee, P. van der. 2007. *Bisj-palen. Een woud van magische beelden.* Amsterdam: KIT Publishers.

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