		SERVICE Wood Biology
OUR REFERNCE exp_464	YOUR REFERENCE Nightstand WEBSTER	DATE 30-11-2023
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CONCERNING EXPERTISE		

ENFORCE – Center for Forensic Wood Research

Expertise Report

This report concerns the macro- and microscopic wood identification of the sample received with references listed below.

Reference: exp_464
Date received: 24/08/2023
Date report: 30/11/2023

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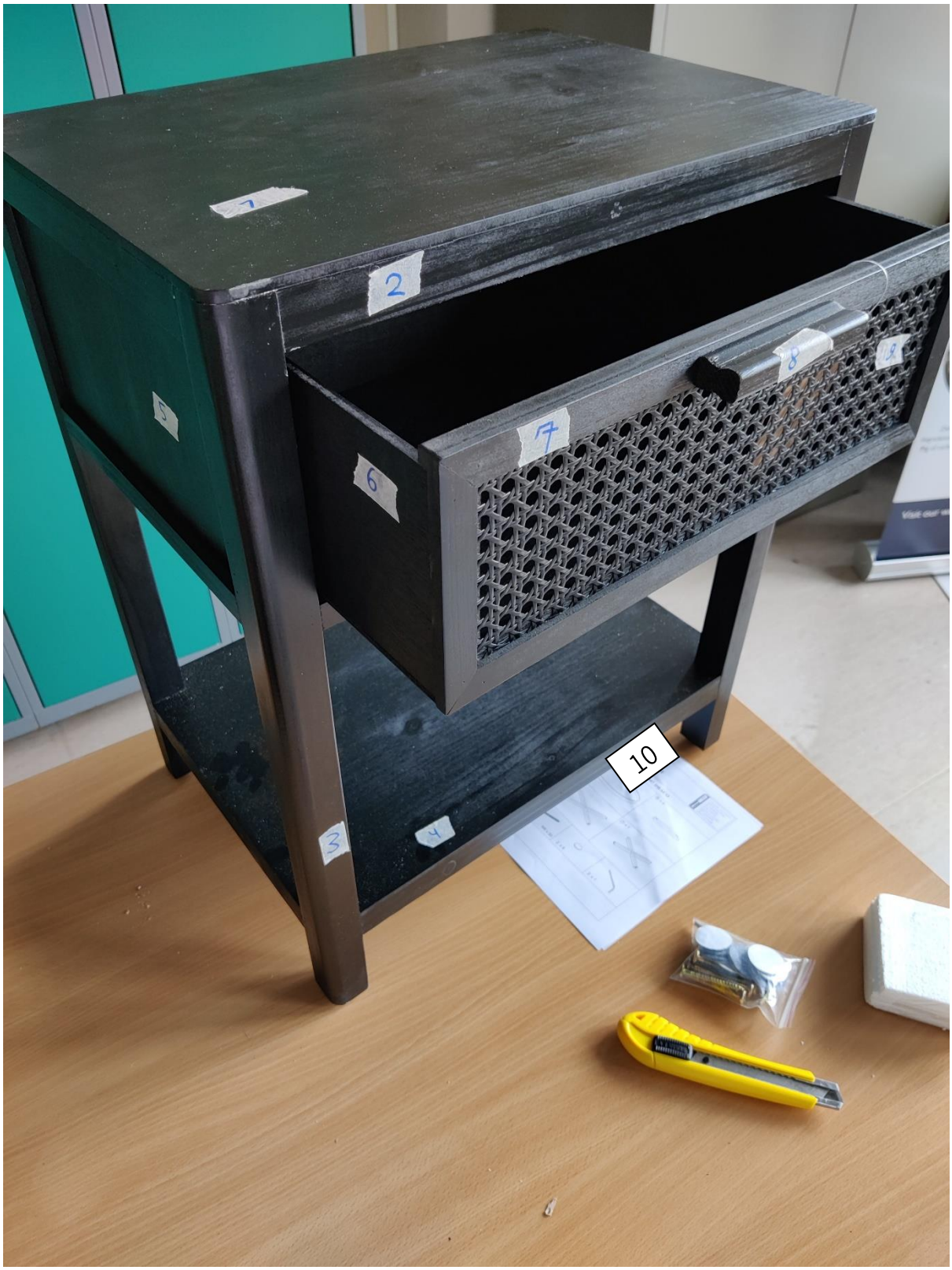
Description sample

Nightstand (WEBSTER). Declaration: Frame, Spruce - *Picea* (China); Drawer, Rotan (China). Produced in China.

See picture(s) listed below:



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Treatment

Samples were taken from different locations in the nightstand (total of 10 samples, 1 from rotan).

The 4 samples of solid wood (sample 2, 3, 8, 10) were about 1 cm^3 and were softened in an oven at 70°C (ref. Lab Protocol). Thin sections were made in transversal, tangential and radial plane using a microtome. These were stained with Safranine 0 and Alcian Blue. The anatomical features (ref. IAWA List) were studied with an optical microscope and an electron microscope. These features were compared with reference material online (ref. InsideWood) and in the xylarium of the Service for Wood Biology.

5 samples were taken from the MDF and attached top layers in the nightstand. The top layers were cut loose and processed to thin sections for microscopic examination. The fibres and vessel elements of the MDF were immersed and loosened in boiling water and prepared as a maceration for microscopic examination. The anatomical features were studied with an optical microscope. These features were compared with reference material online (ref. InsideWood, ref. Atlas of Vessel Elements) and in the xylarium of the Service for Wood Biology.

Anatomical features

Sample 1

MDF with top layers both on top and bottom.
Within the macerations of the MDF two wood taxa (1-2) were observed corresponding to the following anatomical features.

1. Vessel-ray pitting apparently simple, vessel element length 200-400 µm, vessel element diameter 70-180 µm, simple perforation plates, bordered intervessel pit vertical size 4-5 µm, intervessel pit aperture slit-like.
2. Tracheid pitting uniseriate, ray tracheids commonly present, ray tracheid cell walls dentate, cross-field pitting fenestriform.

Top layer 1

N° (IAWA)	Presence*	Feature Description
22	p	Intervessel pits alternate
23	p	Shape of alternate pits polygonal
26	p	Medium intervessel pits - 7 - 10 µm
29	a	Vestured pits
65	p	Septate fibres present
106	p	Body ray cells procumbent with one row of upright and / or square marginal cells

*(p = present, a = absent, v = variable)

Top layer 2

N° (IAWA)	Presence*	Feature Description
44	p	IT pitting (predominantly) uniseriate
72	p	Axial parenchyma (AP) present
76	p	Smooth AP transverse end walls
85	p	Smooth (unpitted) end walls of ray parenchyma cells
87	p	Smooth (unpitted) horizontal walls of ray parenchyma cells
94	p	Taxodioid
107	p	Rays exclusively uniseriate

*(p = present, a = absent, v = variable)

Sample 2

Solid softwood

N° (IAWA)	Presence*	Feature Description
40	p	Growth ring boundaries distinct
43	p	Gradual transition from earlywood to latewood
44	p	IT pitting (predominantly) uniseriate
72	p	Axial parenchyma (AP) present
73	p	Diffuse axial parenchyma
76	p	Smooth AP transverse end walls
77	p	Irregularly thickened AP transverse end walls
80	p	Ray tracheids absent or very rare
85	p	Smooth (unpitted) end walls of ray parenchyma cells
87	p	Smooth (unpitted) horizontal walls of ray parenchyma cells
94	p	Taxodioid
103	p	Average ray height medium (5 to 15 cells)
107	p	Rays exclusively uniseriate

*(p = present, a = absent, v = variable)

Sample 3

Solid softwood

N° (IAWA)	Presence*	Feature Description
40	p	Growth ring boundaries distinct
43	p	Gradual transition from earlywood to latewood
44	p	IT pitting (predominantly) uniseriate
72	p	Axial parenchyma (AP) present
73	p	Diffuse axial parenchyma
76	p	Smooth AP transverse end walls
80	p	Ray tracheids absent or very rare
85	p	Smooth (unpitted) end walls of ray parenchyma cells
87	p	Smooth (unpitted) horizontal walls of ray parenchyma cells
93	p	Cupressoid
107	p	Rays exclusively uniseriate

*(p = present, a = absent, v = variable)

Sample 4

MDF without top layers.

Within the macerations of the MDF three wood taxa (1-3) were observed corresponding to the following anatomical features.

1. Very rare occurrence of vessel elements with scalariform perforation plates and scalariform pitting.
2. Vessel-ray pitting apparently simple, vessel element length 250-400 µm, vessel element diameter 50-190 µm, simple perforation plates, bordered intervessel pit vertical size 5-7 µm, vessels tube-shaped, intervessel pits rare.
3. Tracheid pitting uniseriate, ray tracheids commonly present, ray tracheid cell walls dentate, cross-field pitting fenestriform.

Sample 5

MDF with top layers both on top and bottom.

Within the macerations of the MDF three wood taxa (1-3) were observed corresponding to the following anatomical features.

1. Tracheid pitting uniseriate, ray tracheids commonly present, ray tracheid cell walls dentate, cross-field pitting fenestriform.
2. Vessel-ray pitting apparently simple, vessel element length 300-315 µm, vessel element diameter 120-140 µm, simple perforation plates, vessels tube-shaped, intervessel pits rare, intervessel pit apertures slit-like.
3. Very rare occurrence of vessel elements with scalariform perforation plates.

Top layer 1

N° (IAWA)	Presence*	Feature Description
44	p	IT pitting (predominantly) uniseriate
72	p	Axial parenchyma (AP) present
76	p	Smooth AP transverse end walls
80	p	Ray tracheids absent or very rare
85	p	Smooth (unpitted) end walls of ray parenchyma cells
87	p	Smooth (unpitted) horizontal walls of ray parenchyma cells
94	p	Taxodioid
103	p	Average ray height medium (5 to 15 cells)

*(p = present, a = absent, v = variable)

Top layer 2

N° (IAWA)	Presence*	Feature Description
22	p	Intervessel pits alternate
27	p	Large intervessel pits - >= 10 µm
29	a	Vestured pits
42	p	Mean tangential diameter of vessel lumina 100 - 200 µm
65	p	Septate fibres present
70	a	Fibres very thick-walled
80	a	Axial parenchyma aliform
81	a	Axial parenchyma lozenge-aliform
82	a	Axial parenchyma winged-aliform
83	a	Axial parenchyma confluent
97	p	Ray width 1 to 3 cells
99	a	Larger rays commonly > 10-seriate
106	p	Body ray cells procumbent with one row of upright and / or square marginal cells

*(p = present, a = absent, v = variable)

Sample 6

MDF with top layers both on top and bottom.

Within the macerations of the MDF four wood taxa (1-4) were observed corresponding to the following anatomical features.

1. Vessel-ray pitting apparently simple, vessel element length 480-900 µm, vessel element diameter 40-110 µm, scalariform perforation plates, number of perforation plates 7-10, long tails without abrupt transition, intervessel pits rare.
2. All pits similar, vessel element length 300-314 µm, vessel element diameter 200-242 µm, simple perforation plates, vessels barrel-shaped, tails with abrupt transition, 4-7 pits per ray cell, pits in corners of ray-vessel pit fields present, intervessel pit apertures slit-like.
3. Vessel-ray pitting apparently simple, vessel element length ca. 300 µm, vessel element diameter ca. 130 µm, simple perforation plates, vessels tube-shaped, intervessel pits rare.
4. Tracheid pitting uniseriate, ray tracheids commonly present, ray tracheid cell walls dentate, cross-field pitting fenestriform.

Top layers (same features on both sides)

N° (IAWA)	Presence*	Feature Description
22	p	Intervessel pits alternate
27	p	Large intervessel pits - >= 10 µm
29	a	Vestured pits
42	p	Mean tangential diameter of vessel lumina 100 - 200 µm
65	p	Septate fibres present
68	p	Fibres very thin-walled
97	p	Ray width 1 to 3 cells
106	p	Body ray cells procumbent with one row of upright and / or square marginal cells
159	p	Silica bodies present

*(p = present, a = absent, v = variable)

Sample 7

MDF without top layers.

Within the macerations of the MDF two wood taxa (1-2) were observed corresponding to the following anatomical features.

1. Vessel-ray pitting apparently simple, vessel element length 250-474 µm, vessel element length 100-202 µm, simple perforation plates, vessels tube-shaped, intervessel pits rare
2. All pits similar, vessel element length 328 µm, vessel element diameter 217 µm, simple perforation plates, vessels barrel-shaped, 3-5 pits per ray cell, pits in corners of ray-vessel pit fields present.

Sample 8

Solid softwood

N° (IAWA)	Presence*	Feature Description
40	p	Growth ring boundaries distinct
43	p	Gradual transition from earlywood to latewood
44	p	IT pitting (predominantly) uniseriate
72	p	Axial parenchyma (AP) present
73	p	Diffuse axial parenchyma
76	p	Smooth AP transverse end walls
77	p	Irregularly thickened AP transverse end walls
80	p	Ray tracheids absent or very rare
85	p	Smooth (unpitted) end walls of ray parenchyma cells
87	p	Smooth (unpitted) horizontal walls of ray parenchyma cells
94	p	Taxodioid
103	p	Average ray height medium (5 to 15 cells)
107	p	Rays exclusively uniseriate

*(p = present, a = absent, v = variable)

Sample 9

Rotan (*Calamus rotang*)

Sample 10

Solid softwood

N° (IAWA)	Presence*	Feature Description
40	p	Growth ring boundaries distinct
43	p	Gradual transition from earlywood to latewood
44	p	IT pitting (predominantly) uniseriate
72	p	Axial parenchyma (AP) present
73	p	Diffuse axial parenchyma
76	p	Smooth AP transverse end walls
77	p	Irregularly thickened AP transverse end walls
80	p	Ray tracheids absent or very rare
85	p	Smooth (unpitted) end walls of ray parenchyma cells
87	p	Smooth (unpitted) horizontal walls of ray parenchyma cells
94	p	Taxodioid
103	p	Average ray height medium (5 to 15 cells)
104	v	Average ray height high (from 16 to 30 cells)
107	p	Rays exclusively uniseriate

*(p = present, a = absent, v = variable)

Conclusion

The received nightstand does not contain *Picea* sp. The softwoods identified in the nightstand concern *Podocarpus* sp. and *Pinus* sp.

Below table offers an overview of the botanical genera and species that match the anatomical features of the 10 samples taken from the nightstand.

Sample	Location	Description	Family	Genus	Species
1	Upper surface nightstand	MDF	*Myrtaceae*	cfr. *Eucalyptus*	sp.
			Pinaceae	*Pinus*	sp.
		Top layer 1 (softwood)	*Podocarpaceae*	cfr. *Podocarpus*	sp.
		Top layer 2 (hardwood)	*Burseraceae*	*Aucoumea*	*klaineana*
2	Horizontal beam under upper surface	Solid softwood	*Podocarpaceae*	*Podocarpus*	sp.
3	Vertical corner leg	Solid softwood	*Podocarpaceae*	*Podocarpus*	sp.
4	Bottom surface between the nightstand legs	MDF	*Theaceae*	cfr. *Schima*	sp.
			Myrtaceae	*Eucalyptus*	sp.
			Pinaceae	*Pinus*	sp.
5	Outer frame of the nighstand containing the drawer	MDF	*Pinaceae*	*Pinus*	sp.
			Myrtaceae	*Eucalyptus*	sp.
			Theaceae	cfr. *Schima*	sp.
		Top layer 1 (softwood)	*Podocarpaceae*	cfr. *Podocarpus*	sp.
		Top layer 2 (hardwood)	*Burseraceae*	*Aucoumea*	*klaineana*
6	Drawer side panel	MDF	*Theaceae*	*Schima*	sp.
			Malvaceae	*Durio*	sp.
			Myrtaceae	*Eucalyptus*	sp.
			Pinaceae	*Pinus*	sp.
		Top layers (softwood)	*Burseraceae*	*Aucoumea*	*klaineana*
7	Beams surrouding the drawer rotan	MDF	*Myrtaceae*	*Eucalyptus*	sp.
			Malvaceae	*Durio*	sp.
8	Drawer handle.	Solid softwood	*Podocarpaceae*	*Podocarpus*	sp.
9	Front of the drawer	rotan	*Arecaceae*	*Calamus*	*rotang*
10	Horizontal beam below the bottom surface	Solid softwood	*Podocarpaceae*	*Podocarpus*	sp.

The identifications "*Podocarpus* sp." signify the presence of one or multiple species within the genus *Podocarpus* in the samples taken from the nightstand, including the species *Nageia nagi* (synonym of *Podocarpus nagi*).

The identification "cfr. *Eucalyptus* sp." in one of the MDF samples signifies a strong similarity with the genus *Eucalyptus*. These anatomical features also (partly) match the features of the genus *Shorea* (which contains the meranti-species). It is therefore not excluded that *Shorea* may also be present in these samples.

The identifications "cfr. *Schima* sp." in some of the MDF samples signify an uncertainty of the identification of this genus due to the very limited amount of material of this taxon within the MDF. The anatomical features (which are only partly visible) and the identification of this genus in other MDF samples of the nightstand suggest *Schima*, but do not exclude other genera completely in the sample.

The identifications "cfr. *Podocarpus* sp." in some of the veneers signify a strong similarity with the genus Podocarpus. These anatomical features also (partly) match the features of other genera in the families *Podocarpaceae* and *Cupressaceae*. It is therefore not excluded that other species within these families may be present.

Chinese wood species of the genus Podocarpus are listed in the Threatened Species List of China's Higher Plants. This includes *Nageia nagi* (synonym of *Podocarpus nagi*, endangered), *Podocarpus macrophyllus* (vulnerable), *Podocarpus nakaii* (endangered), *Podocarpus neriifolius* (vulnerable), *Podocarpus wangii* (endangered). Ref.: Anatomical database and atlas of Chinese woods.

However, listings in Threatened Species lists are not always directly linked to illegal activitities or an embargo in trade, like this is the case for e.g., CITES-listed species. This nightstand does not contain any CITES-species but it contains one species that is nowadays linked to laundering and vague or false origin information: *Aucoumea klaineana* (known as okoumé in trade). This African species has a fairly limited distribution and is restricted to Gabon, a part of the Republic of Congo and continental Equatorial Guinea. There are small natural stands in southern Cameroon, near the border with Equatorial Guinea. Plantations are installed in Gabon and Cameroon as well as in Ivory Coast.

Okoumé is considered one of the best species for tropical-faced plywood and veneer. It represents the bulk of timber production in Gabon and Equatorial Guinea. China is the largest importer of okoumé, especially as logs (van Valkenburg 2005). Gabon – the main origin country – banned okoumé log export early in the 2000s, causing a strong shift to Equatorial Guinea, one of the lowest ranked countries in the Corruption Perceptions Index of Transparency International (i.e., high level of corruption). Although Equatorial Guinea also issued a ban on log export between 2008 and 2020, there a several reports stating that logs still enter China through Equatorial Guinea (see further). In China, these logs are transformed into veneer sheets and become part of panels used in diverse applications as furniture and doors that are exported (mainly) to the US and Europe. The multi-continental supply chain is blurred towards the origin of timber. Two examples:

- WWF Belgium sampled 49 pieces of wooden furniture and found inconsistencies between declarations and scientific identification in 22 pieces. In four of those cases, okoumé was found while it was not declared as okoumé by the supplier. In three out of the four cases, the origin of the furniture was China, in the other case it was India (Wedeux 2020). No further research was done but it is clear that okoumé is not always correctly declared by suppliers.

- This month, Environmental Investigation Agency (a leading US non-profit organization) published a report on the US retailer 'Home Depot', using illegally cut okoumé from Equatorial Guinea in door frames. In 2019, the same agency reported on the same species but concentrating on Gabon and the Republic of Congo where forest concessions where illegally obtained, overharvests took place on a regular basis and corporate taxes were avoided. Both reports are focusing on the linkage between the US, China and the African countries of origin but after the US, Europe is the second largest importer of Chinese wood panels and veneers.

Regarding certified wood, okoumé is also under the spotlight of FSC International and part of a transaction verification. Those transaction verifications are linked to mismatches in the chain of custody that FSC audits or the result of complaints by third parties. In this case, FSC identified several potential false claims and significant volume mismatches in FSC-certified okoumé supply chains, originating in Africa (FSC 2023).

Using wood anatomy, we cannot make claims on the origin of the okoumé timber identified in this nightstand, we can only report on the potential risks linked to the species.

References

Environmental Investigation Agency. 2019. Toxic trade: forest crime in Gabon and the Republic of Congo and contamination of the US market. Report. 84 pages.

Environmental Investigation Agency. 2023. The dictator's door: from crimes in Equatorial Guinea to Home Depot's customers. Report. 39 pages.

FSC. 2023. Website, https://fsc.org/en/newscentre/integrity-and-disputes. Accessed 30 November 2023.

Helmling, Stephanie & Olbrich, Andrea & Heinz, Immo & Koch, Gerald. (2018). ATLAS OF VESSEL ELEMENTS: Identification of Asian Timbers. IAWA Journal. 39. 249-352. 10.1163/22941932-20180202.

InsideWood. 2004-onwards. Published on the Internet. http://insidewood.lib.ncsu.edu/search

Itoh, T., B. Pan, P. Baas, J. Luo, D. Li, Y. Cui, F. Wang, M. Mertz, & Y. Yasumoto. 2022. Anatomical database and atlas of Chinese woods. Kaiseisha Press.

Schmitz, Nele. (2010). Lab protocol for basic wood anatomy procedures: making and staining of micro-sections of wood samples.

van Valkenburg, J.L.C.H.. 2005. *Aucoumea klaineana* Pierre. [Internet] Record from PROTA4U. Louppe, D., Oteng-Amoako, A.A. & Brink, M. (Editors). PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands. <http://www.prota4u.org/search.asp>. Accessed 30 November 2023.

Wedeux, B. 2020. WWF-België – Foute aangifte van mogelijk illegaal hout: wat hebben onze meubelen te verbergen? Report. 13 pages.

Wheeler, Elisabeth & Baas, Pieter & Gasson, Peter. (1989). IAWA List of Microcopie Features for Hardwood Identification. IAWA journal / International Association of Wood Anatomists. 10. 219–332.

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