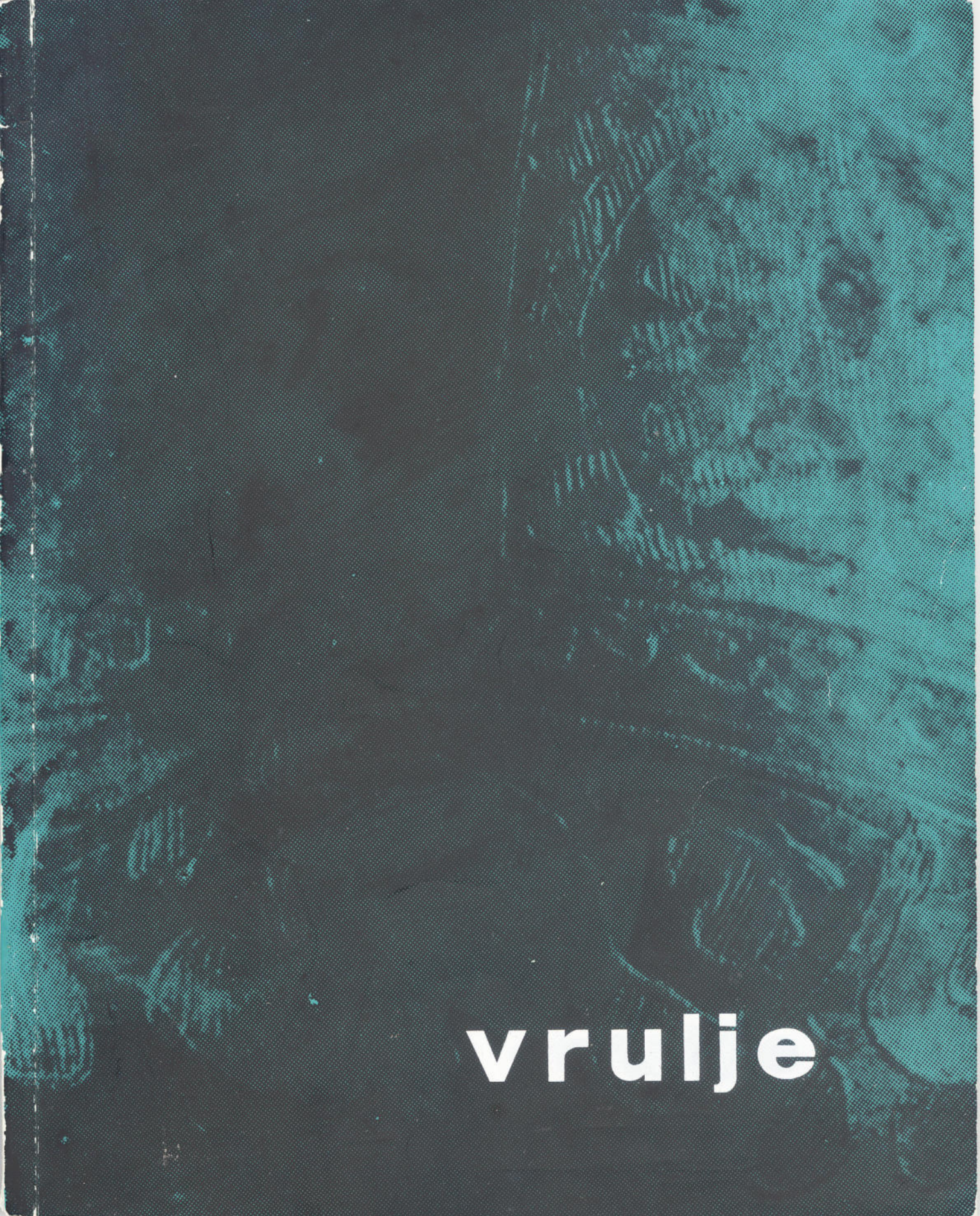
vrulje

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•VRULJE• GLASILO NARODNOG MUZEJA U ZADRU

SV. 1 GOD. I ZADAR 1970.

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Dočekasmo i prvi broj još jednog muzejskog glasila u Zadru. Pored »Diadore« pojaviše se i »Vrulje«. Ispuni se tako želja i nastojanje zadarskih muzealaca da — kulturno-povijesnu baštinu sve tamo od kraja ranog srednjeg vijeka; etnološko-etnografsko bogatstvo; osobitosti iz oblasti prirodnih znanosti; moderno slikarstvo od vremena ilirskog preporoda; noviju povijest od sredine XIX stoljeća do naših dana — muzeološkim pristupom predstave stručnjacima i široj javnosti.

Historijat zadarskih muzeja bogat je i zanimljiv. Od zanesenih sakupljača starina, privatnih arheoloških zbirki (najvrednija zbirka Danieli-Pelegrini u XVIII st.), osnivanja Narodnog muzeja (proglas dalmatinskog namjesnika grofa Vettera von Lilienberga 1832. kada počinje prikupljanje uzoraka iz prirodnih znanosti, starina i narodne i industrijske djelatnosti; uprava imenovana 28. svibnja 1838) do naših dana prijeđen je bogat i zanimljiv put. Bilježimo vrijeme poletna rada, stagnacije, godine otuđenja Zadra od matice zemlje (1920—1944), ponovo osnivanje Narodnog muzeja 1945. u slobodnu Zadru, osamostaljenje muzejskih odjela u samostalne ustanove 1952, da bi ponovo bio osnovan Narodni muzej 1. prosinca 1962, kao kompleksna muzejska ustanova regionalna značaja (zadarsko-biogradsko-benkovačko-obrovačko područje).

Ovaj prvi broj našega glasila predstavlja javnosti radove o materijalima trgovačkog broda s kraja XVI stoljeća. Po svemu sudeći, lokalitet Gnalić predstavlja najznačajnije hidroarheološko nalazište u nas.

Svaki će broj »Vrulja« obuhvatiti problematiku jednog užeg tematskog područja djelatnosti našega muzeja.

Na zadarskom književnom vrelu evo još jednog izdanka.

VALENTIN URANIJA

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BROD KOD GNALIĆA

NAŠE NAJBOGATIJE HIDROARHEOLOŠKO NALAZIŠTE

KSENIJA RADULIĆ

Početkom rujna 1967, slučajnim stjecajem okolnosti, došlo je do jednog od najzanimljivijih arheoloških otkrića posljednjih godina u Jugoslaviji. Dok se arheološka istraživanja usmjeruju dalekim epohama da bi se sistematskim radom na osnovu ostataka materijalne kulture saznalo što više o životu ljudi, našli smo se odjednom neočekivano suočeni s velikom količinom predmeta koji izvrsno dokumentiraju materijalnu kulturu jedne relativno novije epohe o kojoj crpimo saznanja uglavnom na osnovu pisanih izvora i likovnih predstava.

U moru, s jugoistočne strane otočića — hridi Gnalić (sl. 1) u Pašmanskom kanalu, na dubini od 26 do 29

metara otkriveni su ostaci broda s bogatim i raznolikim teretom (sl. 2). Zavod za zaštitu spomenika kulture i Narodni muzej u Zadru, dvije ustanove nadležne za područje gdje se Gnalić nalazi, organizirali su tri kampanje istraživanja, dvije u listopadu 1967, a treću u listopadu slijedeće godine. Došlo je na vidjelo mnoštvo predmeta koji su s jedne strane potvrdili naše poznavanje materijalne kulture kasne renesanse u jadranskom bazenu, s druge otvorili niz pitanja o načinu i mjestu proizvodnje te raspačavanju nekih artikala i tako općenito obogatili kulturnohistorijsku problematiku XVI st.

Pored stečenih naučnih i kulturnih vrijednosti, rad na Gnaliću imao je za našu službu zaštite i veliko praktično značenje. To je bio prvi put da se u zaista velikom opsegu stavilo na kušnju sve što ona danas u hidroarheologiji može postići, i to jednako na razini organiziranja i izvođenja samog istraživanja kao i na razini organiziranja i izvođenja konzervacije izvađenog materijala. Iskustvo je na vrlo oštar način pokazalo u čemu je suština teškoće rada na hidroarheologiji: dok su naučni ciljevi i metode zajednički kao i u kopnenoj arheologiji, sredstva rada su potpuno različita, neuporedivo složenija i skuplja. Nadalje, sredina u kojoj se rad izvodi traži specijalnu kondiciju i obuku općenito smatranu jednom od najtežih i najriskantnijih, što dovodi do takove podjele rada, da onaj tko snosi odgovornost za istraživački uspjeh pothvata nije u mogućnosti da rad neposredno prati i upravlja. Ta se podvojenost može riješiti samo tako da rad obavlja takav tip stručnjaka istraživača koji je istovremeno i arheolog i ronilac, i da mu stoji na raspolaganju naročito u te svrhe adaptirana oprema. Mi nismo imali ni jedno ni drugo i to se odrazilo na rezultatu. Onima koji će možda primijetiti da u nedostatku takve ekipe ne bi trebalo poduzimati tako odgovorne istraživačke radove, odgovorit ćemo: m o r a l o ih se poduzeti i dobro je da ih se poduzelo. Kao što se na žalost često događa u hidroarheološkim istraživačkim kampanjama, tako su i olupinu broda kod Gnalića pronašli ronioci amateri i za svoj račun stali kopati i raznositi predmete. Upravo zahvaljujući tome saznalo se za naše nalazište. Preuzimajući odgovornost da se posao izvrši improviziranim sredstvima i načinom, nadležne institucije su možda onemogućile da Gnalić bude primjer jednog uzornog hidroistraživanja, poput onog napravljenog sa »Wasom«, ili na maloazijskoj obali, ili u Liguriji, što bi vrijednost našeg nalazišta sigurno zaslužívala, ali isto tako je istina da se samo

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brzom pravovremenom akcijom mogao spasiti dragocjeni i primamljivi brodski teret. Unatoč svem neiskustvu, uspjelo se sakupiti i niz dragocjenih podataka, bez kojih sami predmeti ne bi značili onoliko koliko danas znače.

Na radu na našem brodu našli su se prvi put zajedno konzervatori, muzealci i administratori iz nadležnih teritorijalnih ustanova, ronioci (sl. 3) i brodovi Jugoslavenske ratne mornarice, klupski i individualni ronioci. U konzervacijskom dijelu posla suradnja je obuhvatila i druge ustanove, od kojih neke matične republičke, mnoge pojedince, a proširila se i do stranih institucija u Švedskoj i Švicarskoj.

Program rada je bio slijedeći: fotografski zabilježiti stanje dna prije bilo kakvog rada, izvaditi rasute predmete s površine dna (sl. 4, 5), odstranjenjem mulja ustanoviti obris i konstruktivne elemente broda te položaj i vrst brodskog tereta, dokumentirati jedno i drugo, napraviti plan vađenja predmeta, izvaditi ih, dokumentirati, spakovati i transportirati do mjesta uskladištenja odnosno do mjesta primarne konzervacije, odrediti konzervacijski postupak i izvršiti konzervaciju. U ostvarivanju programa bili su upotrijebljeni sredstva i metode uobičajeni u hidroarheologiji, na tehničkom nivou koji nam je bio pristupačan. Tako se fotografiranje i mjerenje nalazišta vršilo u numeriranim kvadratnim poljima, sa stalkom koji je osiguravao ortogonalnost snimka, odstranjivanje mulja i pijeska pomoću tzv. mamut sisaljke s pogonom na benzinski kompresor i s pomoću platnenih vatrogasnih cijevi (mulj se nije pretresao na palubi već se odvajanje usisanih predmeta vršilo preko mrežice na donjem otvoru cijevi), podizanje manjih predmeta pomoću košara od šiblja i od aluminija, sa rupicama za otjecanje vode, i sl. Plan rada je bio podređen programu, iako su često teškoće tehničke i meteorološke naravi, a posebno one prouzrokovane nedostatkom iskustva, nametale na žalost neizbježna odstupanja.

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Po vrstama i količinama nađenih predmeta zaključujemo da je naš brod bio trgovački i da je bio, kao što je i normalno za ono vrijeme, sposoban za oružanu obranu. Udes ga je zadesio za vrijeme jedne od uobičajenih plovidbi koje je valjda redovno obavljao. Nalaz upravo takve vrsti, slično nalazima odjednom zatrpanih gradova kao što su Pompeji, ima jednu svoju specifičnost, a ta se sastoji u tome što omogućuje da se dobije presjek kroz sadržinu jednog običnog, svakodnevnog trenutka i mjesta historije. Zahvaljujući okrutnom slučaju što je katastrofa — prouzrokovana vjerojatno olujom — zadesila brod kad je u naše vode uplovio iza kako je u tada najvećoj luci Mediterana, Veneciji, ukrcao mnoštvo robe za svakodnevnu upotrebu, i to robe koja ide od polufabrikata do gotovih proizvoda, a prije negoli je roba bila prodana, presjek što nam ga daje naš nalaz neobično je potpun i daje uvid i u ona područja života i privređivanja u XVI st. koji se nalaze iza onog koji tvori lice povijesti.

Izvađeni predmeti pripadaju, dakle, *opremi* broda (osam bronćanih topova i više kugli, dva sidra, nešto od keramičkog, bakrenog i kositrenog posuđa, mnoštvo okamina koje su sačuvale oblik užadi, te čvorova i kuka na njima, brodski balast od kvarcitnog kamenja i šljunka) i *trgovačkom teretu* namijenjenom prodaji po, vjerojatno, lukama Jadrana i istočnog Mediterana (mjedeni svijećnjaci za zid i strop, stakleno posuđe, okrugla i četvrtasta stakla za prozore, stakla za ogledala i zrna za ogrlice, mjedeni praporci, igle pribadače, napršnjaci i britve, smoci mjedene žice različitih debljina, mjedene folije, cinober pripremljen u kuglama od po cca 70 kg, olovni karbonat odljeven u male čunjiće, kositar u obliku uskih šipki dugih 70 cm. žigovanih mletačkim žigom, sanduk i kutija s britvama i okovana škrinja (kasa) sa unutrá više suknenih kapa, parom košulja, pečom damasta i vagom za precizna mjerenja, crvena i žuta uljena boja).

Mjedene folije, kositrene šipke, cinober, olovni karbonat, i peča damasta su, koliko nam je uspjelo dosad saznati, *apsolutni unikati.* Ako se za njihovu proizvodnju i znalo, do ovog nalaza nedostajali su primjerci.

Posebnu zanimljivost predstavljaju *ostaci originalne ambalaže* robe i podaci o pakovanju i smještaju na brodu. Šipke kositra su bile pakovane poredane jedna uz drugu u sanducima vel. 30 x 30 x 75 cm, poslaganima naizmjenice s uskim, pa širokim stranama. Daske tih sanduka su debljine cca 2 cm, grubo tesane, spojene na uglovima pravokutnim utorima i pričvršćene željeznim čavlima. Za čunjiće olovnog karbonata moglo se ustanoviti da su se nalazili u bačvicama (sl. 6) visine 70 cm, a promjera 50 cm (bile su u svemu nalik na one koje se danas upotrebljavaju za slanu ribu). Dna bačvica bila su signirana užarenim željezom. Tako se na dva dna nalazi utisnut monogram S Z i križ između slova (sl. 7), a na trećem inicijali G. P. i muška glava u profilu (sl. 8). Svici mjedenog lima također su se nalazili u bačvici, promjera 40 cm,

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a visine 55 cm, dok su zidni svijećnjaci bili u velikoj bačvi promjera 70 cm, a visine 1 m. Zidni svijećnjaci su bili složeni rastavljeni u dijelove i to tako da je u element s rukom bio složen tanjurić a u nj čaška i krak. Veliki viseći svijećnjaci čini se da su bili u posebnim sanducima. Staklene čaše su bile pakovane u pletene košare, a prozorska stakla složena jedno uz drugo i zaštićena slamom. Crvena boja je nađena u dvama sanducima veličine 80 x 110 cm, dok je žuta boja bila u bačvicama poput onih u kojima se nalazio olovni karbonat. Rušenje i va-

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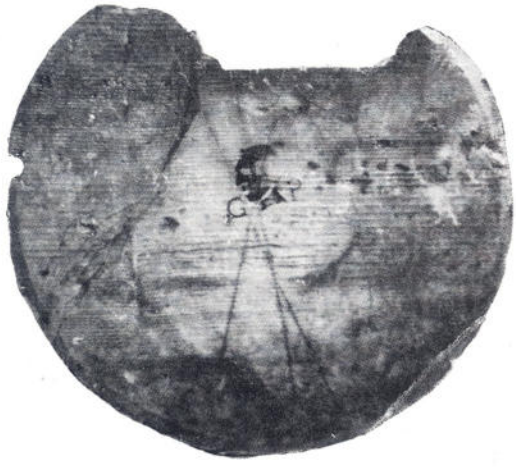
ljanje prilikom udesa, nagrizanje drva od strane crva i ukotvljenost u mulju učinili su da se teret nije mogao dići skupa s pripadajućom ambalažom već posebno. Najveća koncentracija robe bila je na pramčanom i središnjem dijelu broda, ali je dio bio rasut i izvan opsega olupine, čak i 30 m dalje, gdje je nađena velika množina staklenih čaša. To se može objasniti da su ti predmeti ispadali iz broda dok je ovaj tonuo, ili da su ih mornari u tom času namjerno izbacili.

Ostaci broda su naravno minimalni. U tako toplom moru kao što je Jadransko žive crvi koji nagrizaju drvo i za mnogo kraće vrijeme negoli je vrijeme proteklo od potonuća broda do danas. Sačuvani su dijelovi kobilice, rebara i brodske oplate, najbolje tamo gdje je mulj bio dublji i kompaktniji. Pramac broda se mogao ustanoviti po ostacima željeznih okova na kosniku broda i ostacima oplate, a upravljen je prema zapadu-sjeverozapadu. Ukupna dužina nalazišta je oko 40 m, širina oko 8 m. Iz toga se samo približno mogu odrediti dimenzije samog broda koji je bez kosnika mogao mjeriti oko 30 m. Slaba očuvanost broda onemogućuje da se bilo što određenije zaključi o vrsti kojoj je pripadao, da li je bio g a l i j a, ili *galijun* (galeazza), koji su se razlikovali prvenstveno nadgradnjom. Broj topova nije također mjerodavan u tu svrhu. Sigurno je jedino da nije *marceliana*, najčešći tip trgovačkog broda u to vrijeme, jer je naša olupina znatno većih dimenzija. Brod je doplovio do Gnalića svakako poslije 1582. godine, koja nam je posvjedočena na dvama topovima. Vjerojatno je stradao već do kraja stoljeća ili odmah na početku slijedećeg, jer roba na njemu po svojim stilskim osobinama ne prelazi to vrijeme. Postoji mogućnost da se arhivskim istraživanjem doznaju pojedinosti o brodolomu, pa tako i tačna provenijencija broda, jer premda je sasvim vjerojatno da je tada dolazio iz Venecije, to ne mora značiti da je bio mletački (grbovi na topovi-



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ma nisu mletački, što opet ne daje bez daljnjega osnova da se samo zbog toga isključi pripadništvo Veneciji, već samo da se to pitanje ostavi zasad otvorenim).

Do sredine XVII st. brodski udesi se mogu pratiti samo na osnovu notarskih spisa u vezi osiguranja roba. Od tog vremena dalje mletačka vlada propisuje lokalnim vlastima uzimanje podataka u slučaju stradanja broda na njihovom području, kao i posadama brodova da udese prijavljuju. Na tim arhivskim izvorima treba nastaviti traženje. Međutim, kolikogod rješenje tog pitanja bilo interesantno, ono ipak ima ograničenu vrijednost! Određivanje tačnog vremena udesa i pripadnosti broda ne može bitno utjecati na naše poznavanje ondašnjih prilika. *Sva neprocjenjiva dokumentarna vrijednost je u teretu broda.*

SIDRA I TOPOVI

IVO PETRICIOLI

Od inventara koji je pripadao brodu izvučeno je mnogo. Razne željezne kuke i omče, dijelovi užeta, sasvim korodirani i obrasli školjkama, koraljima i algama, još čekaju na konzerviranje, ali teško je vjerovati da će se naći nešto vrednijeg materijala. No najmarkantniji predmeti: sidra i topovi dobro su sačuvani i zaslužuju punu pažnju. Naročito pak topovi koji su saliveni od bronce i ukrašeni raznolikim reljefnim elementima.

Dva željezna sidra većih su dimenzija: jedno je dugačko 4,85 m, široko 2,65 m, drugo je dugo 3,75 m, a široko 2 m. Imaju jednostavan oblik s jednom prečkom blago savijenom na kojoj su dvije trokutaste široke lopate. Na vrhu se nalazi širok prsten (sl. 9, 10). Drvena masivna greda koja se po ondašnjem običaju nalazila ispod prstena u položaju okomitom na prečku sidra nije se sačuvala.

Na brodu je pronađeno osam brončanih topova. Četiri većih dimenzija predstavljaju uobičajen tip starog topa koji se punio kroz cijev odnaprijed. Poznat je po različitim nazivima, već prema kalibru: *sakro, kolubrina, falko, falkonet* itd. Četiri manja imaju uređaj za punjenje odostrag i pripadaju tipu poznatom po imenu *pedriera*. Dok su topovi prvog tipa imali posebna ležišta s kotačima i nalazili su se na palubi, pedriere su bile usađene u ogradu broda pomoću viljuške koja je omogućavala kretanje cijevi horizontalno i vertikalno.

Najreprezentativnija su dva najveća topa. Potpuno su jednaki (sl. 11). Dugi su 3,50 m. Najširi su na stražnjem dijelu, na ojačavajućem prstenu 33 cm. Cijev na najužem dijelu ima dijametar 16 cm, a usta 23 cm. Kalibar cijevi je 9,1 cm. Bogato su ukrašeni pomno modeliranim reljefnim ukrasima renesansnih karakteristika. Usta cijevi (sl. 12) su profilirana poput klasične baze stupa s torusom i trohilusom. Na tu profilaciju nastavljaju se tri girlande povezane trima dugmetima na gornjoj i donjoj strani cijevi. Na tu dugmad

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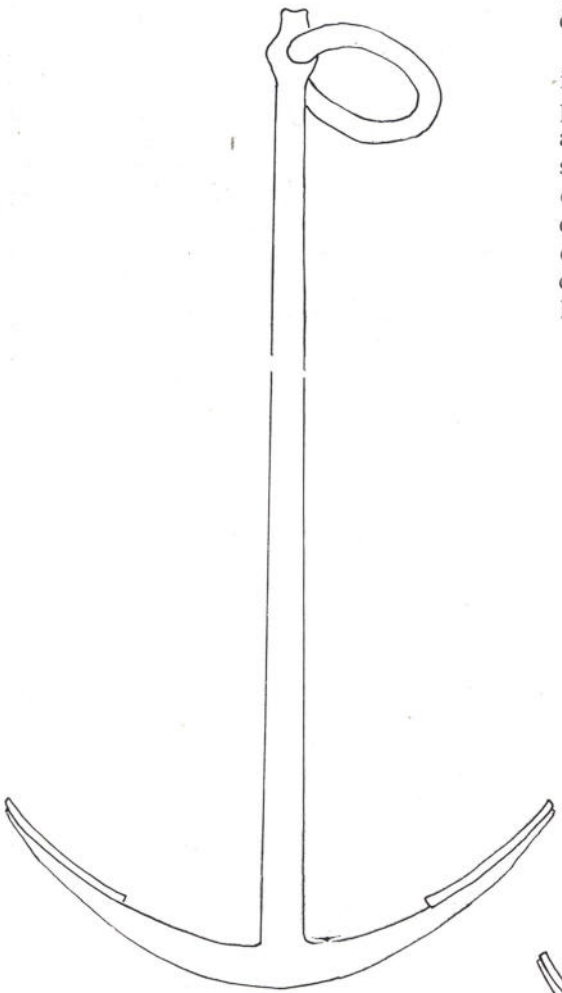
okačena su dva akantusova lista s volutama, na svako po jedan. Ispod gornjeg akantusova lista izrađen je bogat okvir za grb s kićankom na vrhu, a s bočnih strana ima po jednu orlovsku glavu s vrpcom u kljunu. Pod okvirom nalaze se reljefni inicijali Z. A. odijeljeni rozetama (sl. 13). Na mjestu gdje je cijev zadebljana i gdje se nalaze istaknuti krakovi oslonca topa, nalazi se također bogata profilacija i na gornjoj polovini pet reljefnih akantusovih listova. Nešto iza krakova nižu se reljefni rimski brojevi MDLXXXII između dviju reljefnih rozeta (sl. 14). Najbogatiji su ukrasi oko otvora za fitilj (sl. 15). Dvije istaknute biljne volute uokvirile su sam otvor. Nad njima položito su prikazane dvije manje, a nad njima profilirana preokrenuta baza nad kojom se diže visoka profilirana noga košarice. Flankiraju je dvije biljne volute. Košarica vrlo malih dimenzija puna je cvijeća, a dva lista vise sa strana. Na obje strane ornamenta nalaze se dva akantusova lista. Na najistaknutijem dijelu profiliranog prstena ugravirani su arapski brojevi, na jednom topu 2360, a na drugom 2380.

Tražeći primjerke topova sličnih ovim dvama pronašli smo najviše dodirnih tačaka s topovima koje su u Veneciji u XVI st. lijevali pripadnici obitelji ljevača Albergetti. Top datiran MDXXXIII i potpisan HIERONYMI ALBERGETI u Pomorskom muzeju (Museo storico navale) u Veneciji

ukrašen je sličnim akantusovim listovima, ali manjim od naših, a oko cijevi su girlande s dugmetom slične našima. Top datiran MDLXVIII u istom muzeju koji je salio Sigismondo Albergetti ima gotovo identičan okvir grba s kićankom na vrhu s identičnim orlovskim glavama s vrpcom u kljunu. Akantusovi listovi i drugi dekorativni elementi također su jako slični. Inicijali ljevača iz te obitelji I. A. (Iulius A.) ili S. A. (Sigismundus A.) odijeljeni su rozetama jednako kao Z. A. na našim topovima. Može se stoga s priličnom sigurnošću pretpostavljati da se u inicijalima Z. A. krije neki dosad nepoznati predstavnik te obitelji mletačkih ljevača topova. Usput spominjemo da je jedan Albergetti, Virginije bio ljevač Dubrovačke Republike od 1545. do 1569.

Dva druga topa s punjenjem kroz cijev nisu međusobno toliko slična koliko dva prethodna, ali u biti tvore također par (sl. 16). Neznatne su razlike u dimenzijama i u ornamentalnim detaljima, dok im je osnovni oblik jednak. Cijevi su im oktogonalne. Bridovi teku kontinuirano od stražnjeg dijela do usta cijevi, a da nije posebno istaknut dio od oslonca do stražnjeg dijela, kao što je bio slučaj s prethodnima. Time topovi izgledaju vitkiji, a precizno izrađeni bridovi, profilacija i diskretno upotrijebljeni ornamentalni detalji daju topovima izvjesnu klasičnu eleganciju.

Neznatno kraći top (dug 2,58 m) ima otvor za fitilj uokviren glatkom pravokutnom tablicom širokom 7,5 cm, a visokom 5,2 cm. Sa strana izrađene su dvije bradate ljudske glave s dijademama (vis. 4 cm) tako stilizirane da dijadem i brada tvore tablici siluetu klasične »tabula ansata«. Oko 30 cm od fitilja prema ustima cijevi nalazi se reljefni grb ovalnog oblika



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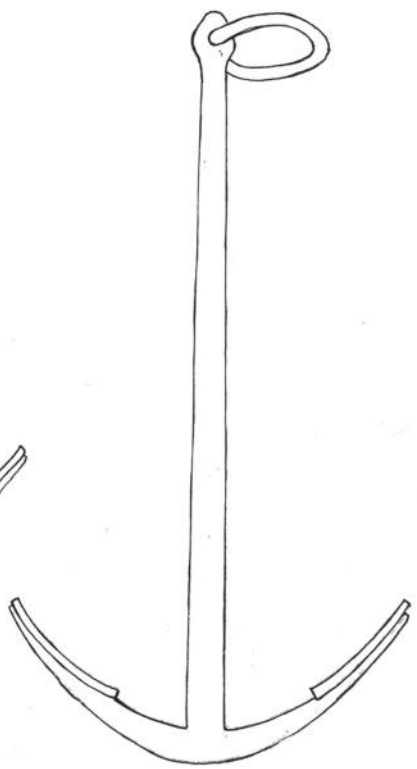

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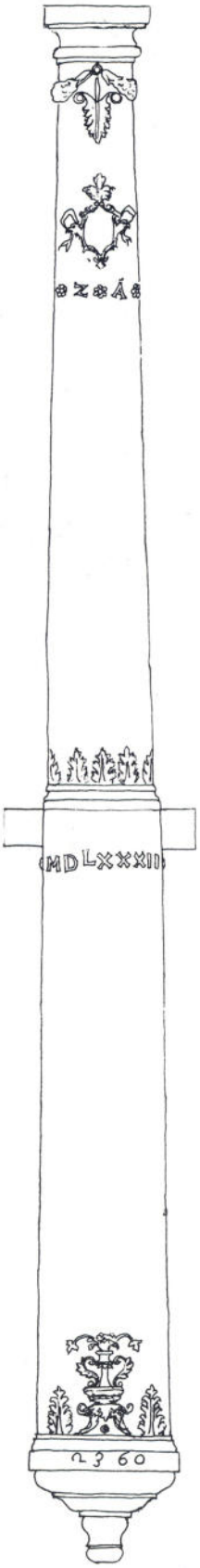

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uokviren vijencem i okrunjen grofovskom krunom (7 bisera). Grb je podijeljen u tri dijela. Gornju trećinu ispunja 7 ljiljanovih cvjetova. Donje dvije trećine vertikalno su podijeljene u dva jednaka dijela. Lijevu polovicu ispunjaju tri križa s trilobama na vrhu krakova, a na desnoj su dijagonalno postavljene dvije grede. Nismo identificirali grb, ali gornji dio s ljiljanima ukazuje na Francusku, budući da se često na grbovima francuskih pokrajina i gradova nalaze u gornjem dijelu ti simboli koji pripadaju francuskom kraljevstvu.

Drugi top, nešto duži (2,61 m) ima kod otvora za fitilj tablicu istih dimenzija kao i prvi s reljefnim okvirom koji se sa strana produžuje u dva dekorativna elementa. Unutar okvira su izrađeni inicijali G. P. (sl. 17). Prema cijevi otprilike jednako udaljeno od fitilja kao grb na prethodnom topu nalazi se prazno polje grba nemirne siluete. (Podudaranje inicijala G. P. s inicijalima na jednoj bačvi sigurno nije slučajno!)

Od pedriera dvije tvore par. Potpuno su jednake. Imaju brončane cijevi duge 1,12 m s ustima profiliranim po-

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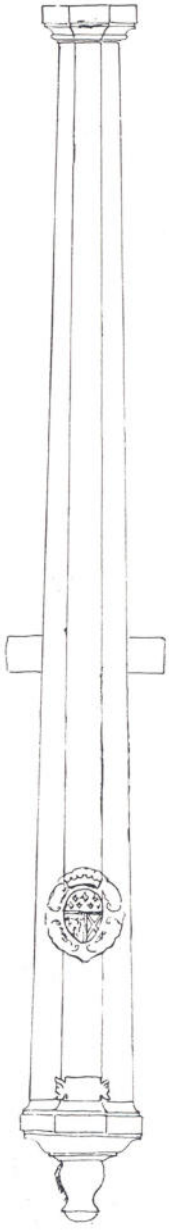

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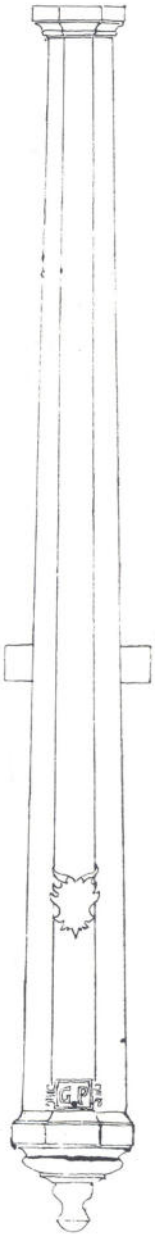

put baza klasičnog stupa. Blaže istaknuta profilacija nalazi se i pored zadebljanja u stražnjem dijelu. Dio za punjenje topa — ležište za »maškul« (naprava poput posude u koju se nabijalo zrno i barut) — izrađen je od željeza kao i viljuška kojom je top bio zataknut u ogradu broda. Samo se na jednom topu sačuvao taj željezni dio jako korodiran i obrastao. Na priloženom crtežu (sl. 19) rekonstruirali smo ga po analogijama zadržavajući tačne dimenzije. Oba topa na prednjem dijelu cijevi imaju jednake male grbove ovalnog oblika uokvirene zavojima (dim. 10,5 x 6,5 cm) s praznim poljem. Ukupna im je dužina (cijev, ležište »maškula« i ručka zajedno) iznosila oko 2 m.

Od treće pedriere sačuvala se samo brončana cijev, duga 1,07 m promjera od 18 do 13 cm, s ustima uobičajene profilacije, s četiri karakteristična istaka sa strana: dva valjkastog oblika poput onih na velikim topovima, na kojima je bila zakačena viljuška, i dva prizmatičnog oblika o koje je bilo prikovano željezno ležište za maškul. Na prednjem dijelu cijevi nalazi se reljefni maskeron bradatog muškog lica u kasnorenesansnom okviru, zanatski

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vješto izrađen (10,5 x 8 cm), a pod njim inicijal C (sl. 18).

Od četvrte pedriere također imamo samo cijev, jer se željezni dio, danas sasvim amorfan, odvojio od nje kratko vrijeme nakon što je izvađen iz mora. Bio je to najmanji top. Cijev je dugačka samo 87 cm, s dijametrom od 7,5 i 10 cm s promjerom kalibra 4,5 cm. Na prednjem dijelu nalazi se ovalni grb (sl. 21) bez okvira, visok 9 cm podijeljen horizontalno u dvije polovine. U gornjoj je prikazan okrunjen dvoglavi orao s manjim grbom na prsima (cik-cak linija). Donja je polovina podijeljena vertikalno u dva dijela. Na lijevom dijelu nalazi se monogram sa-

stavljen od slova P, N i M sa cvijetom na vrhu. Na desnom prikazana je palma, lijevo od nje ljiljanov cvijet, a desno goli dječak sa štitom koji diže ruku prema krošnji palme. Nismo uspjeli identificirati taj grb. Na kratkom zadebljanju cijevi gdje je bilo prikovano ležište »maškula« ugraviran je broj 87.

Zanimljivo je napomenuti da su svi topovi osim najmanje pedriere istog kalibra 9,1 cm. Pronađeno je i nekoliko kamenih kugla i ostaci jedne željezne, koje odgovaraju tom kalibru.

S ovim topovima treba povezati i mjerilo za kalibre topova tzv. *scala librarum* koje je pronađeno i prije početka sistematskog istraživanja (sl. 20). Dugo je 25 cm. Izrađeno od mjedi. Obično se takve »scale« nalaze ugravirane na bodežima.

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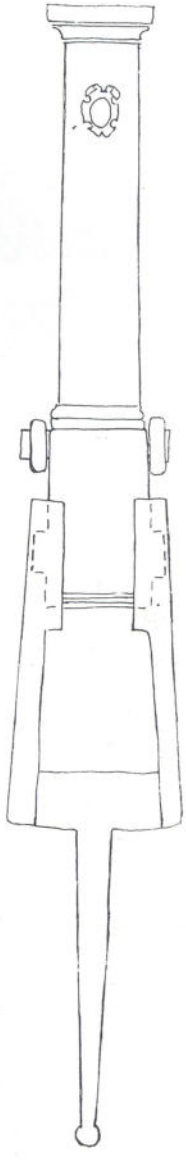

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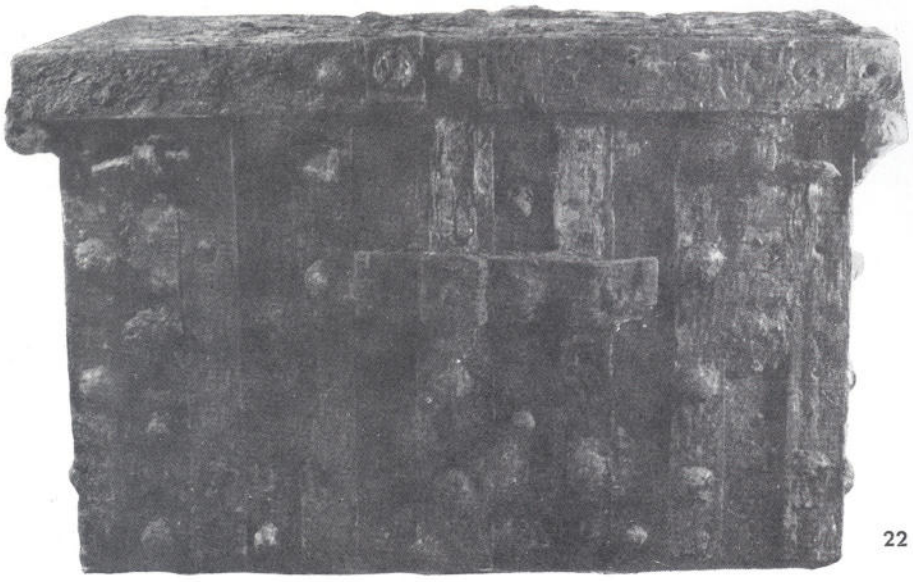

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DAMAST

KSENIJA RADULIĆ

Kako smo već rekli, *damast* je nađen u okovanoj škrinji (sl. 22). To je tipična škrinja kakva se upotrebljavala donedavno za blagajnu. Željezni lim na unutrašnjim i vanjskim plohama, vrpčasti okovi prikovani velikim čavlima sa širokim glavama i kompliciran sistem brave garantirali su sigurnost. Mnogi naši muzeji čuvaju takve blagajne, naročito pomorski. Naša škrinja ima slijedeće dimenzije: vis. 65 cm, duž. 97 cm, šir. 59 cm; poklopac je dug 105 cm, širok 64 cm.

Damast se zajedno s ostalim predmetima nalazio u hrpi muljem zaprljane slame. Mulj je bio tako fin i gust, da se u prvi mah nije moglo raspoznati o čemu se radi; opipavao se samo tvrd predmet, dug oko 60 cm i širok oko 25 cm. Nakon prvog ispiranja pod tekućom vodom mjestimično se pokazalo krupno tkano platno i neko drugo platno svilenkastog odsjaja, ali više od svega su se vidjele i opipavale tvrde inkrustacije crno-smeđe boje. Inkrustacije su se nalazile na čitavoj površini predmeta, a kad bi se otkinule, ostavljale bi iza sebe rupu. Tek poslije dugotrajnog ispiranja doznali smo prirodu predmeta. Pred sobom smo imali originalno pakovanu peču damasta 54 m dugu, pregibanog u 60 pregiba dužine 80 cm, zapečaćenu plombama sa žigom i umotanu u grubo platno. To vanjsko zaštitno platno bilo je gotovo potpuno izjedeno rđom (škrinja je bila puna nje, jer su oksidirali željezni okovi), tek se tu i tamo razaznavala njegova struktura, koja je bila poput one današnjeg debljeg lanenog platna. Rđa je zahvatila i svilu u dubini od desetak pregiba i slijepila ih sa vanj-

skim platnom, negdje potpuno uništivši tekstil, drugdje učinivši ga samo neodvojivim. Razmatajući damast, između općeg crnila, pojavili su se i prvi ljubičasti odsjaji, iz čega se zaključilo da je tkanje bilo purpurne boje. Nakon konačnog pranja nestalo je crnilo od mulja i tkanina je ostala smeđa (zbog rđe) i, na žalost samo mjestimično, ljubičasta.

Naš damast spada u prave damaste, tj. i osnova i potka su od svilenih niti jednake boje, a ukras je postignut suprotstavljanjem sjajnih i nesjajnih ploha, pri čemu sjajne nose ukrasne motive dok nesjajni dijelovi igraju ulogu pozadine. Sjaj nastaje zbog naročitog načina provlačenja potke kroz osnovu na jednoj od strana, kod čega sjajni dijelovi budu lagano uzdignuti u odnosu na nesjajne. Dio tkanine koji je na jednoj strani sjajan, na drugoj je nesjajan i obratno. Živost tkanine zavisi od nagiba pod kojim svjetlo pada na tkanje, i ide od sasvim prigušenog do takvog kontrasta ornamenta i podloge da se čini kao da su različitih tonova.

Ukrasna šara (sl. 23, 25) našeg damasta razvija se na dužini od 150 cm, nakon čega se bez prekida ponavlja, i tipično je kasno renesansna. Sastoji se od ovih elemenata: *kantaros*, sa *balustradom* i *volutama* (prva u ulozi grla posuda, druge kao ručke), *šipkov* plod i listovi, *zvijezde* i *palmeta*. Grupa sa *šipkom* i *palmetom* uokvirena je dvjema nejednako širokim i međusobno se obavijajućim trakama, od kojih ona šira je ornamentirana kao *šahovsko polje*, koje ukrašuje i jedan dio *kantarosa!* Ti motivi su sakupljeni u grupe koje se povezano nastavljaju jedna na drugu. U punoj svojoj širini predočen je samo središnji niz koji zauzima sredinu tkanine, dok prvu i posljednju četvrtinu ukupne širine ispunja polovica motiva. Horizontalno, ukrasi se izmjenjuju tako da na visini gdje je u sredini kantaros, na krajevima je palmeta, itd. Ukras gusto pokriva pozadinu, ostavljajući vidljivima samo male površine, koje ne tvore vlastiti motiv.

Pet olovnih plombi (sl. 24) koje su zatvarale peču imaju na sebi otiske če-

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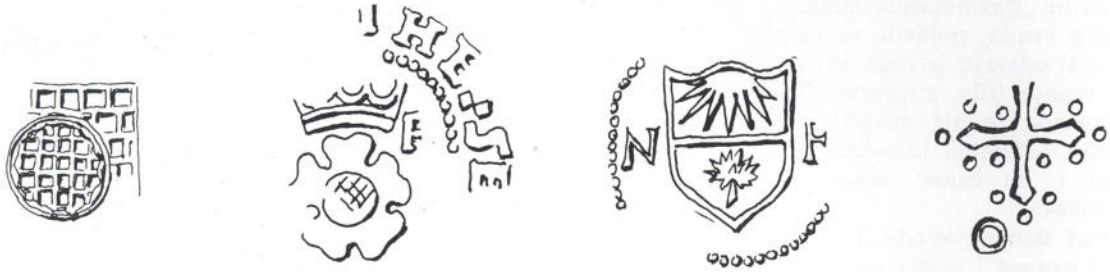

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tiriju različitih žigova. Dvije donose polje horizontalno podijeljeno, u gornjem dijelu sunce sa jako izraženim zrakama, u donjem stablo. Lijevo od polja grba nalazi se slovo N, desno F (?). Treća plomba ima na sebi križ jednakih krakova, zašiljenih na krajevima, sa po tri kuglice uz svaki vrh i po jednom u uglovima. Četvrta je dosta slabo sačuvana pa se žig čita s nesigurnošću. Polje grba je podijeljeno u kvadrate i to na način da oponaša strukturu zida. Unutar tog kvadratnog polja nalazi se krug koji je sa tri vertikalne i jednakim brojem horizontalnih crta također podijeljen u kvadrate. Peta plomba ima krunu sa četiri kraka koji na vršcima završavaju ljiljanom, i pod njom otvoreni peterolatični cvijet. Desno od grba nalazi se slovo F (?).

Koliko je nama poznato, ova peča damasta jedini je stari tekstil dosad sačuvan koji nam dokumentira stanje u kojem su ovi artikli izlazili iz radionice i bili donošeni na tržište.

Iz koje radionice i na koje tržište?

U XVI st., na srednjem Mediteranu, svila općenito, pa tako i damast, proizvodila se u nizu gradova na Apeninu: Firenci, Luki (Lucca), Pizi, Bolonji, Milanu, Veroni, Veneciji. Dok su u XV st. glavni centri bili Firenca i Luka, u XVI st. se radionice otvaraju i u mnogim drugim gradovima, naročito poslije pljačke Luke koju su izveli Pizanci, zbog čega su lukeški tkalci prešli drugamo i tamo nastavili sa svojim zanatom. Proizvodnja u Veneciji dokumentirana je bez prekida od XIV do XVIII st., iako se iz arhivskih dokumenata čini da se može zaključiti da je baš u XVI st., zbog žestoke konkurencije drugih gradova, proživljavala razdoblja dosta jakih kriza, koje je mletačka vlada nastojala ukloniti raznim protekcionističkim mjerama. Razlikovati ishodište pojedinog damasta između svih ovih i još drugih centara proizvodnje (u Španjolskoj, Francuskoj), vrlo je teško, gotovo nemoguće. Prilagođavanje posvuda vladajućem renesansnom ukusu utjecalo je na izjednačavanje tehnika i ornamenta, a seljenje tkalaca još više je tome pridonijelo. Sve atribucije nekog tekstila pojedinim gradovima napravljene samo na osnovu stilskih sličnosti, a gotovo sve su tako učinjene, ne mogu se uzeti nego kao realno moguće. Stoga bi dešifriranje žigova na plombama našeg damasta predstavljalo prvi čvrst oslonac za lokaliziranje barem onog damasta koji ima ornament jednak ili vrlo blizak našem, a to su dva komada iz kolekcije Guggenheim u Museo Correr u Veneciji, za koje se inače ne zna gdje su i kada nabavljeni. Dešifriranje plombi bi osim toga pokazalo na jednom određenom primjeru tko sve uopće žiguje jedan proizvod, da li samo radionica i uprava grada u kojem se radionica nalazi ili još i uprava tržišta na koji se proizvod donosi.

Nepostojanje mletačkog žiga među našim plombama upućuje da se odmah na početku isključi mogućnost da je

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damast tkan u Veneciji, naročito kad se iz arhivskih podataka zna da je 1507. mletačka vlada izričito propisala da »sav tekstil koji se izvozi morem mora biti žigovan žigom sv. Marka, uz taksu od četiri novčića po peči«, inače će se smatrati stranom robom i vjerojatno biti sasvim drukčije carinjen. Osim toga, službena konstatacija iz 1594. da u Veneciju stiže strana svila s raznih strana i da se razvija veletrgovina bez plaćanja poreza, te da mletački brodovi prenose na Istok i po 50 hiljada lakata svile, a da od te ogromne količine gotovo ništa nije kupljeno u mletačkih proizvođača, jer trgovci i kupci nemaju povjerenja u njihovu robu, taj zaključak još više osnažuje. Brod koji je stradao kod Gnalića mogao je, dakle, biti i mletački, a ipak prenositi stranu robu i to bez propisnog ocarinjenja.

Grbova sličnih onima na našim plombama ima u Luki. Pripadaju različitim obiteljima koje su mogle proizvoditi i svilu. Obitelj Cerù ima upravo grb sa suncem u gornjem polju i stablom u donjem, a 1614. njen je član neki Ferrante na kojega bi se moglo odnositi ono F, ali činjenica da prezime obitelji počinje sa C, a na plombi je drugi inicijal N, opet dovodi u pitanje to povezivanje. Križ sa kuglicama grb je Pise. Ipak, zasad još ne bismo iz toga definitivno zaključili da je to mjesto izrade našeg tekstila. Vjerojatno je Piza kao lučki grad bila trgovački posrednik. Ograničit ćemo se na to da izrazimo uvjerenje da on ne potječe iz Venecije već vjerojatno iz Luke.

Za pitanje kome i gdje je bila namijenjena ova skupa tkanina (purpurna svila je bila znatno skuplja od one drugih boja; u doba Dioklecijana čak deset puta skuplja od bijele) može se samo pretpostavljati.

KAPE I KOŠULJE

SOFIJA PETRICIOLI

U željeznoj škrinji se uz peču svilena damasta našlo još nekoliko predmeta iz tekstila. I oni su također bili namijenjeni trgovini, a kako su se nalazili u istoj škrinji s damastom najvjerojatnije su porijeklom iz istog mjesta.

To je osam crnih vunenih kapa i tri bijele platnene košulje.

Od osam kapa samo su dvije dobro sačuvane (sl. 26), dok su sve ostale u stanju raspadanja. Sve su bile iste veličine, gornjeg promjera 30 cm, a otvora za glavu 17,5 cm. Ispletene su od crne vune, ali se čini da su bile

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stupane i da se prije od dlačica očice nisu niti opažale. Imaju okrugli ravni dio i obod širine 3,5 cm koji ide oko cijelog otvora za glavu. Takve kape poznate su nam sa slika i portreta onoga vremena. Nailazimo na njih na Caravaggiovim likovima, Holbeinovim portretima i na slikama mnogih Flamanaca. Nosili su ih ljudi svih društvenih slojeva, a često su ih znali još ukrasiti kakvim medaljonom ili perom. Košulje su također muške, a izrađene su od bijelog platna. Sve tri su u lošem stanju, no jednoj nedostaje cijeli gornji dio s rukavima. Nađene su pažljivo složene u male zamotaje veličine 21 x 25 cm. Interesantno je da je ovratnik načinjen od drugačijeg i to mnogo kvalitetnijeg platna. Gustoća niti na platnu košulje je 20 na 1 cm^2, a na platnu ovratnika 30 niti na cm^2. Taj detalj posljedica je tadašnje mode u kojoj se od košulje najčešće vidio samo ovratnik.

Košulje su vrlo duge i komotne (sl. 27), (dužine 114 cm). Prednjica i leđa krojeni su iz jednog komada i to od širine platna (između 66 i 69 cm što je uslijed oštećenja za sada teško odrediti). U donjem dijelu imaju sa

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strane raspore dužine 38 cm. Oko vratnog izreza košulja (sl. 28) je sitno nabrana da bi se dobila potrebna širina ramena. Preko nabora izveden je ukrasni bod tzv. kosa opletuša. Prsni izrez nije osobito dubok. Na jednoj košulji je 20 cm, a na drugoj nešto dublji. Porub izreza opšiven je cik-cakom. Oko vrata košulja se vezala tankim pletenim gajtanom. Rukav je dug 65 cm i sužava se prema zapešću. Rub rukava krojen je malo oblo i također je opšiven cik- cakom. Pod pazuhom je proširen sa dva trokutna umetka. Ovratnik je ravno krojen i nešto duži od vratnog izreza tako da su mu krajevi slobodni i mogu se zavrnuti. Na rubu ovratnika izveden je ažur i sitna zupčasta kerica. Visina ovratnika iznosi 9,5 cm.

Obje košulje (treća je u takvom stanju da se o njoj ne može ništa reći) istog su kroja samo se razlikuju u veličini. Dužina im je približno ista, ali je druga nešto šira od gore opisane. Šira košulja ima i 1 centimetar veću visinu ovratnika, na kojemu je jednostavnija kerana čipka.

Za sada su košulje samo dobro isprane od morske soli te je proces raspadanja uglavnom zaustavljen. Nakon čišćenja naslaga rđe i rekonstruiranja oštećenih mjesta njihov izgled bit će potpuno drugačiji.

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STAKLO

SOFIJA PETRICIOLI

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Brod je nosio vrlo veliku količinu staklenih predmeta od kojih su veći dio predstavljali luksuzni predmeti kao čašice, boce, bočice, zdjele i relikvijari, dok su manji dio, ali također velik broj, zauzimali jednostavniji predmeti: okrugla prozorska stakla, četvrtaste neobrađene ploče i mala okrugla ogledala.

Na žalost sačuvalo se vrlo malo cijelih predmeta, jer iako je staklo izvrsnog kvaliteta, nije moglo izdržati stoljetne neprilike na morskom dnu.

Bez ikakve je sumnje da je staklo porijeklom iz Venecije. U XV i XVI stoljeću svjetskom proizvodnjom stakla dominirale su venecijanske radionice stakla u Muranu. Kvalitet i ljepota oblika muranskog stakla bili su tako izvanredni da su sve evropske tvornice u ono vrijeme bile pod utjecajem Murana i nastojale što vjernije oponašati njegove proizvode. Tako su de facto i one bile samo sljedbenice Murana što je još jasnije kad se zna da su osnivane od muranskih staklara.

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Osobine muranskog stakla bile su izvanredna tankoća i prozirnost — dvije osobine koje nije imalo ni antičko niti srednjovjekovno staklo.

U našem nalazu imamo prilike vidjeti muranske predmete iz vremena kada su oni bili najljepši, kada su forme bile jednostavne i elegantne bez suvišnih opterećenja koja je donio barok. Uz ljepotu i bogatstvo oblika nailazimo i na nekoliko tehnika ukrašavanja koje su toliko karakteristične za Murano. To je tehnika umetanja bijelih staklenih niti i graviranje dijamantnom iglom.

Počet ćemo nabrajanje tipovima predmeta koji su najbrojniji. To su dvije vrste čašica, obje vrlo jednostavna oblika. Stopa je i jednoj i drugoj vrsti gotovo jednaka, od zadebljana ruba postepeno se diže i sužava sve do početka same čaške. Čaške su potpuno različite, jedna je zvonolika i mala (sl. 29), a druga je veća i široka u obliku polukugle (sl. 30). Na žalost od tolikog broja (zvonolikih ima 406, a širokih 218) niti jedna nije sačuvana potpuno cijela.

Slijedeći po broju (75 komada) je nešto luksuzniji tip čašice sa lijevanom nožicom ukrašenom dvjema lavljim glavicama (sl. 31). Čaška je obla ali nema čisti oblik polukugle.

Od nekih tipova čašica nađena su samo tri do četiri primjerka, tako tip čašice s lijevanom nožicom koja je dekorirana s vertikalnim nizovima sitnih kuglica, te manje čašice kojima je čaška u obliku šišarke. Među bocama ističu se na prvom mjestu visoke boce s vrlo dugim i uskim grlom (sl. 33), ukrašene bijelim nitima. Sačuvana su, doduše, samo duga grla obavijena na jednom ili dva mjesta valovitom staklenom trakom i dna koja su svojim koničnim dijelom zadirala u tijelo boce. Tanki plašt same boce nije mogao odolieti raznim pritiscima i udarcima. Kako su boce izgledale lako je pretpostaviti na osnovu onovremenih slika, na primjer Ghirlandajove »Posljednje večere« u refektoriumu samostana Ognissanti u Firenci (sl. 32).

Zatim su brojni dijelovi boca koje se prije mogu nazvati vaze. Na osnovu jedne takve zelene vaze u privatnom vlasništvu u Beču bilo je olakšano rekonstruiranje njihovog oblika. Bile su to vrlo dekorativne posude na niskoj stopi s nodusom te sa tri vrlo lijepe ručice koje su svojim gornjim zavrnutim dijelom bile vezane za izvijeno grlo, a donjim u obliku školjke za plašt posude. Sama posuda bila je okruglog nešto izduženog oblika, a u gornjem dijelu ukrašena tankim profiliranim obrubom. Neke od posuda imaju još na rubu grla i plaštu aplicirane male rozete.

Sačuvano je i desetak sasvim jednostavnih grla bez ukrasa, samo malo proširenih pri vrhu. Kakvog su oblika bile njihove boce, bez komparativnog materijala teško je reći.

Manjih boca koje su cijele ili gotovo cijele ima dva tipa: trbušastih bočica sa stopom i posebno formiranim grlom (sl. 34), koje se produžava do nepoznate dužine (takvih ima 26) i bočica s vrlo niskom stopom i nisko položenim trbuhom koji se postepeno sužava u vrlo usko grlo. Grlo završava malim ravnim rubom.

Dignuto je i mnogo dijelova interesantnih posuda koje su čini se nastale imitirajući oblike srebrnih ili kositrenih vrčeva (sl. 36). Niti njima nije sačuvan trbuh, ali po ostacima plašta na pojedinim grlima i stopama čini se da je bio kuglast. Grla ovih staklenih vrčeva su cilindrična s malom izvijenom ručicom. Zatvarali su se poklopcem s kuglicom na vrhu (sl. 35). Na prijelazu grla u plašt utisnuta je uska izbrazdana traka stakla. Osim ovog dekorativnog elementa cijeli vrč bio je ukrašen umetnutim vertikalnim uskim i bijelim staklenim nitima.

Najljepša je među svim nađenim staklenim predmetima posebna skupina predmeta ukrašenih graviranim cr-

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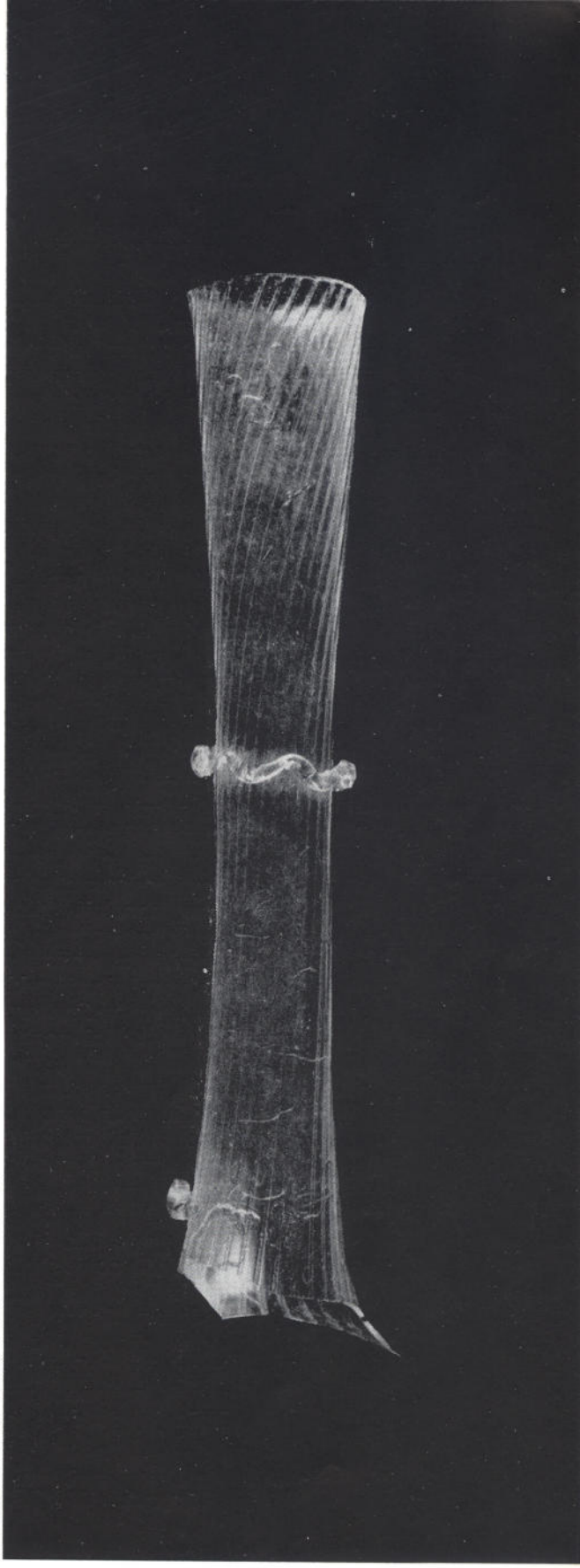

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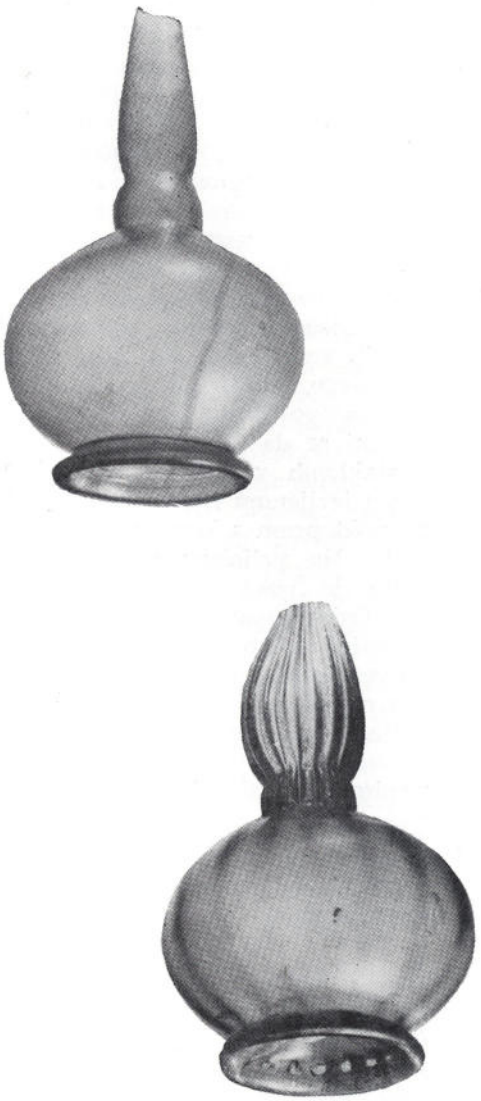
težem. Graviranje dijamantnom iglom također je jedna specijalnost muranske proizvodnje, koja se kasnije rašira na mnoge evropske radionice. Predmet se još dok je bio mek ukrašavao nježnim crtežem po cijeloj površini. Najvećim su dijelom upotrebljavani stilizirani biljni motivi, dok su se znali javljati i životinjski likovi, ali ih na našim predmetima nema. Svi crteži su vrlo uredni. Iako su rađeni brzo i rutinski, velika je pažnja posvećena šrafiranju, potezi su po mogućnosti što više paralelni i gotovo nikada ne prelaze granicu crteža (što je inače vrlo čest slučaj). Na prvom mjestu da spomenemo zdjelu (sl. 37), najljepši predmet cijelokupnog nalaza. Začudo iako ima jednako tanke stijenke kao i svi do sada opisani predmeti ostala je potpuno cijela. Visoka je 7 cm, a promjera 15,5 cm. Sasvim je jednostavna oblika polulopte s malom tankom nožicom. Gravirani ukras je pokriva cijelu, a raspoređena je u tri horizontalna pojasa. Dominira centralni pojas koji je ukrašen vrlo stiliziranom kontinuiranom viticom. Ljepota zdjele je u njezinoj potpunoj jednostavnosti, crtež je nježan i diskretan te se ništa ne nameće i ne narušava čiste obrise posude. Na žalost sada je zdjela mjestimično prekrivena tankom mutnom ljuskom, znakom bolesti stakla, koja je zahvatila gotovo većinu graviranih predmeta.

Neki oblici posuda se ponavljaju i među graviranim predmetima, kao vrčevi s poklopcem (nađena su dva grla i jedan poklopac), zatim dekorativne vaze sa tri ručice (od takvih postoji jedno grlo i pet stopa), te čašice s lavljim glavama na nozi (samo dvije). Ali zato su neki oblici sasvim novi kao što je bila i gore opisana zdjela. Slijedeći novi oblik su male elegantne bočice (sl. 39), na stopi ukrašenoj nodusom. Sačuvana je na žalost samo jedna cijela* dok ih u fragmentima ima još pet. Bočica je uskog izvijenog grla obavijenog nabranim vijencem. Plašt joj je dugoljast i bogato dekoriran. Gravirani crtež je također raspoređen u tri horizontalna pojasa od kojih gornji i donji imaju isti motiv kao okrugla zdjela, a samo je središnji drugačiji. Ovaj je podijeljen u pravokutna polja od kojih je svako drugo ispunjeno crtežem. Sve bočice su imale isti raspored crteža samo su se razlikovale u motivu unutar pravokutnog polja.



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Treći specifični oblik predmeta predstavlja okrugli, plitki pladanj s ravnim i niskim bočnim stranicama. Njegovo

* Nestala prilikom postavljanja zbirke u Biogradu, 11. VII 1970. godine.

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ravno dno je razmjerno debelo u odnosu na druge predmete, ali su mu zato bočne stranice također tanke. Dekoriran je cio. Na dnu su mu tri tipične renesansne girlande smještene u koncentričnim krugovima između tri jača profila. Na bočnim stranicama ima nježni ornament koji smo već susreli kao završni ukras na zdjeli i bočicama. Nađeno je gotovo cijelo dno još jednog takvog pladnja. On također ima tri profila samo je ornament unutar njih drugačiji. Umjesto girlandi ponovo se javljaju pravokutna polja od kojih je svako drugo ispunjeno crtežem. Prema širini pojasa između profila najduža su pravokutna polja u centru, pa se sve više skraćuju prema vanjskom rubu.

Posebnu skupinu sačinjavaju predmeti od plavog stakla. Nađena su samo dva tipa: male poluloptaste zdjelice i male bočice s dugim i uskim grlom. Nađene su tri zdjelice, sve približno iste veličine, promjera 7—8 cm, niske i s vrlo malom nožicom. Jedna je potpuno cijela, dok je jedna intarzirana krhotinama crvenog i bije-

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log stakla. Bočice su imale uska i duga grla sa proširenjem na vrhu (sl. 38). Sačuvano je dvadesetak grla, što više, što manje, ali je samo na jednom ostao mali dio plašta boce po kojemu se ne može rekonstruirati oblik. Ipak može se zaključiti da nije bila u obliku kugle nego više spljoštena. Okruglog prozorskog stakla izvađene su vrlo velike količine (648 komada, a od toga cijelih 205). Ono je potpuno jednostavno sa zavrnutim rubom. Ima ga u tri veličine (promjera 20,5 18,5 i 17 cm). Zatim oko 50 komada staklenih ploča nepravilnog pravokutnog oblika odlivenih u ravnoj plohi.

Izvađeno je i dosta malih okruglih ogledala. Na žalost živa je ispala te su mutna ili su stakla gotovo čista. Izrađena su tako da je između dva grubo rezana okrugla stakla namazan tanki sloj žive nakon čega su ona nekom smjesom poput gipsa slijepljena zajedno.

Ovaj kratki pregled samo informira o oblicima i načinu ukrašavanja nađenih staklenih predmeta ne ulazeći u valoriziranje i vremensko određivanje. Ipak može se slobodno reći da predmeti stoje na visokom zanatskom nivou, a jednostavnom ljepotom oblika ulaze u epohu kada je muransko staklo bilo najljepše.

Datirati bi se moglo u zadnje godine XVI stoljeća s jedne strane na osnovu ostalih predmeta nađenih na brodu, a s druge strane komparacijom s predmetima u Muzeju stakla u Muranu.

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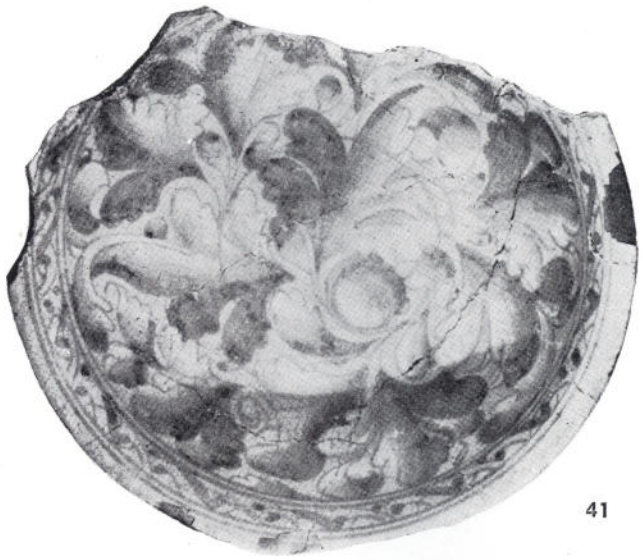

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KERAMIKA

SOFIJA PETRICIOLI

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Za razliku od ostalih predmeta koje je brod transportirao u vrlo velikim količinama, keramičkih predmeta nađeno je samo tridesetak komada. Polovinu od toga možemo ubrojiti u luksuznu keramiku dok drugu polovinu sačinjavaju grubo obrađene posude raznih oblika namijenjene domaćinstvu.

Poznato je da je Venecija bila jedan od jačih centara proizvodnje keramike u Italiji počevši od XV pa sve do XVIII stoljeća. Vrlo vjerojatno da su ti predmeti proizvedeni u njezinim radionicama, a zatim ukrcani također u Veneciji na brod.

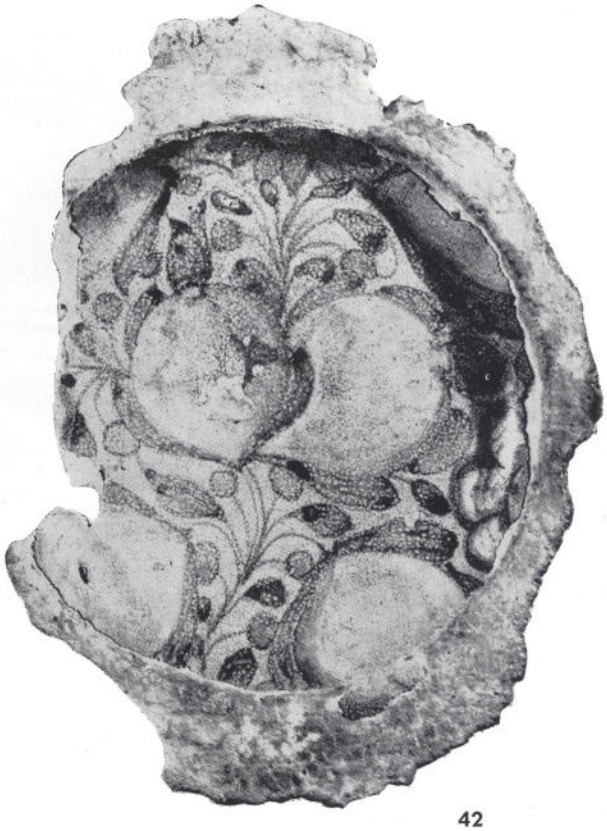
U Veneciji se izrađivala ingubirana gravirana keramika u istoj mjeri koliko i slikana keramika, a oba ta tipa zastupljena su među predmetima na brodu.

Prije nego što pristupim opisu predmeta, potrebno je napomenuti da su predmeti u dosta velikoj mjeri oštećeni. Tamni mulj u kojem su ležali prodro je ispod glazure pa su boje potamnjele, a sama glazura je izgrižena te površina nije više glatka niti dovoljno prozirna da bi boje, koje su kod nekih predmeta bile vrlo žive, došle do punog izražaja. Gravirani predmeti izrađeni su od crvene gline ingubirane bijelom glinom, a zatim ukrašeni graviranim crtežem i

potom glazirani. Sačuvane su samo tri male poluloptaste zdjelice ukrašene s obje strane graviranim crtežem. Na plaštu imaju identični motiv stilizirane vitice s listovima i razlikuju se samo po centralnom motivu na dnu. Jedna ima malog kunića zgurenog u travi, druga stablo sa tri grane, a treća geometrijski ornament izveden od uvijene uske trake.

Nešto se od njih razlikuje velika plitka zdjela (sl. 43), svijetlozelene boje ukrašena geometrijskim i geometriziranim biljnim motivima. Njezina tehnika ukrašavanja poznata je pod nazivom »a fondo abbassato« što znači da je samo crtež sačuvao bijeli engob, dok je s pozadine potpuno uklonjen. Tako se stvara dojam kao da je predmet ukrašen plitkim reljefom, a zelena glazura dobila je na taj način dva tona, svjetliji na engobu, a tamniji na očišćenoj pozadini.

U drugoj su skupini zdjele, zdjelice i tanjuri ukrašeni plavim slikanim crtežem na sivoplavoj podlozi. Crtež je izveden vrlo vješto i sa profinjenim ukusom, te se opaža da su predmeti izrađeni u radionici visokih kvaliteta. Na njima prevladavaju dva motiva pa ih možemo podijeliti u dvije skupine: jedni su ukrašeni preko cijele površine isprepletenim hrastovim lišćem (sl. 41), dok druge (sl. 40), prekriva nešto stilizirani prikaz pejzaža s okruglom kulom u lijevoj polovini slike. Motivi su međusobno toliko slični da predmeti djeluju kao da su dijelovi dvaju servisa. U trećoj su skupini samo tri zdjele koje su na žalost vrlo oštećene. Na sebi imaju vrlo sličan motiv: na sivoj podlozi izmjenjuje se voće sa cvijećem i malim listićima. Prevladavaju veliki žuti plodovi limuna (sl. 42), simetrično ali ipak slobodno raspoređeni među zelenim listićima i narančastim bobicama. Na najvećoj zdjeli među limunima nailazimo i na zelenožute krastavce, a na dvjema nešto manjim zdjelama krupne cvjetove s bijelim i plavim laticama. Zaista je šteta što su ovi lijepi predmeti toliko oštećeni, jer se glavni čar njihove ljepote nalazi baš u slobodnom rasporedu svježih i vedrih boja koje im je more dobrim dijelom odnijelo.



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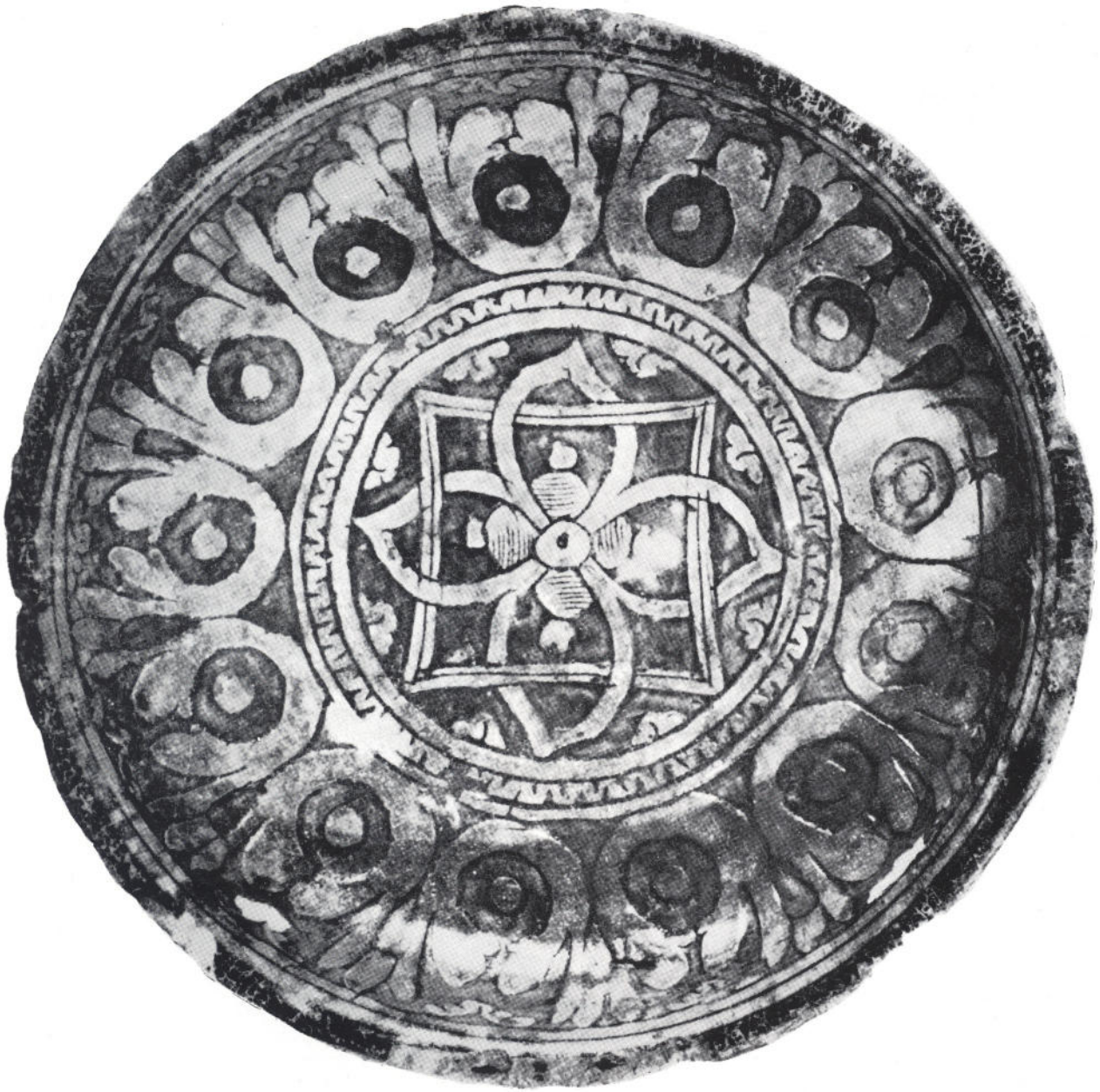
Keramički predmeti namijenjeni domaćinstvu vrlo su različiti. Ima vrlo malih posudica u obliku lončića s jednom ručkom, lončića s dvije ručke i poklopcem, te vrlo velikih posuda za spremanje i prijenos tekućina. Te su posude po obliku vrlo slične amforama tj. imaju usko grlo i dvije simetrično postavljene ručke.



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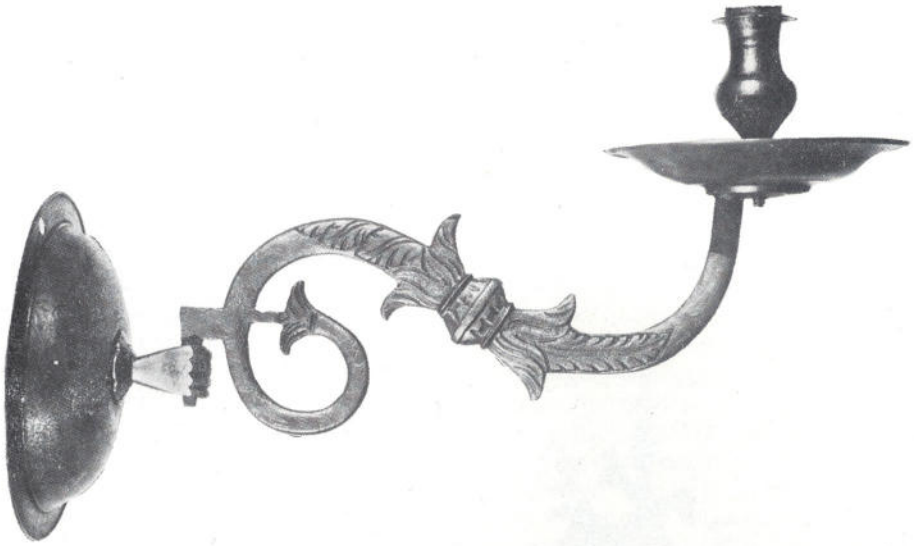


MJEDENI SVIJEĆNJACI

SOFIJA PETRICIOLI

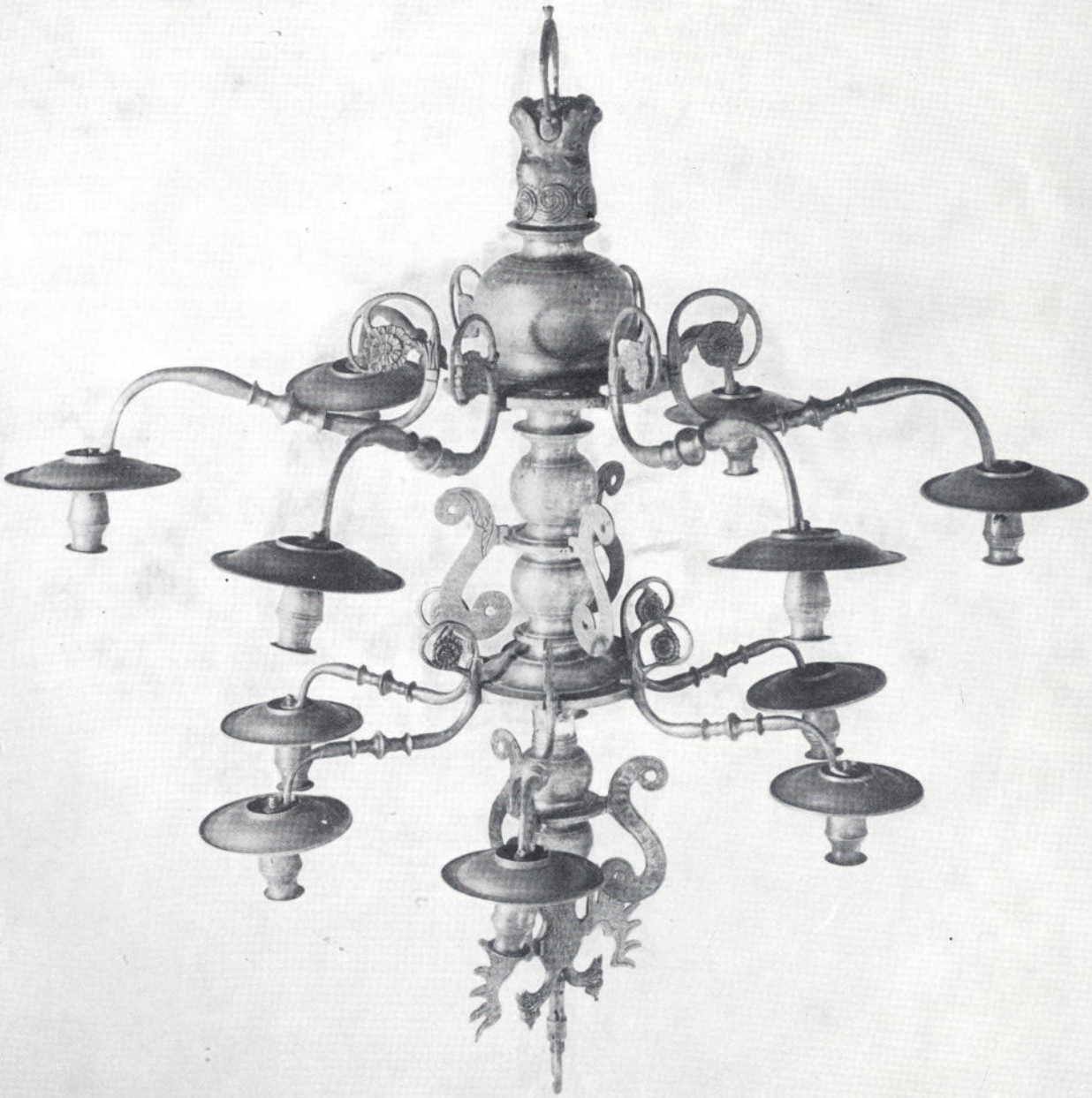
Među predmetima koji su se transportirali u velikim količinama nalaze se i svijećnjaci od mjedi. Oni se svojim porijeklom izdvajaju od velikog broja ostalih predmeta za koje potpuno sigurno znamo da potječu iz Italije. Mjedeni svijećnjaci za razliku od njih izrađeni su na sjeveru Evrope i to vrlo vjerojatno u Lübecku.

Predio srednje Evrope između rijeke Maas i Rajne bio je još u rimsko doba poznat po rudnicima cinkove i bakrene rude. U srednjem vijeku ovdje su se rano razvili obrti kojima je kao sirovina služio mjed — legura cinka i bakra. Među ostalim obrtima javlia se i izrada mjedenih svijećnjaka, ali je interesantno spomenuti da su svijećnjaci u početku bili samo nusprodukt u radionicama zvona, topova, brončane sitne skulpture i sl. Izrađivali su se već u XIV st., ali njihov cvat pada u kraj XV, a osobito u XVI i XVII stoljeće.

Već je u vrijeme gotike postojao tip lustera s krakovima, ali je bio opterećen raznim dekorativnim elementima. Krakovi su bili iskićeni hrastovim lišćem ili viticama vinove loze, a osovina lustera bila je često u obliku kapelice s figurom unutra.

Ranorenesansni tip, kojemu pripadaju i naši svijećnjaci, oslobođen je svih suvišnih dodataka, te oblici njegovih krakova postaju vitki i funkcionalni, a dekorativna figura u obliku dvoglavog orla povlači se na sam vrh tokarene osovine. Uz elegantnu funkcionalnost još je jedan moment bio važan što su se ti svijećnjaci vrlo brzo raširili izvan njemačkih granica. To je bila njihova mogućnost demontiranja u najosnovnije dijelove, što je od velikog značenja za njihovo transportiranje. Tu njihovu osobinu iskoristila je njemačka Hansa i među artikle kojima je trgovala uvrstila i svijećnjake. Zahvaljujući Hansi oni su se vrlo brzo proširili ne samo po sjevernoj Evropi, već kako vidimo, dospjeli su i na jug.

Gradovi koji se ističu u izradi svijećnjaka jesu Aachen, Nürnberg i Lübeck, sva tri grada u kojima su postojale i druge radionice u kojima se obrađivao metal. U Aachenu i Nürnbergu izrađivao se mjedeni lim, u



Nürnbergu je postojala poznata ljevačka obitelj Vischer koja je izrađivala sitne brončane skulpture i mjedene pladnjeve, a u Lübecku je bila poznata ljevaonica zvona i topova. Kako se u Lübecku nalaze dva najčistija primjerka tih ranorenesansnih lustera, taj tip lustera dobio je naziv »Lübecker Krone« — lübečka kruna.

Da bismo lakše vremenski odredili naše svijećnjake, opisat ćemo tok razvoja pojedinih dijelova lustera. S obzirom na to da su lusteri složenijeg oblika od zidnih svijećnjaka, bit će ovdje opisani sastavni dijelovi lustera.

Već je spomenuto da su se krakovi za svijeće oslobodili suvišnih dekoracija. Jedino mjesto za ukras zadržano je u donjem zavoju kraka, gdje se najčešće nailazi na cvijet margarite. Krak ima karakterističnu oblik slova »S« koji se svojim slobodnim dijelom vertikalno diže uvis i nosi vrlo jednostavni tanjurić i čašku za svijeću. Razvojem lustera ovaj vertikalni krak se sve više spušta dok mu konačno u XVIII stoljeću svijeća ne dođe ispod mjesta gdje je uglavljen u osovinu. Na osovini se također može pratiti razvojni put. Već su se u drugoj polovini XV stoljeća javili na njoj balustri, ali je tek renesansa sredinom XVI stoljeća usavršila oblik osovine, kad se ona počela tokariti pomoću vodene snage. Među ostalim kuglastim elementima počinje se izdvajati jedna veća kugla koja na ranijim lusterima nema stalni položaj, pa se javlja na sredini osi kao i na kraju ili pak nije strogo odijeljena od ostalih elemenata. Na lusteru iz katedrale u Lübecku kugla je još ponešto spljoštena, ali se već spustila ispod ishodišta donjeg niza krakova, gdje će se zadržati sve do kraja. Na lusterima XVII stoljeća poznatim pod nazivom »Flämische Krone« — flamanska kruna, kugla je potpuno okrugla, mnogo veća od ostalih elemenata na osovini i uskim grlom potpuno odijeljena od gornjeg dijela osovine. Na dnu kugle nestala je lavlja glava koja se ovdje nalazila još iz gotičkih vremena i na njezino mjesto dolazi na kraju XVI stoljeća ukras u obliku žira ili tokarena dugmeta.

Među dijelovima mjedenih svijećnjaka s broda, kojih ima preko 300 komada, nađene su tri osovine, dvije veće i jedna manja. Sve tri osovine imaju približno istu profilaciju, a kugla im se nalazi ispod ishodišta krakova. I kod njih je kao i kod lustera u Lübecku kugla ponešto spljoštena. Na dnu kugle je lavlja glava koja drži u ustima ručicu ukrašenu dvjema ribama. Našla se samo jedna lavlja glava dok je ručica s ribama nađeno osam što govori da je isto toliko bilo i lavljih glavica i osovina lustera, međutim za sada nisu još nađeni. Vrh osovine završava dvoglavim orlom raširenih krila (sl. 47). Orlova je nađeno tri koliko i osovina, ali je zato nađeno još jedno malo krilo koje je pripadalo orlu manjih dimenzija, pa se nameće pomisao da je luster s manjom osovinom imao i manjega orla.

Sva tri lustera s broda imaju krakove raspoređene u dva reda (niza) po šest komada. U gornjem redu su

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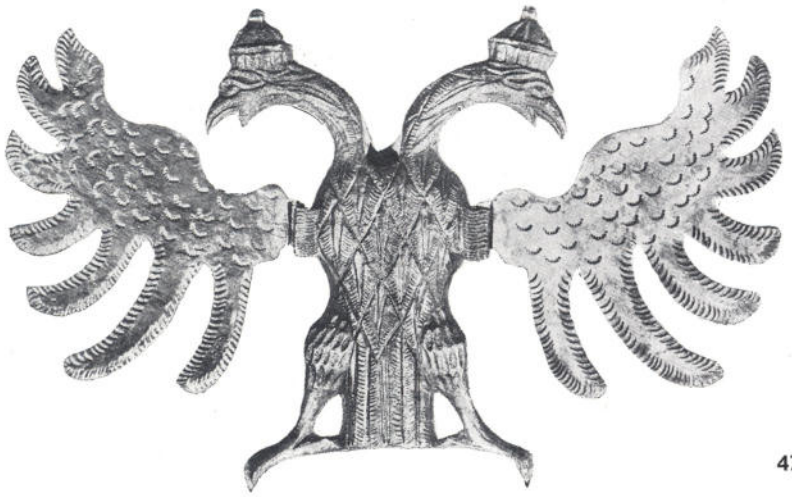

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uvijek krakovi manjih dimenzija. Jedan luster (sl. 45) ukrašen je još dekorativnim elementima u obliku slova »S« raspoređenim u dva reda po tri zajedno. Nađeno je ukupno šest S-elemenata no svi ne pripadaju istome lusteru jer su ukrašeni na dva načina, jedni horizontalnim crticama, a drugi polukružnim urezima koji podsjećaju na riblje ljuske.

Ukupno je nađeno deset vrsta krakova koji pripadaju lusterima. Najvećim dijelom razlikuju se u dimenzijama, ali su inače jednaki s margaritom u zavoju. Ima i nekoliko vrlo malih krakova koji nemaju margaritu već samo mali zavoj.

Krakovi lustera razlikuju se od zidnih krakova, osim u dekoraciji, u jednom bitnom konstruktivnom dijelu. Oni se usađuju na osovinu lustera pomoću malog trapeznog dijela koji na osovini ima odgovarajuće udubljenje. Svako udubljenje je numerirano istim brojem kao i krak koji mu pripada. Uopće svi su dijelovi lustera numerirani: krakovi, krila orla, S-elementi, čaške za svijeće. No ova numeracija je opća pojava kod svih lustera koji se mogu demontirati te nije neka posebna osobina naših svijećnjaka.

Zidni krakovi se razlikuju od ovih s lustera već u načinu fiksiranja. Umjesto u osovinu oni se usađuju u jedan poluloptasti element sličan tanjuru koji na sredini ima plastično izrađenu malu ljudsku šaku s udubljenjem po sredini. U to udubljenje se stavlja klinu sličan dio kraka.

Kako su zidni krakovi visili pojedinačno, nisu se morali izrađivati serijski pa je njihova raznolikost vrlo velika. Teško je naći nekoliko potpuno istih krakova, pa je od 62 nađena 17 raznih tipova. Ipak ta se raznolikost na prvi pogled ne opaža jer postoje samo tri osnovna tipa koji se onda međusobno razlikuju u malim detaljima.

Najveći krakovi (sl. 44) ukrašeni su po sredini dekorativnim prstenom koji kao da steže snop listova što izbijaju lijevo i desno od njega. Prema vrhu kraka i zavoju pružaju se manji i veći listovi koji su samo ugravirani u površinu kraka. Zavoj kraka je jednostavan, a završava ukrasom sličnim ribljem repu.

Drugi tip je donekle sličan prvome. Po sredini nema dekorativnog prstena ni stegnutog snopa listova, već samo izbočeni dio jednak onome na krakovima lustera. Lijevo i desno od njega su ugravirani listovi u bezbroj varijanti. U zavoju je smješten trolist.

Svi krakovi trećeg tipa (sl. 46) su potpuno jednaki, kako po veličini tako i u svim detaljima. Potpuno se razlikuju od prva dva tipa. Namjesto biljnog ornamenta u zavoju, kod njih je izrađena stilizirana glava dupina u profilu. Po sredini kraka su dvije volute smještene tako da djeluje kao da je krak ovdje sastavljen iz dva uvijena dijela. Sam vrh gdje se navija čaška za svijeću ni kod jedne vrste krakova nije bio dekoriran dok je ovdje ukrašen također volutom. Ispod volute je ugravirana vijugava linija koja dopire sve do prve volute u sredini kraka.

Čaški za svijeću ima također desetak varijanti, no spomenut ćemo samo najkarakterističnije. Najviše ima čaški koje su u literaturi poznate pod

»oblikom urne«. Ima ih većih, manjih, užih i debljih, ali u biti su sve jednake. Druge su karakteristične čaške cilindričnog oblika, s četiri rupe. Taj oblik se javio ranije od prethodnoga, no ovdje su istovremeni. Treći oblik čaški je također sličan urni samo ima nešto više izvijene forme.

Na kraju je potrebno spomenuti tri kraka koji se potpuno razlikuju od svih do sada opisanih predmeta. Kako nalaz nije do kraja ispitan, ne zna se da li takvih krakova ima još, te da li pripadaju lusteru ili su samostalni zidni. Razlikuju se već po materijalu iz kojega su izrađeni. Dok svi do sada opisani predmeti imaju žutu boju mjedi, ovi su boje bronce, no vjerojatno su također mjedeni samo s većim postotkom bakra. Imaju oblik krakova kakve nalazimo na zrelim lusterima tipa »Flämische Krone« kod kojih se svijeća nalazi niže od ishodišta kraka. I dio kojim se pričvršćuje za osovinu razlikuje se od dosadašnjih.

Gdje su se svijećnjaci ukrcali na brod teško je reći sve dok se ne bude znalo porijeklo broda. Za sada se može pretpostavljati dvije mogućnosti: da su kopnenim putem stigli do Venecije i ovdje se ukrcali ili da su se odmah u kojoj sjevernoj luci Antwerpenu ili Lübecku, uputili morskim putem preko Evrope put istočnog Mediterana. Venecija je oduvijek bila veza između Evrope i Istoka, pa se u njoj sakupljala roba iz raznih krajeva svijeta i dalje otpremala na Istok odnosno na Zapad. Njemački trgovci imali su svoje sjedište u tzv. Fondaco dei Tedeschi gdje im je Venecija bila omogućila sklapanje trgovačkih poslova s partnerima s Istoka. Njemačka Hansa je svoju trgovačku mrežu razvila najvećim dijelom na sjever, te je trgovala sa svim baltičkim zemljama uključujući i Englesku i Rusiju no nije isključeno da je svoje brodove upućivala koji put i na jug.

Tako za sada ostaje otvoreno pitanje kojim su putem naši mjedeni svijećnjaci dospjeli do Jadrana, ali je zato gotovo potpuno rasvijetljeno pitanje njihovog porijekla.

Bibliografija: K. Jarmuth, Lichter leuchten im Abendland, Berlin 1967; K. Jarmuth, Lübecker Leuchten vom Meeresgrund, Lichttechnik, Nr. 3/1969; također bogata prepiska s K. Jarmuthom kojemu ovom prilikom zahvaljujem.

VAGA I UTEZI

SOFIJA PETRICIOLI

U željeznoj škrinji se među predmetima od tekstila našla i jedna drvena kutija srednje veličine. U momentu nalaza raspala se, otpao joj je poklopac i dno, a njezin sadržaj se istresao. U njoj je bila mala precizna vaga i dvije vrste utega.

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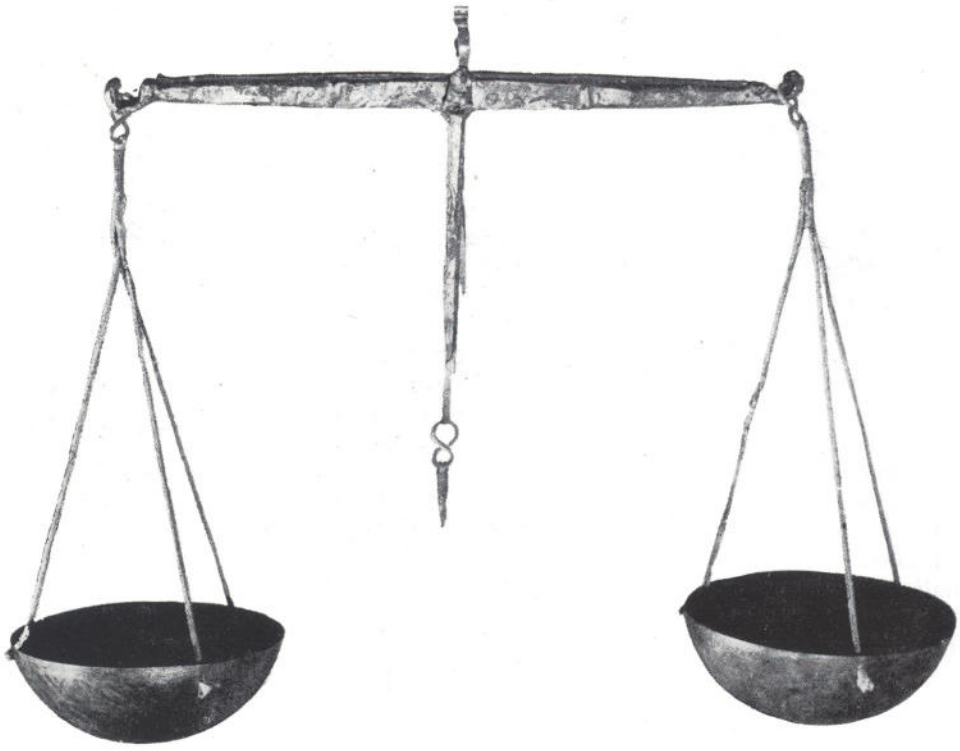

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U ovome napisu nećemo govoriti o težinskim vrijednostima utega, značenju žigova na njima, niti o njihovom porijeklu. Ovdje ćemo dati samo osnovnu deskripciju njihovog izgleda, dok ćemo stručnu stranu prepustiti dr Z. Herkovu iz Zagreba koji se tim problemom već bavi.

Nakon konzervatorskog zahvata kutija (sl. 48) je ponovo dobila svoj pravi izgled, jer se tikovo drvo od kojeg je načinjena odlično sačuvalo.

Osim jednostavnih profila koji teku uz rub dna i poklopca kutija je na poklopcu ukrašena još intarziranim kvadratićima od drugačijeg drveta (mislimo da je bambus). Njezina unutrašnjost podijeljena je jednom uzdužnom i dvjema poprečnim pregradama na četiri nejednaka pretinca. Najveći je središnji pretinac u kojemu su ležale zdjelice vage složene jedna u drugu. Igla i horizontalna poluga položile bi se u uski uzdužni pretinac, a dva bočna pretinca služila su za smještaj utega. Položaj vage u kutiji možemo vidjeti iz sl. 70 na kojoj je prikazana vaga u času kad je izvađena iz škrinje. Da bi poklopac ostao uzdignut nakon otvaranja kutije, pomaknula bi se u kosi položaj pokretna drvena papučica smještena uz desni rub poklopca. Kutija se zatvarala malom željeznom kukicom.

Još samo da spomenemo da je unutrašnja strana poklopca bila tapecirana grubim platnom na kojemu se našlo i nešto pamuka koji je kao i danas služio da se osjetljivi predmet prilikom trešnje ne ošteti.

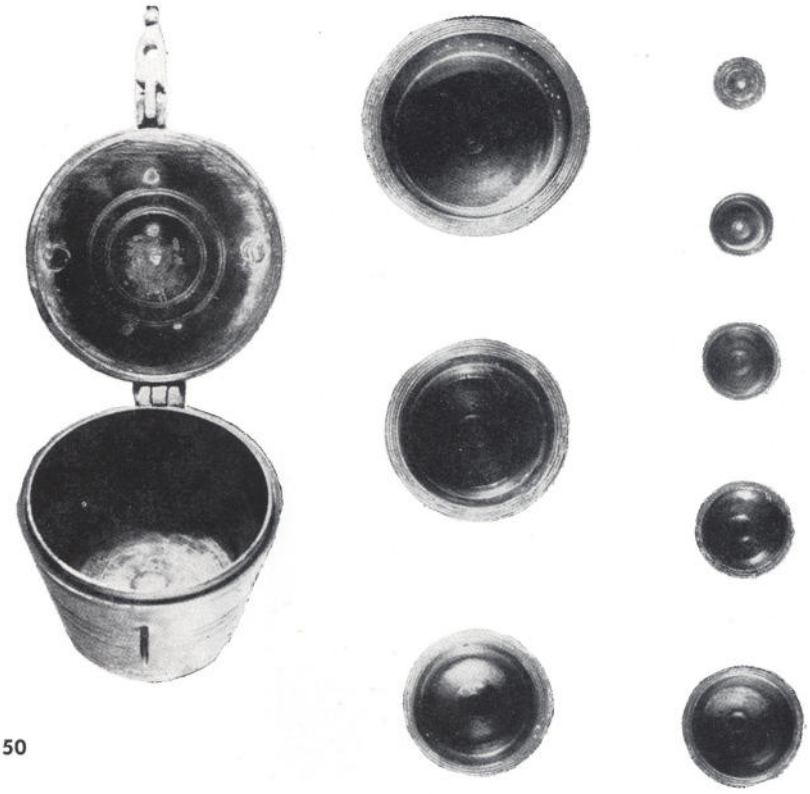
Vaga (sl. 49) se sastoji od dvije poluloptaste mjedene zdjelice koje pomoću tri konopčića vise na uglovima horizontalne poluge. Horizontalna poluga bila je od željeza (sada je rekonstruirana), a samo su se na uglovima

nalazile mjedene osmice za fiksiranje konopčića i u sredini lijepo izvedena omča, također od mjedi, za eventualno vješanje vage. U sredini je prema dolje visila igla i tanki željezni okvir s kojim se ona trebala poklopiti za vrijeme vaganja.

Utega imamo dvije vrste od kojih jedna predstavlja posebni komplet, a druga pojedinačne utege istog oblika. Kako su izrađeni od mjedi, odlično su se sačuvali.

Komplet utega (sl. 50) sastoji se od devet komada koji se ulažu jedan u drugi, a imaju oblik malih zdjelica. Najveći uteg ima također oblik zdjelice, ali je dopunjen poklopcem koji se može zatvoriti, te ručkicom da se može lakše prenositi. Na poklopcu velikog utega utisnuta je kao znak mala kruna.

U drugoj vrsti utega (sl. 51) nalazi se šest komada, dva veća i četiri manja. Imaju prizmatični oblik sa zakošenim uglovima. Na njima su oznake za težinu 100, 50, V, 2 i 1, a na svakome posebno još i mletački grb.



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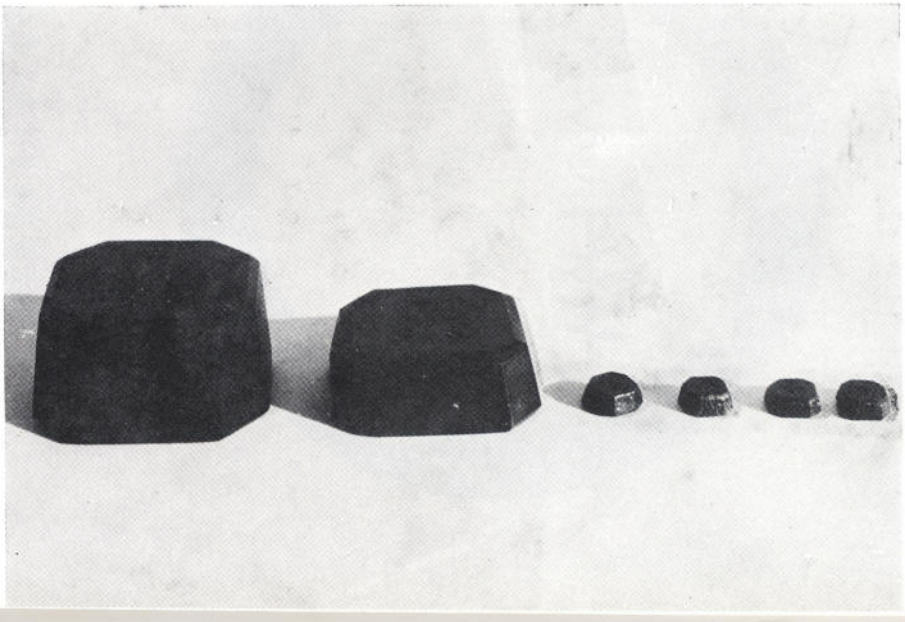

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O SIROVINAMA

IVO KELEZ

Iz asortimana sirovina nađenih na površini morskog dna i palubi potopljenog broda, te vremenu kad se datira njegovo potapanje, može se izvlačiti više pretpostavki o namjeni nađenog tovara pojedinačno po vrsti. Polovinom XVI st. nastaje nova epoha u tehnologiji. Sirovine nalaze novu upotrebu i način prerade, ali ostaje i dalje ona poznata iz antike i srednjeg vijeka. Nova saznanja — zahvaljujući štampanju knjiga — postaju brzo javna i prestaju da budu vlasništvo cehova i pojedinaca, pa se sada koriste i daleko od mjesta gdje je ta proizvodnja u srednjem vijeku imala primat.

Nesumnjivo je, da je brod iz Venecije plovio u jedan ili više jakih i bogatih proizvodnih centara gdje su dobru prođu imale velike količine vrijednih sirovina koje je nosio, kao i u to vrijeme tražena, a skupa gotova roba, koja je proizvedena u Veneciji i drugdje (ogledala, svijećnjaci).

Do danas su na nalazištu otkrivene slijedeće sirovine:

Mjed. Valjani mjedeni lim (sl. 52), debljine 0,8—1 mm nađen je u 11 stlačenih smotaka. Svaki smotak sadrži cca 16 m trake širine 170 mm, sastava: 72,6% Cu, 23,6% Zn i 3,8% Pb. Dalje je nađeno preko 70 svitaka (sl. 54) mjedenog lima debljine 0,3—0,4 mm od kojih svaki sadrži po cca 14 m trake širine 100 mm, sastava: 70,5% Cu, 24,1% Zn, 5,2% Pb i 0,2% Sn. Analiziran je po jedan uzorak svakog lima i odstupanja u sastavu se

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mogu očekivati od šarže do šarže iz koje je lim valjan. Karakterističan je veoma visok sadržaj olova.

Nađeno je i 50 smotaka mjedene žice različitog promjera do najviše 1,2 mm, namotane u kolutove različitog promjera. I tu je karakterističan visok sadržaj olova (do 6%).

Vanjska obrada lima i žice (sl. 55), uz normalna oštećenja tolikim stajanjem u moru, pokazuje visoku kvalitetu rada kod izvlačenja, a metalografski izbrusci vrlo stručno provedenu termičku obradu. Kolikogod je sadržaj olova nedopustivo visok za današnje zahtjeve i izaziva teškoće pri obradi izvlačenjem, mora se starim majstorima priznati visoka vještina prerade, s obzirom na sredstva kojima su raspolagali. Visok sadržaj olova treba pripisati nedovoljno savršenoj metalurgiji cinka. Role mjedi nose oznaku (sl. 53) koja bi uz analizu legure mogla pomoći da se odredi porijeklo robe.

U to je vrijeme vučenje mesinga bila već razvijena manufakturna proizvodnja u srednjoj Evropi, naročito poznata u Saksoniji, iako je već tada (1600) postojala i »Messing-Hütte« u Reichramingu u gornjoj Austriji.

Tada se mjedeni lim proizvodio u tri glavna trgovačka oblika:

— Tafelmessing — u obliku tabli debljih limova,
— Bugmessing — u obliku stlačenih smotaka srednje tankih limova, te
— Rollmessing — u obliku rola tankih limova.

U dvije posljednje vrste spadaju nalazi na našem brodu.

Bijeli lim. Iz pijeska je virio, donekle korodiran, ali kroz tri i po stoljeća dobro sačuvan, komad lima srebrnaste boje. Radi opterećenja nečim pod pijeskom, nije ga bilo moguće izvaditi. Odrezani komad pokazuje da se radi o bijelom limu (pokositrenom čeličnom limu), debljine 0,5—0,6 mm, vrlo lijepe perlitno-feritne strukture sa presvlakom od kositra debljine nešto preko 0,1 mm sa svake strane. Kositrena prevlaka je djelomično amalgamirana od rasute žive, nađene obilno oko broda. Amalgamom žive oštećeni su i neki mjedeni limovi.

Iako je kositrenje poznato još Piniju, bijeli lim se počeo proizvoditi u XIII st. u Češkoj, a 1620. je to već razvijena proizvodnja i u Saksoniji. Cijenjen je onda kao i danas radi svoje

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vanredne otpornosti prema koroziji. Do daljnjih istraživanja ostaje nepoznata količina, koju je nosio brod.

Živa. Iako je velik dio žive nađen među staklima ogledala, ipak se jedna količina morala nalaziti na brodu i kao teret. Za izradu ogledala se upotrebljavao zapravo kositreni amalgam. Početak proizvodnje je poznat od XIII st., a od 1507. je to privilegij muranskih staklara u Veneciji, no od 1563. već postoji i korporacija proizvođača ogledala. Na tanki kositreni lim, stavljen na ravnu ploču, nalijevala se živa, pokrila listom papira, a zatim naslonila staklena ploča. Pritiskivanjem i izvlačenjem papira, živa je dolazila u kontakt sa staklom i davala metalni refleksni sloj. Istisnuti višak žive se ponovo koristio, a onaj na ploči je sa kositrom gradio amalgam od kojeg je bio sačinjen metal na ogledalu. Svakako da je neplemenitiji kositar bio izložen koroziji u izrazito sumporovodičnoj vodi nalazišta. Od samog se amalgama ne mogu objasniti velike količine rasute žive. Kolikogod teško, sakupljeno je preko 2 kg, dio još i danas blista na površini pijeska, a velik je dio sigurno i utonuo u pijesak. Uzorak žive pokazuje danas samo 2% kositra. Živa je bila dakle i poseban dio tereta.

Tada je služila, osim za izradu ogledala, kao farmaceutska sirovina za »unguentum mercuriale«, vrlo cijenjenog lijeka za kožne bolesti a dugo još i kao jedini lijek protiv sifilisa. Upotrebljavala se, međutim, i za vađenje zlata amalgamiranjem sitnih količina metala u zlatonosnim rudačama ili pijescima.

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Živa potječe vjerojatno iz Idrije, koja je počela radom 1497, što se poklapa i sa naglim procvatom te proizvodnje u Veneciji skoro istovremeno. Teško je pretpostaviti, da je dovožena iz Češke, gdje se počinje vaditi početkom XVI st., ili iz antičkih nalazišta u Almadenu.

Kositar. Nađeno je preko 1000 kg u šipkama dužine 70 cm (sl. 56), čistoće približno 99% sa 0,04% Pb i ostalih primjesa u tragovima. Šipke nose utisnutu oznaku mletačkog lava (sl. 57). U Veneciji se kositar nije dobivao, mogao se samo pretapati, a oznaka je vjerojatno služila za potvrdu kvaliteta robe. Čistoća kositra odgovara tadanjim najvišim standardima kvalitete: »pig tin, first grade« i »Sachsischer Stangenzinn«.

Etruščani su u Italiji vadili kositar iz, u autarhično doba ponovno vrednovanih, nalazišta u Campiglia Marittima (Toscana), ali već Rimljani idu po njega u Britaniju, poput Feničana i Frigijaca prije njih.

Tek u drugoj polovici XV st. nastaje britanskom kositru konkurencija u Saksoniji, iako se nešto još od XII st. dobija iz Češke.

Upotrebljavao se za kositrenje bakarnog mjedenog posuđa, upotrebljavanog za ljudsku ishranu, za izradu stolnog posuđa uz 10% olova u XVI st., sa 9% antimona u istu svrhu, te za izradu ogledala. U isto vrijeme, legiran sa olovom, počinje se upotrebljavati i za lemljenje. S obzirom na velik teret lima na brodu najvjerojatnije je trebalo da posluži za kositrenje i lemljenje posuđa.

Cinober. Veliku je pažnju ronilaca privuklo 10 velikih crvenih livenih zvonolikih predmeta (sl. 58), šuplje konične jezgre težine po 100 kg. Radi se o živinom sulfidu HgS crvene modifikacije, sastava 85% Hg, pominjanom još u Bibliji kao vrijedan crveni pigment (cinober, vermilion). U vrijeme datiranja broda upotrebljava se za proizvodnju boja kao dobro pokrivni pigment, trajne žive crvene boje, kao punilo za pečatni vosak, pa čak i za šminku. Međutim ova količina sadrži oko 850 kg žive, koja se lako može ponovno dobiti destilacijom. Nije li to bio pogodan oblik za transport? Cinober je veoma skup, a u to su vrijeme već poznati i drugi jeftiniji crveni pigmenti. Iznenađuje tako velika količina, ali je i proizvodnja boja tada već jako razvijena i traženje sirovina za nju je bio veliki impuls osvajanju kolonija u novo otkrivenim zemljama.

Potječe vjerojatno iz Idrije. Dobijao se miješanjem ekvivalentnih količina žive i sumpora u grijanim rotirajućim zvonima. Živa i sumpor se tada vezuju u sulfid, a posljedica rotacije je konično udubljenje u sredini odljevka. Mljevenjem se dobijao fini pigment.

Olovno bjelilo. Kao i cinober i ovdje su odmah pali u oči crni konični čunjevi (sl. 59) težine od cca 0,25 kg svaki, na čijoj se bazi opažaju tragovi livenja. Nalazio se i u bačvama i rasut. Količinu je teško sada drugačije ocijeniti nego — mnogo. Vađeno je poput kamenja, a nije vagano.

Presjekom se čunja vidi da je crna naslaga samo nekoliko milimetara sloja ispod površine, dok je jezgra bijela, specifične težine 4,2, a uzorak sadrži

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65,6% Pb, 6,1% Ca, 0,8% Mg, tragove drugih metala i ostatak od CO_3'' i OH'. Stehiometrijskim računom se izvodi sastav od 82% olovnog bjelila (baznog olovnog karbonata) i 18% krede.

Crna je kora sastavljena od crnog olovnog sulfida koji je vjerojatno nastao ležanjem dugo u moru, za ovo nalazište specifično visokog sadržaja sumporovodika. Naime, tek u XIX st. se pominje oblik zaštite od trovanja olovom kod manipulacije vještačkim stvaranjem sulfidnog sloja na površini. Olovno bjelilo inače je nestabilno i pocrni na zraku djelovanjem sumporovodika, čak i u bojama koje su njim pigmentirane. Sumporovodika ima u malim količinama uvijek u zraku. Konfekcioniranje u ovakve čunjeve čuva ga pri transportu i skladištenju od toga (oštećena se površina može ostrugati). Dugotrajno izlaganje u moru pokazuje vrijednost tog načina. Pretpostavka je da je sulfidna kora nastala propadanjem onako kako je i kositar dobio žutu sulfidnu koru a mjed crnu patinu. Konfekcioniranje je vršeno miješanjem olovnog bjelila najvjerojatnije sa gašenim vapnom, a intereakcijom je materijal očvrsnuo nakon livenja u kalupe.

Već su Rimljani poznavali proizvodnju olovnog bjelila. U to vrijeme monopol imaju Holanđani i Venecija. Holandski način proizvodnje, koji je ostao još dugo poznat do novijeg doba, sastojao se u postupku, da se usitnjeno olovo u zemljanim loncima, sa nešto octa na dnu ispod njega, zakopa u stajski gnoj. Fermentacija gnoja daje potrebnu toplinu i ugljični dioksid, a kroz nekoliko tjedana, olovo preko acetata prelazi u bazni karbonat u vidu finog praha. Kuhanjem praha u lanenom ulju istiskiva se voda, a pasta služi za pigment vanredne pokrivne moći.

Vjerojatno je roba bila namijenjena u tu svrhu, iako se mogla upotrijebiti i za glaziranje keramike. Ali su za to služile i mnogo jeftinije sirovine. Od njega se mogu praviti i dobra ljepila — kitovi, ali nikako od ovako konfekcioniranog, jer je kemizam lijepljenja identičan postupku konfekcioniranja. Međutim mljevenjem i kuhanjem u ulju mogu se dobiti paste za boje.

Antimon sulfid (blistavac, antimon crudum). Nađen je i komad veoma čistog antimonovog sulfida, sivog, čiji sastav pokazuje do 78% Sb. Ovaj sastav ukazuje da se radi o tzv. antimon crudumu, sulfidnom obliku antimona prečišćenog topljenjem, koji se kao komercijalni oblik odavno upotrebljava i iz kojega se lako dobiva čisti antimon.

On se u davna vremena još upotrebljavao kao crnilo za oči, cijenjen kozmetički preparat na bliskom istoku, a u kasnom srednjem vijeku za lijekove (tartar emeticus). Međutim u vrijeme putovanja broda je već služio za izradu legura za zvona, štamparska slova, te za ogledala, ali i kao sredstvo u pirotehnici za bojenje plamena plavičasto-bije-

lom bojom. Knjiga objavljena 1604, navodno prijepis dva vijeka starijeg izdanja autora Basiliusa Valentinusa, svjedoči da je ta primjena već dobro poznata. Oblik nađenog komada (odlomak većeg odlivka pravilne forme) pokazuje da se radi o namjernom teretu, koji vjerojatno još nije sav otkriven, ali mu je namjena bila da posluži u metalurgiji, u koliko se potvrdi veća količina na nalazištu.

Porijeklo je teško utvrditi, jer su nalazišta veoma česta. Jugoslavija je danas jedan od najvećih svjetskih proizvođača antimona, a većina iskorištavanih nalazišta koristi se još od srednjeg vijeka.

Ostalo. U većem broju razbijenih bačava, od kojih neke više-manje cijele, nađen je i sumpor u prahu (sumporni cvijet). Dužice razbijenih bačava također su impregnirane sumporom, pokazuju tragove nagaranja, a količina svjedoči o komercijalnom teretu. Ovaj sumpor, podvrgnut vjekovima anaerobnom bakteriološkom vrenju, uzročnik je visokog sadržaja sumporovodika na nalazištu koji je izazvao kvarenje mnoge nađene robe.

Iz ovog se pregleda vidi da je definirano ono, što je nađeno dobro očuvano. Neki analizirani uzorci po svom obliku, kemijskom sastavu i stepenu sulfidnog pretvaranja ne daju dovoljno podloge da se utvrdi o čemu se radilo, jer su nađene male količine i ne može se tvrditi da se radilo o brodskom teretu. Ono što je more rastvaralo i ostavilo samo male ostatke, ili što još krije pijesak i utroba broda, mogu da pokažu samo daljnja istraživanja. Njihova cjelina može samo dalje precizirati i definirati historiju i cilj posljednjeg putovanja potopljenog broda.

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BAKRENO POSUĐE

SOFIJA PETRICIOLI

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Ovo je jedina skupina predmeta za koje nismo sigurni da li su pripadali inventaru broda ili su također bili trgovačka roba. Našlo ih se dvadeset komada. U vrlo su lošem stanju jer ih je s jedne strane nagrizla morska voda na koju je bakar mnogo osjetljiviji od svojih legura bronce i mjedi, a s druge strane nalazeći se na površini nalaza prekrili su ih razni školjkaši koji svojim sokovima također vrlo štetno djeluju.

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Sve su to uglavnom veći predmeti vrlo različitih oblika. Nađena je jedna kutlača (sl. 60), jedna tava s jednom ručkom (sl. 62) i jedna s dvije (sl. 61), dva umivaonika, kabao, peka, nekoliko poklopaca, nekoliko većih kotlova i zdjela, te jedan poklopljeni kotao s kljunom.

Iako je brod bio velik i imao veći broj posade, teško je vjerovati da su se svi ti predmeti upotrebljavali imajući u vidu činjenicu da se u ono vrijeme izbjegavalo loženje vatre na brodu radi mogućnosti požara. Ipak jedan podatak govori i u prilog pretpostavci da su oni bili brodski inventar. Naime, jedna od tava je pokrpana a sigurno da se rabljeni predmeti nisu prodavali.

Ali o ovom problemu moći će nešto više reći stručnjaci kojima je poznat način života na brodovima XVI stoljeća.

Da spomenemo još dimenzije pojedinih predmeta: kutlača 28 x 20 cm, tava s jednom ručkom 33 x 47 cm, tava s dvije ručke 35 x 44 cm, veliki kotao

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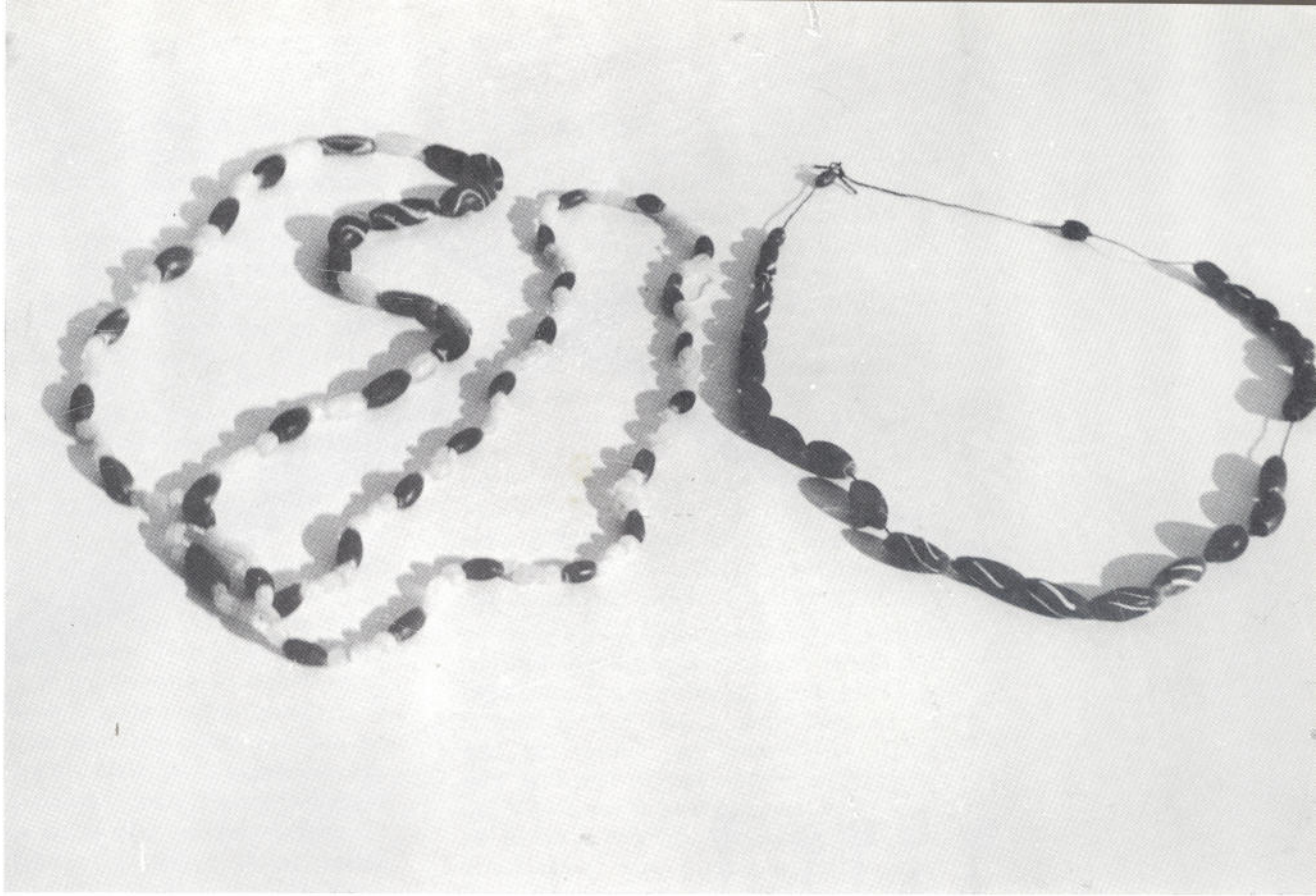
45 x 45 cm, a kotao s kljunom 50 x 30 cm. Kako svi predmeti nisu očišćeni i restaurirani teško je dati dimenzije svih predmeta jer su mnogi zgnječeni i deformirani.



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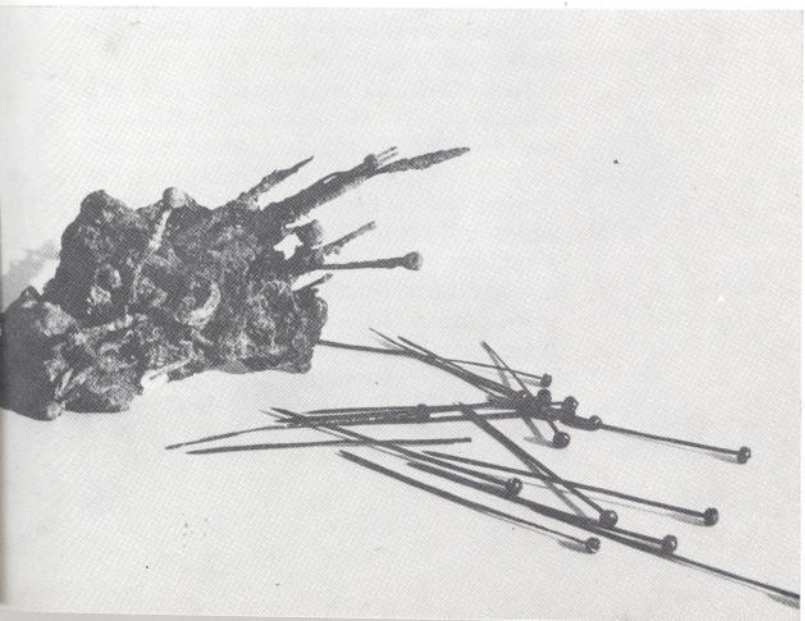
SITNI PREDMETI

SOFIJA PETRICIOLI



Iako nalaz nije sistematski obrađen niti do kraja dovršen, diglo se s morskog dna i mnogo vrlo malih predmeta.

Najsitnije su raznobojne staklene perlice (sl. 63), koje su se bile rasule po velikoj površini. Našlo ih se u pijesku koji se zadržao u topovskim cijevima, u mulju na dnu bakrenih posuda ili su ih ronioci sakupili po samom dnu. Perlice su bijele, plave i smeđe boje, najčešće je pomiješano nekoliko boja zajedno, kao tamnije i svjetlije plavo s bijelom bojom ili prozirna i mliječna bijela boja zajedno. I po veličini su različite: od 12 mm do 4 mm. Sakupilo ih se toliko da

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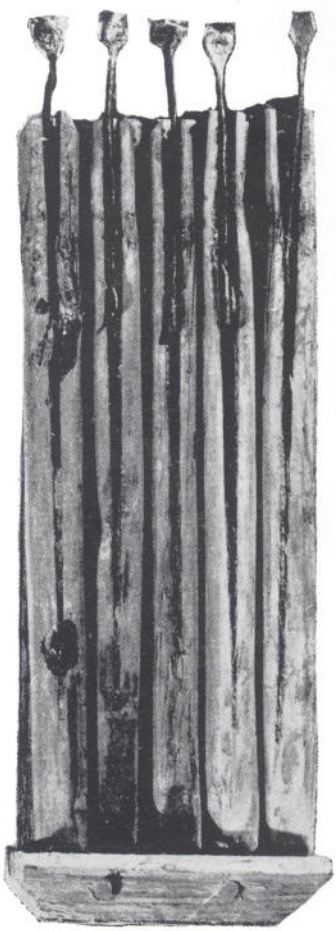

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se moglo nanizati dvije niske. Prevladavaju plave i bijele.

S obzirom na to da se na brodu nalazila velika količina muranskih staklenih predmeta, najvjerojatnije su i perlice istog porijekla.

Našlo se desetak naprstaka. I oni su se rasuli po dnu i zalijepili uz ostale predmete. Najviše ih je skinuto sa malih svježnjeva mjedene žice. Načinjeni su od mjedi i ne razlikuju se mnogo od današnjih.

Nešto više se našlo malih igala pribadača (oko 80 komada). Bile su međusobno slijepljene i obložene vapnenom korom (sl. 64). Pažljivim čišćenjem su razdvojene. Izrađene su od tanke mjedene žice dužine 5,5 cm s malom glavicom koja je od iste, samo zavrnute žice.

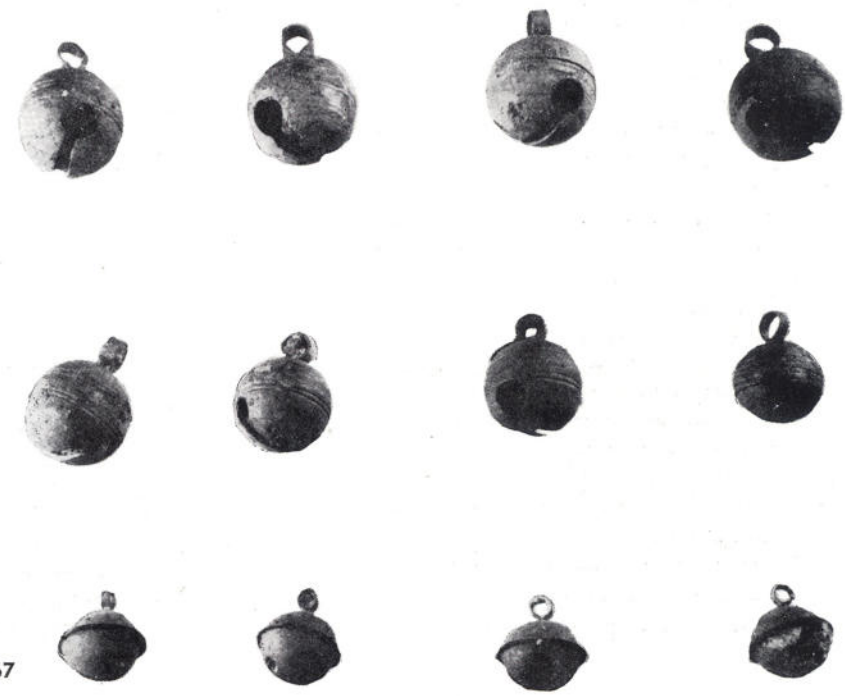
Praporaca se sakupila znatna količina. Izvađeni su u velikim grudama koje je trebalo pažljivo razdvajati. Iako su od tankog mjedenog lima, ipak

ih je velik broj oštećen. Ima ih tri vrste (sl. 67). Najveći su promjera 2 cm, potpuno okrugli s nekoliko urezanih koncentričnih krugova. Gore imaju petlju za pričvršćivanje, a dolje uobičajeni izduženi izrez. Manji praporci su potpuno jednaki, samo im je promjer 1,7 cm. Najmanji su malo drugačiji: sastavljeni su iz dva dijela koji se spajaju po sredini i ovdje stvaraju mali izbočeni prsten. Inače također imaju malu petlju i karakteristični izrez. Promjer im je 1,5 cm.

Najviše je izvađeno britvi za brijanje. One se nisu rasule jer su bile pažljivo zapakovane u dva paketa. Veći je pravokutni sanduk (dužine 81 cm, širine 53 cm i visine 37 cm) sa zaobljenim poklopcem i dvjema ručkama sa strana. More je uništilo dno i ručke od kojih se opažaju samo tragovi. U sanduku su britve uredno složene po deset zajedno. Vrlo je interesantan način pakovanja: oko jedne dašćice britve su se složile po pet s jedne i druge strane (sl. 66) i zatim vezale konopčićem. Da ne bi iskliznule dašći ca je na donjem dijelu imala dodano jedno podnožje o koje su se britve upirale. Drugi paket je ovalna kutija od vrlo tankog drveta (duga 54 cm, široka 30, a visoka 18 cm). Kako su britve u njoj složene za sada je još teško reći jer kutija još nije očišćena pa se britve samo naziru u njoj.

Same britve jednake su današnjima (sl. 65): duga i uska drvena drška s prorezom u koji se sklapa čelična oštrica. Oštricu je pridržavao mjedeni dio koji se sačuvao za razliku od oštrice koja je nestala. Prema otisku koji je ostavila na dršci može se lako rekonstruirati njezin oblik. (Dužina drvene drške 16 cm, oštrice 8,5 cm, mjedenog dijela 7 cm).

Na kraju još da spomenemo šestar koji je vjerojatnije bio dio brodskog inventara nego robe za prodaju. Cijeli je dug 16,5 cm, a sami krakovi 13 cm. Od mjedi je. Sastavljen je iz dva dijela koji gore zatvaraju krug, a dolje prelaze u krakove. Na vrhu kruga je mala osovina oko koje se dijelovi okreću i šire prema potrebi. Krakovi su do polovine dekorirani horizontalnim žljebovima.



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IZVJEŠTAJ PREPARATORA

BOŽIDAR VILHAR

Kratki prikaz metoda primijenjenih pri čišćenju i konzervaciji predmeta treba dopuniti s nekoliko riječi o općem stanju i stupnju oštećenosti predmeta, u kojem su se nalazili prije obrade. Opaža se prilična jednakost ali u dva suprotna pravca. Predmeti koji su ostali u većim grupama uslijed boljeg pakiranja ili dospjeli brzo u mulj, relativno su malo oštećeni. Mnogo su stradali predmeti s površine, rastreseni, izloženi mehaničkim utjecajima, gibanju mora i brzom raspadanju omota. To je stanje utjecalo i na način obrade tih predmeta tokom čišćenja i konzervacije. Na to je utjecao i sam materijal i to: metal zastupljen u šest varijanti (željezo, bakar, mjed , bronca, olovo i kositar, nabrojenih ovdje redom njihove osjetljivosti na koroziju počevši od najosjetljivijeg) organski materijali, staklo i keramika.

Najprije je trebalo odstraniti vapnenačke naslage. Na drvetu je to učinjeno ručno, dlijetom i laganim udarcima, isto tako i na brončanim topovima. Na staklu (sl. 68) i na kositru učinjeno je to razblaženom solnom kiselinom, dok na bakru, mjedi i keramici termičkim putem i električnom redukcijom.

Međutim stupanj korozije na jednom dijelu nalaza toliko je promijenio njihovu metalnu strukturu, osobito kod tanjih predmeta, da nije preostalo

drugo do intenzivne desalinizacije i impregnacije što je jedino moglo učvrstiti ugroženu čvrstoću predmeta. To je bio slučaj s velikim brojem praporaca, dok se kod izvjesnog broja čaški svijećnjaka moglo otići korak dalje, naime termička obrada ali bez traženja metalne površine.

Kod termičke obrade unose se predmeti u električnu peć zagrijanu prethodno na 400° C, ostave nekoliko minuta, već prema debljini predmeta, a zatim onako ugrijani urone u hladnu vodu. Kore otpadaju same od sebe ili poslije lagana struganja i četkanja. Za metal je bolje da atmosfera u peći bude reduktivna.

Daljnja faza za većinu metalnih predmeta bila je električna redukcija u 5—10% otopine sode kaustike kao elektrolit i kod ispravljene struje od 5—10 Volta. Pošto je termički obrađena i temeljito osušena, keramika je samo očišćena i impregnirana.

Veliki predmeti kao laminirani mjedeni lim, smoci žice i bakreni kotlovi (sl. 62) kod kojih zbog veličine nije promijenjen metod električnom redukcijom, čišćeni su u 10% sumpornoj i dušičnoj kiselini. To je bilo primijenjeno i na predmetima jače korodiranim, čije su patine odolijevale električnoj redukciji.

Poslije primjene kiselina izvršena je obavezna neutralizacija lužinama u običnoj kupelji ili ponovljenom električnom redukcijom. Odstranjivanje omekšalih naslaga s površine vršeno je najprije u mokrom stanju željeznim, mjedenim ili najlon četkama, već prema čvrstoći predmeta.

Ispiranje je vršeno u često mijenjanoj običnoj vodi, a na samome završetku i u destiliranoj. Taj proces ispiranja trajao je i do nekoliko tjedana. Nakon sušenja predmeti su polirani mekanim mjedenim četkama. Impregnacija je izvršena u većini slučajeva polivinil acetatom osim na drvenim predmetima gdje je upotrijebljeno laneno ulje.

Željezo je potpuno korodirano bez obzira gdje se nalazilo. Niti na jednome predmetu, osim na sidrima, nije primijećena metalna jezgra, što više metal je tako reći iscurio u obliku grozdastih izraslina i ostavio šupljine čak i na željeznim stražnjim dijelovima malih topova. Zbog dodira s broncom nastala je galvanska struja posredstvom morske vode kao elektrolita i time stavila željezo u još gori položaj.

Bronca, mjed (sl. 52, 55, 54) i bakar su ili potpuno sačuvani zahvaljujući mulju, tek s neznatnom patinom koja se u većini slučajeva formirala na zraku, ili vrlo korodirani osobito na tankim predmetima.

Kositar je vrlo dobro sačuvan (sl. 56), olovo također.

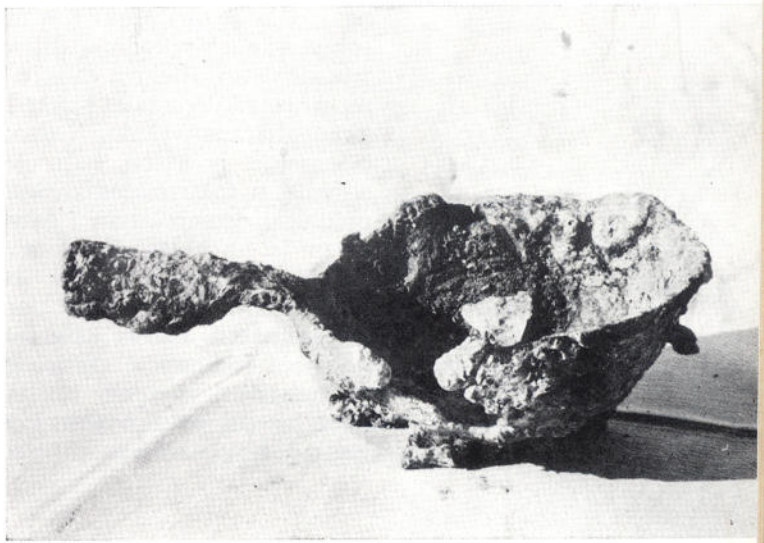
Za drvo do sada obrađivano pretpostavlja se da je orahovo i crnogorično. Dobro je sačuvano s malo gubitka u volumenu uslijed sušenja. Na nekoliko manjih komada primijenjen je metod alkohol-eter, ali nije zamijećena razlika s onima sušenim na zraku. Boja drveta uprljana je željeznim oksidom.

Staklo je osim loma dosta dobro sačuvano. Površina je nešto matirana rastvaranjem alkalija iz njegove mase.

Keramika je također osim loma, nešto malo alterirane glazure i oslabljene veze s podlogom.

Nekoliko specifičnih slučajeva:

Jedini željezni predmet koji je do sada potpuno konzerviran i restauri-



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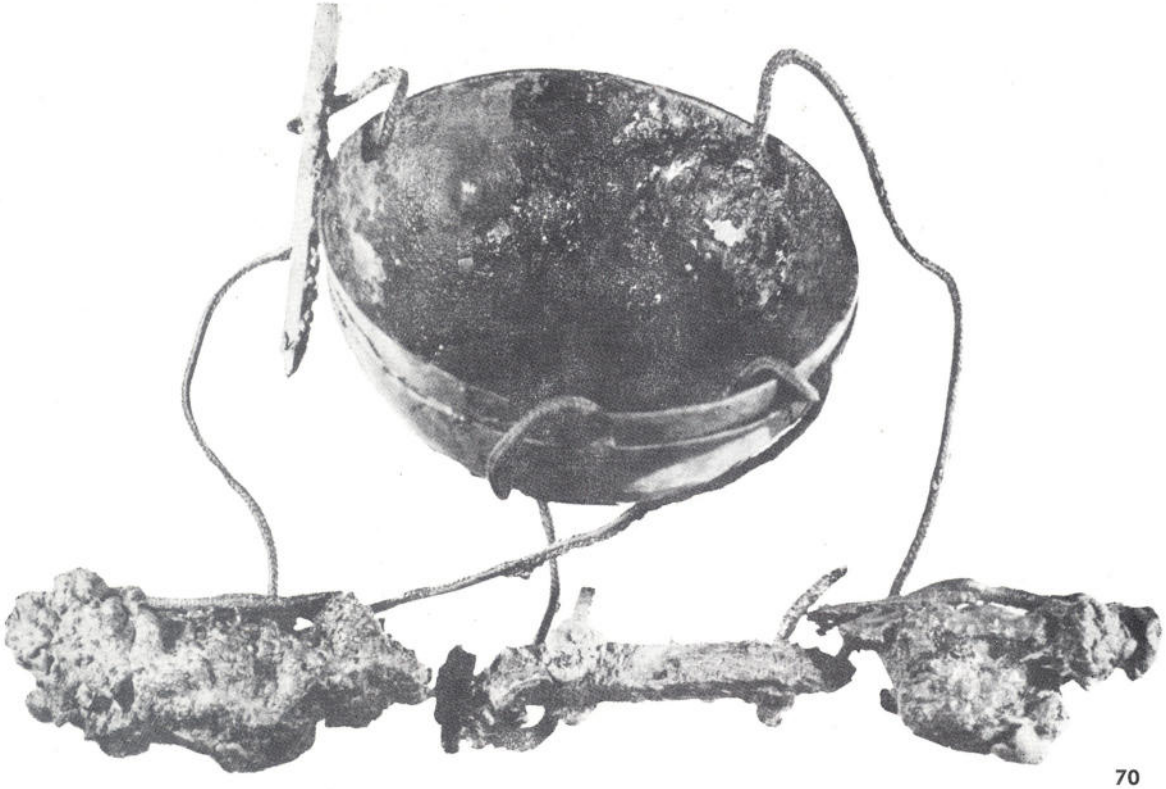

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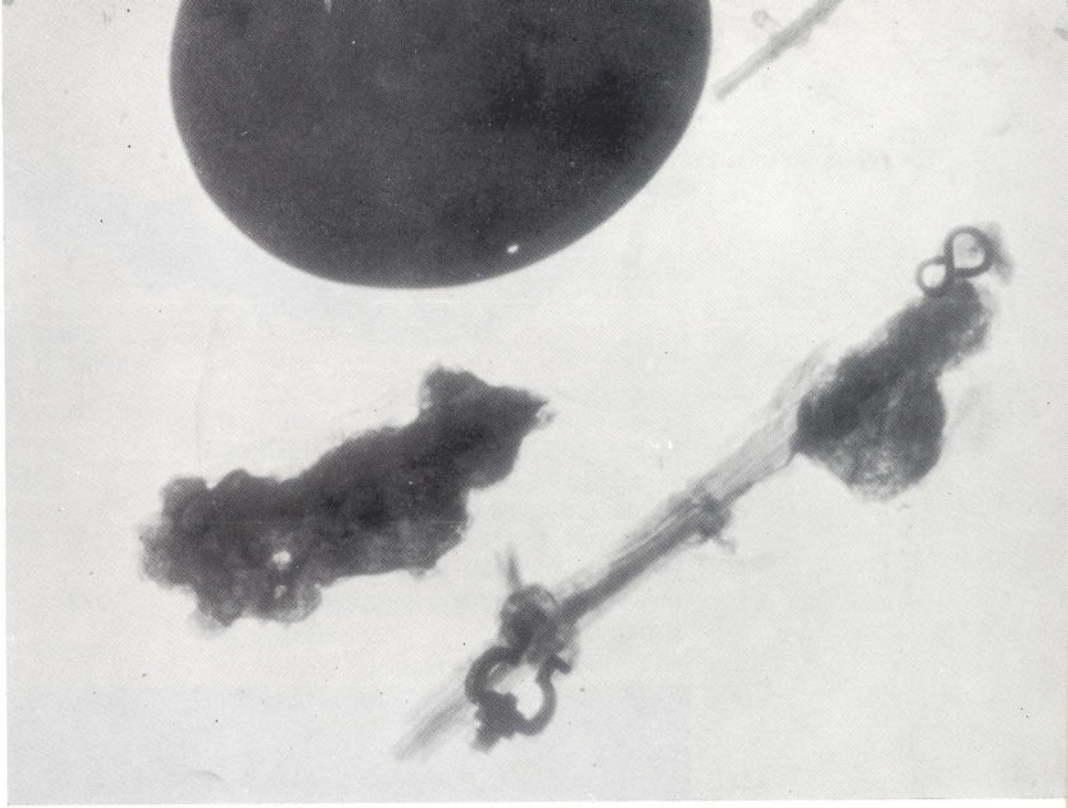
ran jest precizna vaga (sl. 49). Plitice i kukice (osmice) s vage podvrgnute su električnoj redukciji, dok su željezni krakovi-polugice, igla i ležaji bili skoro potpuno deformirani (sl. 70) izraslinama nastalim kod nestajanja metalne jezgre i sekundarnog deponiranja rezultata te korozije. Rendgen-snimka (sl. 71) bila je ovdje neophodna i dala je približnu formu i međusobne odnose pojedinih dijelova. Unutrašnjost tih dijelova bila je djelomično prazna. Preostala materija bila je koncentrirana s jedne i druge strane originalne površine koju je trebalo slijediti u toku čišćenja. Sam presjek polugica, osmerokutan i četvrtast, dobiven je na slučajnim lomovima. Čišćenje i odvajanje slojeva izvršeno je mehanički i skalpelom uz pomoć rendgen-snimke. U isto vrijeme bili su tako odvojeni i konopčići plitica koji su se razmekšali i donekle izbijelili oksalnom kiselinom. Spajanje konopčića i impregnacija izvršena je također polivinil acetatom dok je za restauraciju željeznih dijelova upotrijebljen araldit.

Utezi nađeni uz vagicu (sl. 50) pričinili su nešto poteškoća kod razdvajanja. To je postignuto nakon električne redukcije laganim udarcima duž vanjskih rubova i površine utega, tako da su postepeno ispadali jedni iz drugih. Kod četvrtastih primijenjena je samo električna redukcija kao i kod mjerila kalibra topova, šestara, pribadača, naprsnjaka i olovnih plombi s tekstila.

Veliki i mali mjedeni smoci žice (sl. 55), veliki laminirani limovi kao i manji smoci iz iste legure preparirani su termički i kemijski, dopunjeno kod manjih predmeta električnom redukcijom. Manji laminirani smoci (sl. 52) pošto su potpuno odmotani vraćeni su, prije impregnacije, u prvobitan oblik. Kod bakrenih posuda nestali dijelovi nadomješteni su bakrenim limom.

Na kositrenim šipkama žigovi su dosta jasni a s njihove donje strane još



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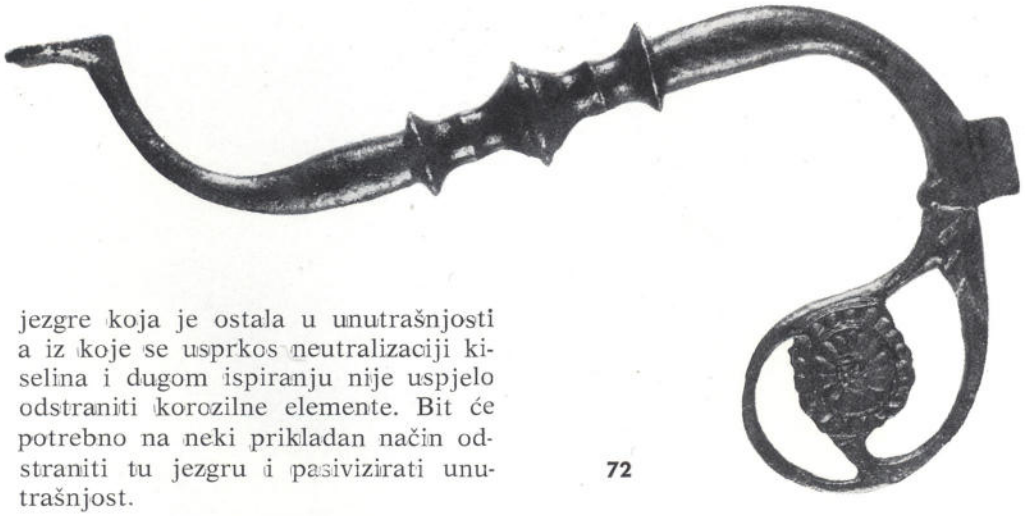
su lijepo vidljivi tragovi obrade primitivnih kalupova u kojima su bili lijevani.

Drvena kutija (sl. 48) (sa intarzijama od bambusovine) za pohranu precizne vage i utega, čiji su se sastavni dijelovi održali uglavnom zajedno, najprije je očišćena i rastavljena u dijelove. Mrlje spojeva željezna oksida odstranjene su u razblaženoj solnoj kiselini. Poslije neutralizacije ispiranje. Polagano sušenje između letvica pod pritiskom vratilo je dijelove na približno originalnu veličinu sa 2—3 mm gubitka u smjeru poprečnom na godove. Dijelovi su sastavljeni stolarskim ljepilom i natopljeni lanenim uljem.

Britve (sl. 65, 66). Problem je bio kompleksan jer se radi u isto vrijeme o drvetu, željeznoj skroz korodiranoj oštrici, njenom mjedenom usadniku i pločicama zakovica. Laganim udarcima i pilenjem razdvojeno je deset komada u jednome smotku, 5 naspram 5 odvojenih drvenom pločicom sa tragovima konopčića. Kod mjedenih odvojenih dijelova primijenjen je metod el. redukcije, kod drvenih dijelova i kutije upotrijebljena je solna kiselina. Za razliku od kutije vage koja je nađena unutar velike škrinje, tu su još postojale vapnenačke kore. Na sam nož britve taj postupak nije mnogo djelovao. Rendgenske snimke dale su približan oblik samoga noža. Taj oblik je potvrđen sasvim slučajno: pet oštrica ispalo je iz drvenih držaka valjda udarcem, bile su spojene u kompaktnu pješčanu masu. Pilenjem su razdvojene. Nakon ispiranja i impregniranja paraloidom, brušenjem i poliranjem tog trapezastog brida dobio se jasan oblik noža skroz korodiranog na podlozi pješčanog konglomerata. U tom specifičnom slučaju kiselina nije bila upotrijebljena. Prema tome podatku rekonstruirana je i jedna željezna oštrica. Kod ostalih komada dijelovi su montirani u originalni položaj.

ZAKLJUČAK

Na čitavom obrađivanom materijalu nije se do danas obnovila korozija, osim na velikoj osovini svijećnjaka i to samo na dijelovima gdje je metal uslijed lošeg lijevanja ostao šupljikav i u dodiru s velikom masom lijevane



jezgre koja je ostala u unutrašnjosti a iz koje se usprkos neutralizaciji kiselina i dugom ispiranju nije uspjelo odstraniti korozilne elemente. Bit će potrebno na neki prikladan način odstraniti tu jezgru i pasivizirati unutrašnjost.

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Novak Perica, 40, 41, 42, 43, 44, 46, 47, 48, 49, 54, 56, 59, 60, 61, 62, 65, 66, 72, 73,
Radulić Ksenija, 1, 4, 5, 7, 8, 17

CRTEŽI

Ivo Petricioli

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Here is at last the first issue of a new journal published by the museums of Zadar. Side by side with »Diadora« we now welcome »Vrulje«. The desires and endeavours of the museum workers of Zadar — to present to the scholars and the general public the cultural-historical heritage from the end of Early Middle Ages to the present day; the ethnologico-ethnographical material; the peculiarities of the natural history; modern painting since the times of the Illyrian Revival; the recent history from the middle of 19th century to the present day-have thus borne fruit.

The history of the museums of Zadar is rich and varied. It begins with the first enthusiastic collectors of antiques and private archaeological collections (the most precious of being the Danieli-Pelegrini collection in 18th century). The important milestone is the foundation of the People's Museum in the proclamation of the Governor of Dalmatia, Count Vetter von Lilienberg, in 1832, which was the signal for the collection of specimens of natural history, antiquities, popular and industrial activities. The management of the Museum was appointed on May 28, 1838. Since then the fate of the museum has been rich in interesting events. We note the alternating periods of enthusiatic work, stagnation, the years of alienation of Zadar from its country (1920—1944). The People's Museum was founded anew in 1945 in free Zadar, in 1952 its various departments became independent institutions, only to be integrated again in December 1, 1962 in a complex institution responsible for the wider area comprising the regions of Zadar, Biograd, Benkovac, and Obrovac.

The first issue of our journal is a collection of papers devoted to the materials found on the site where a merchant ship from the end of 16th century was lying on the sea-bottom. In all appearance the site at Gnalić is the most notable hydroarchaeologic site in Yugoslavia.

Each subsequent issue of »Vrulje« will be devoted to problems related to a single limited field of activity of our museum.

Here is a new offspring of the literary fount of Zadar.

Valentin URANIJA

THE SHIP AT GNALIĆ : OUR RICHEST HYDROARCHAEOLOGICAL SITE

The concurrence of events early in September 1967 lead to one of the most interesting archaeological discoveries in Yugoslavia made in recent years. While archaeological investigations are directed to the distant epochs so as to learn from the systematic study of material remains as much as is possible about human life, we were unexpectedly brought face to face with large quantities of articles which document in a most admirable way the material culture of a relatively recent epoch that was hitherto known chiefly from written sources and from pictorial representation.

The wreck of a ship which had carried a rich and varied cargo (No. 2) was discovered to the south-east of the islet (rock) of Gnalić (No. 1) in the Channel of Pašman. The ship lay at the depth of 26 to 29 metres. The Board for the Preservation of Cultural Monuments and The People's Museum, both of Zadar, and both responsible for the area in question, had jointly organized three investigation campaigns on the site: two in October 1967, and one in October 1968. Numerous objects have come to light and have on the one hand corroborated our earlier knowledge of the material culture in the Adriatic area during Late Renaissance period and have on the other raised a series of questions concerning the place and the methods of production and of the distribution of certain articles, thus adding to the stock of cultural and historical problems relating to 16th century.

Besides the scholarly and the cultural interests, the investigations at Gnalić was of great practical value to our

preservation service. This was the first occasion that all resources of underwater archaeology were put to extensive tests — both on the level of organization and actual investigation, and on the level of conservation of salvaged materials. Experience has shown conclusively that work in underwater archaeology is incomparably more difficult as it requires different equipment, one which is more complex and more expensive than in land archaeology, although the methods and aims of investigation are common. In addition, the medium of work requires special fitness and a training which is considered to be one of the most difficult and strenuous — all of which leads to a division of labour in which the person in charge of the investigation is in no position to direct and supervise it immediately. The problem can only be solved by training experts who are at the same time both archaeologists and divers, and supplying them with special outfit designed for the purpose. We had neither, which was immediately reflected in the results of the campaigns. To the possible critics who might justly remark that such important investigations should not have been undertaken in the first place without such a team, there can be one answer only: something had to be done, and it is our luck that it has been done. As it is often the case in underwater archaeology, the wreck had been discovered by amateur divers who started digging and distributing the articles. It is precisely because of this latter fact that we learned about the find and the site. Accepting the responsibility of performing the task by improvisation, the two institutions have perhaps neutralized the possibility of Gnalić becoming a model example of underwater archaeological investigation, as was the case with the Wasa, or off the coast of Asia Minor, or in Liguria, which our site deserves because of its importance, but at the same time it is true that only immediate action could rescue the precious and attractive ship's cargo. In spite of total lack of experience in this kind of work, numerous precious data were collected without which the articles that were salvaged would lose much of the importance they have at present.

Work on the ship was the first example of cooperation of conservation workers, museum workers, administrators of the territorial institutions responsible for the area, divers (No. 3) and ships of the Yugoslav Navy, divers organized in clubs, and individual divers. The conservation part of the work included other institutions, some of the on state level, many individuals, and also institutions from Sweden and Switzerland.

The programme of the operations was as follows: to document photographically the site prior to any other work, to rescue the objects scattered over sea-bottom (Nos. 4, 5), to ascertain the outline and construction of the ship and the nature of the cargo after removing the sand, to document both the ship and her cargo, to make plans for salvage operations, to salvage the objects, to document, pack, and transport them to storage, i. e. to the site of primary conservation, to decide on the methods of conservation, and finally to conserve the objects. Methods and equipment usual in underwater archaeology were applied, on the technical level accessible to us. Thus photographing and measurements of the site were made by means of numbered squares, with the use of a stand to provide for orthogonal pictures. Mud and sand were removed by means of the so-called mammoth pump driven by a gasoline compressor coupled to linen hoses such as are used by fire-extinguishing teams. The mud was not washed on deck but the objects that had been sucked by the pump were removed in a filter at the lower end of the hose. Smaller objects were raised in wicker or aluminium baskets which could be drained, etc. The execution of operations was subject to the program of work, although technical and weather conditions, and especially difficulties due to the lack of experience, have unfortunately caused some modifications.

Judging by the tipes and quantities of cargo, the ship was a merchant vessel and was capable of defence, which was normal during the period. The disaster occurred during one of her usual voyages, which were supposedly regular. Not unlike the finds of whole cities that had been buried suddenly and unexpectedly, such as Pompeii, the find of just this kind has a specific character in that it provides a section through the contents of an ordinary, everyday moment of history at a certain point. Owing to the cruel fact that the disaster — probably caused by storm — had occurred when the ship was sailing in our waters after having loaded at Venice, the largest port in the Mediterranean at the time, a variety of goods intended for everyday use and ranging from semi-finished to final products, prior to sale and delivery, the section of life thus obtained is exceedingly detailed and it provides a view of those spheres of life and economics of 16th century as lie hidden behind the face of history.

The salvaged objects, then, belonged in part to the *ship's equipment* (eight bronze guns and several balls, two anchors, some earthen pots, copper pots, and pewter pots, a large quantity of petrified objects which have preserved the shape of ropes, with knots and hooks, and the ship's ballast consisting of quartz stones and pebbles), and in part to the *cargo* intended for sale, probably in the Adriatic and east Mediterranean ports (brass chandeliers for walls and ceilings, glass vessels, necklace beads, round and square window panes, mirrors, brass wether-bells, pins, thimbles, razors, coils of brass wire of various gauge, brass sheets, cinnabar shaped like balls of about 70 kg each, carbonate of lead cast in the shape of small cones, thin bars of tin 70 cm long, bearing a Venetian stamp, a chest and a box containing razors, and an iron-bound chest (safe) containing eight woolen berets, three white shirts, a roll of damask, a precision balance, red and yellow oil colours).

The brass sheets, tin bars, cinnabar, carbonate of lead, and the roll of damask are, as far as we were able to ascertain up to date, absolutely u n i q u e. If their production was known, specimens were not extant untill this find.

Of special interest are *remains of original packing* of the goods and data concerning packing and stowage on board the ship. The bars of tin were packed in boxes 30 x 30 x 75 cm. The boxes were stowed with alternate layers crossing one another. The sides of the boxes were rough boards, some 2 cm thick, joined by square mortises and tenons in the corners, and then nailed. The cones of carbonate of lead were stowed in small barrels (No. 6), 70 cm high and 50 cm across, which are very similar to the barrels used nowadays for fish salting. The heads were branded. Two heads carry the initials S Z with a cross between the letters (No. 7), while the third head carries the initials G P and the profile of a man's head (No. 8). Rolls of brass sheet were also found in a barrel, 55 cm high and 40 cm across. Wall chandeliers were stowed in a large barrel, 1 m high and 70 cm across. They were taken apart and so stowed: first the handle, then the cup and the branch. Large ceiling chandeliers seem to have been packed in chests. Glass goblets were packed in wicker baskets, window panes were stowed side by side and lined with straw, red pigment was found in two chests, 80 x 110 cm, and the yellov pigment was packed in barrels similar to those containing carbonate of lead. The rolling and crumbling during the disaster, the attack of worms and settlement in the mud have ruined the packing to such an extent that the cargo could not be salvaged together with the packing, but separately. The greatest concentration of the cargo was in the bows and in the midship section, but part of it lay scattered beyond the perimeter of the wreck, as far as 30 metres, where a large quantity of glass goblets has been found. This can be explained if it is supposed that the objects fell over-

board while the ship was foundering, or that part of the cargo was jettisoned.

The remains of the ship itself are minimal, which is natural in such a warm sea as the Adriatic where worms can destroy wood in a much shorter period than that which has passed since the disaster. Parts of the keel, frames and outer planking have been preserved, mostly in places where the mud is deeper and more compact. The position of the bow could be ascertained from remains of bowsprit irons and the planking, and it is pointed west-north-west. The total site is some 40 m long and some 8 m wide, but precise dimensions of the ship cannot be established with certainty. She was probably 30 metres long, the bowsprit excluded. The poor state of the ship prevents any definite identification as to type. It is not known whether she was a galley or a *galijun* (galeazza) since they primarily differed in the respective superstructures. The number of guns is no definite proof either. One thing is certain: she was not a *marceliana*, the most common type of merchant vessels at the time, because the wreck is considerably larger. That the ship sailed to Gnalić after 1582 is quite certain because two of the guns bear that date. It is possible that the disaster occurred before the turn of the century or shortly after: this is suggested by the stylistic types of the goods which fall within the period indicated. There are some possibilities to learn the details about the shipwreck from the study of archive materials, and consequently about the provenance of the ship; for although it is quite possible that she sailed from Venice, it does not necessarily imply the she was in Venetian hands (the coats of arms on the guns are not Venetian, which in turn is no certain negative proof, but it only leaves the question open). As late as the middle of 17th century, shipwrecks can only be followed in notary documents relating to insurance of goods. After that date, the Venetian government requested of the local authorities to record any shipwreck in their respective areas, and of the crews to notify the authorities of the disaster. The search should be continued on these sources. However, the solution of this problem is of limited value, irrespective of our curiosity! The determination of the exact date of the disaster and of the identification of the owner can not modify to any essential degree our knowledge of the history of the period. *The priceless documentary value remains in the ship's cargo itself!*

Ksenija RADULIĆ

ANCHORS AND GUNS

Much of the ship's equipment has been salvaged from the sea-bottom; various iron hooks and rings, and rope parts, all heavily corroded and covered with a growth of shells, coral, and algae are still waiting their turn for conservation, though it is difficult to believe that anything of value will be found. However, the most remarkable of these objects, anchors and guns, are in good state and deserve full attention. This is especially true of the guns, which were cast of bronze and are decorated with various ornaments in relief.

Two iron anchors have been salvaged, both large in size. One is 4.85 m long and 2.65 across the arms, the other is 3.75 m long and 2 m across the arms. They are of simple construction consisting of a shank and slightly curved arms which end in wide, triangular flukes. A wide ring is attached to the shank (Nos. 9, 10). The stock, which used to be attached immediately below the ring, perpendicularly to the plane of the arms, has been lost. According to custom, it was made of wood and was very strong.

Eight bronze guns have been found on the ship. The four larger ones are of the usual type loaded at the muzzle and known variously as *sakro, kolubrina, falko, falkonet*, etc., depending on their calibre. The other guns are

smaller, of breech-loading type known as *pedriera*. Guns of the former type were supported on carriages on wheels and fired from the deck, the latter were set in the ship's side by a fork swivel, so that the gun could be swung horizontally and vertically.

The two largest guns are most representative. They are indentical in shape and size (No 11). The guns are 3.50 m long, 33 cm in diameter at the base ring, 16 cm at the chase, and 23 cm at the swell of muzzle, and have the bore of 9.1 cm. The guns are richly decorated with carefully executed reliefs of Renaissance characteristics. The swell of muzzle (No. 12) is shaped like the base of a classical column with torus and trochilus. The decoration is continued with three garlands linked with knobs. An acanthus leaf is suspended from each knob. A richly decorated escutcheon continues the decoration of the upper side of the gun. Is shows a crest above the field, and an eagle's head with a ribbon in its bill on either side. The initials Z. A., set off with rosettes, all in relief, are executed below the field, (No. 13). Five acanthus leaves in relief decorate the upper side immediately before the trunnions, and the Roman numerals MDLXXXII, set between two rosettes all in relief, are executed on the upper part of the reinforce immediately behind the trunnions, (No. 14). The richest decoration is around the touchhole, (No. 15). The hole is framed by two marked plant volutes and two smaller volutes laid immediately above them. Above the latter is an upturned column base carrying the stem of a basket. The stem is flanked by two plant volutes. The basket is very small, but full of flowers, with two leaves on long stems hanging over the sides. Acanthus leaves are executed to the left and right of the touchhole. Arabic numerals are engraved in the uppermost part of the base ring: one gun bears the figures 2360, the other 2380.

The search for other similar guns revealed that the guns which were cast in 16th century by the Albergettis of Venice show greatest resemblance in details. The gun dated MDXXXXIII and signed HIERONYMI ALBERGETI, which is on exhibit in the Maritime Museum (Museo storico navale) in Venice, is decorated with similar acanthus leaves, only smaller in size, and with similar garlands and knobs. Another gun in the same museum, dated MDLXVIII, which was cast by Sigismondo Albergetti, bears an almost identical escutcheon with the crest above and identical eagle's heads with ribbons in their bill at the sides. The leaves of acanthus and other decoration are markedly similar. The initials of the members belonging to this family of casters, I. A. (Iulius A.) or S. A. (Sigismundus A.) are set off with rosettes, in the same manner as the initials Z. A. on our guns. It can therefore be assumed with a fair degree of certainty that the initials Z. A. indicate an unknown member of that Venetian family of casters. It can be mentioned in passing that one Albergetti, Virginius by name, was in the employ of the republic of Ragusa as a caster from 1545 to 1569.

The other two muzzle-loading guns are not completely similar to each other as the two guns just described, yet they constitute a pair, (No. 16). Differences in size and ornament are negligible, and their basic shapes are the same. The barrels are octogonal: the edges run uninterrupted from the breech to the muzzle, without any reinforce in the part extending from the breech to the trunnions as is the case with the other two guns. Thus they are more slender in appearance which, along with the carefully shaped edges, neat profile, and inobtrusive ornaments, creates an impression of a certain classic elegance.

The shorter of the two guns, which is 2.58 m long, has the touchhole framed in a rectangular field, 7.5 cm long and 5.2 cm high. A bearded head with diadem (4 cm high), is arranged on either side, facing out, so that the beards and diadems outline the classical »tabula ansata« around

the field. Some 30 cm away from the touchhole is a coat-of-arms in relief, surmounted with a count's coronet (7 pearls). The escutcheon is divided into three fields. The chief contains seven fleurs-de-lis. The rest is divided vertically in two parts, with three crosses with trilobate arms in the dexter half, and two bends laid diagonally across in the sinister half. The coat-of-arms could not be identified, but the fleurs-de-lis indicate France since these symbols often appear on the arms of regions and cities of the kingdom of France.

The other gun is slightly longer (2.61 m). The touchhole is framed in a field of the same size as on the first gun of the pair. The sides of the frame end in decorative extensions. The initials G. P. (No. 17), are executed within the frame. An escutcheon of irregular, unquiet outline is executed at a similar distance from the touchhole as with the other member of the pair. (The initials G. P. found on a barrel and matching the initials on the gun, are certainly not accidental!)

Of the four *pedrieras,* two constitute a pair. They are exactly alike. The bronze barrels are 1.12 m long, with the swell of muzzle shaped like the base of a classical column, and with a similar molding, only less marked, at the rimbase. The breechblock, i. e. the part which received the so-called »maškul« (a receptacle for the charge and the ball) was made of iron. Of iron was also the fork which served to set the gun in the bulwarks. This part, heavily corroded and covered with sea growth, has been preserved on one gun only. It has been reconstructed on analogy with other guns (No. 21) keeping the size to scale. Both guns are decorated on the chase with an identical escutcheon, oval in shape (10.5 by 6.5 cm), framed with a winding line, but with empty field. The whole gun: barrel, breech, wooden breech handle, was some 2 metres long.

Ot the third gun, only the bronze barrel has been preserved. It is 1.07 m long, with the diameter varying from 18 to 13 cm, with the swell of muzzle of the usual shape, and with four characteristic projections at the sides: two cylinder-shaped trunnions which engaged the fork, and two prism - shaped guides which engaged the breechblock. The chase is decorated with a relief representing the mask of a bearded man's face in a Late Renaissance frame, executed with great skill (10.5 by 8 cm) and the initial C. below it, (No. 18).

Of the fourth gun, the barrel is preserved only; because the iron part, completely amorphous, broke off shortly after the gun had been salvaged from the sea-bottom. This was the smallest gun. The barrel is only 87 cm long, with the diameter of 7.5 and 10 cm, and with the bore of 4.5 cm. The chase is decorated with an oval escutcheon without the outer frame, 9 cm high, and divided horizontally in two parts, (No. 19). The upper part shows a twin-headed crowned eagle bearing a smaller coat-of-arms on its breast (a zig-zag line). The lover half is divided vertically into two parts. The dexter part shows a monogram composed of the letters P, N, and M, with a flower above. The sinister part shows a palm tree with a lily to its left, and a naked boy carrying a shield and an arm raised towards the crown of the tree. The coat-of-arms could not be identified. Number 87 is engraved in the reinforce receiving the breechblock.

It is of interest to note that all guns, except the smallest *pedriera,* are of the same calibre, i. e. 9.1 cm. Several stone balls and remnants of an iron ball of the same calibre have been found.

The calibrating gauge, the so-called *scala librarum* should be mentioned in this connection, (No. 20). The gauge had been discovered prior to the systematic explorations. It is 25 cm long, made of brass. Such gauges used to be engraved on daggers.

Ivo PETRICIOLI

DAMASK

As stated elsewhere, *damask* has been found in an iron-bound chest, (No 22). The chest is of the type that was used as a safe until recent times. Iron plating inside and out, iron strips nailed down strongly with long nails having broad heads, and a complex system of locking, all ensured safety of articles kept inside. Many Yugoslav museums, maritime museums particularly, exhibit such safes. The chest is 97 cm long, 59 cm wide, and 65 cm high; the lid is 105 cm long and 64 cm wide.

The piece of damask lay together with other objects in a mud-impregnated bundle od straw. The mud was so fine and thick, that it was impossible to identify the object at first. The mass was hard, some 60 cm long and some 25 cm wide. After initial washing in running water, two kinds of textile became apparent in some places, a roughly woven piece and a piece with silky lustre; but on the whole, the surface was covered with hard incrustations of blackish-brown colour. The incrustations were all over the surface of the object, and attempts at removal left holes behind. It was only after continuous washing that the nature of the object had been discovered. It was a roll of damask, in its original packing, 54 metres long, in 60 folds of 80 cm, secured with stamped seals, and wrapped in rough cloth. The wrap was almost entirely damaged with rust (the chest was full of rust because the iron bindings had oxidized) so that it was only here and there that the texture of the material could be discerned: it was similar to the texture of the present-day hard linen. The rust had affected some ten folds of silk and had it cemented to the protective wrap destroying the material entirely or making it impossible to detach from the rest. Having partly unfolded the roll, the first gleams of violet gloss appeared out of the general black, from which fact it was deduced that the material had been originally purple. After final washing, black mud stains disappeared, but the material remained brown on account of the rust, and only in places, unfortunately, it is violet.

Our piece of damask belongs to the group of true damasks, i. e. both the warp and the weft are of silk of the same colour. The decorative effect is achieved by contrasting glossy and plain areas: the glossy areas are the decoration, the plain areas serve as the background. The gloss is achieved by a special method of interlacing the weft threads on one side of material in that the glossy parts are slightly raised in relation to the plain parts. Parts which are glossy on one side are plain on the reverse side, and vice-versa. The liveliness of the material depends on the striking angle of light, and it varies from a subdued effect to such strong contrast between the decoration and the background that they appear to be made of threads of different tints.

The decorative pattern on our piece of damask (Nos. 23, 25) evolves for 150 cm to be repeated without interruption, and is of Late Renaissance type. It consists of such elements as follow: *cantharus*, with a *balustrade* and *volutes* (the former functioning as the mouth of the vessel, the latter as the handles), the *pomegranate* and its leaves, *stars*, and the *palmette*. The group containing the *pomegranate* and the *palmette* is framed by two intertwining bands unequal in width, the wider of which is ornamented with a *chessboard* design, which design also covers part of the *cantharus!* The ornaments are arranged in groups which follow one another. The central part only is covered by whole ornaments: the first and the last quarters of the width of the piece are covered with respective halves of the ornament, leaving the other half out. In the horizontal direction, the ornaments are arranged alternately, so the cantharus in the central field is flanked by palmettes, etc. The ornaments fill the material very densely so that small areas only are left bare, but they do not form a separate ornament.

The five lead seals (No. 24) with which the roll was secured bear marks of four different stamps. Two seals show an escutcheon which is divided horizontally: the upper part represents the sun with very well marked rays, the lower half represents a tree. The initial N appears to the left, and F (?) to the right. The third seal has a cross with four equal arms pointed at the ends, with three balls besides each end and one ball in each corner. The fourth seal is preserved poorly and the seal cannot be read with certainty. The escutcheon is divided into squares in imitation of the structure of a wall. Within the field is a circle divided into smaller squares by three vertical and three horizontal lines. The fifth seal represents a crown with four fleurs-de-lis, and an open flower with five petals below the crown. The initial F (?) is to the right of the crown.

To the best of our knowledge, this roll of damask is the only specimen of old textile preserved, which documents the state of the material after it left the workshop to be brought to the market.

Which workshop and which market?

In the central Mediterranean in 16th century, silk in general and damask in particular was manufactured in a number of cities on the Apennine peninsula: in Florence, Lucca, Pisa, Bologna, Milano, Verona, Venice. While Florence and Lucca were the chief centres of production in 15th century, new workshop were opened during 16th century in many other towns as well, particularly after the looting of Lucca by Pisa, which forced the Luccan weawers to move to other places where they continued their trade. The manufacture of silk in Venice is attested from 14th to 18th centuries continuously, although the documents from various archives seem to indicate several periods of sharp crises, particularly in 16th century, due to severe competition with other centres, which the Venetian government attempted to neutralize by imposing protective measures. To distinguish the provenance of this piece from among these centres as well as from other centres of production (in Spain and in France) is very difficult, in fact almost impossible. The conformation to the prevailing Renaissance taste had certainly influenced the technique and the ornaments, which was only amplified by the migration of weavers. Attribution of a piece to a particular city on the basis of stylistic similarities alone — and almost all attributions have been made on this basis — can be made, but only as a possibility. It is therefore the decoding of the seals found with the piece that would mean the first step toward the localization of at least that kind of damask which has the same type of ornament or a one not differing from it greatly, such as are two pieces in the Guggenheim collection in Museo Correr in Venice for which no data as to the time and place of acquisition are available. The decoding would also show, in a particular instance, which authorities stamp a particular product — whether the workshop and the city autorities alone or the management of the market as well.

The absence of the Venetian seal removes at the outset the possibility of its being manufactured there, especially if it is known from the archives that the Venetian government, as early as 1507, expreslly decreed that »all textiles exported by sea should be stamped with the seal of St. Mark subject to the payment of the tax of four soldi per roll«, otherwise it could be treated as foreign goods and probably taxed differently. In addition, the official statement from 1594 that foreign silks from various places were brought to Venice and wholesale dealings were on the increase without any payment of taxes, that Venetian merchant ships carry as much as 50 thousand ells of silk, but almost nothing of this vast quantity bought from Venetian manufacturers since neither merchants nor buyers trusted them, only corroborates such a conclusion. Therefore, the ship that was lost at

Gnalić could have been owned by Venice, and yet carry foreign goods without proper payment of taxes.

Seals similar to those found on our piece occur in Lucca. They belong to various families that could have manufactured silk as well. The Cerùs used to have the seal with the sun in the upper half and the tree in the lower, and in 1614 one Ferrante is mentioned as a member. The initial F could refer to him, but the fact that the family name begins in a C, whereas the seal has an N, casts some doubt upon this connection. The cross with the balls is the coat of arms of Pisa, but at present it cannot be deduced with certainty that our piece had been manufacture in that town. Since it had a port, Pisa was probably an intermediary. We shall limit ourselves to the statement of a belief that it had not been manufactured in Venice, but probably in Lucca.

It can be onlv conjectured for whom and to what place this expensive material was intended. Purple silk was rather more expensive than silk of other colours — in the times of the Diocletian even ten times more expensive than white silk.

Ksenija RADULIĆ

BERETS AND SHIRTS

By the side of the roll of silk damask, the iron-bound chest contained several other articles of clothing. They, too, were intended for trade; and as they were kept in the same chest, they are most likely of the same provenance.

These are eight black wool berets and three white linen shirts.

Two berets only are in good state (No. 26), the rest are in the state of decay. All were of one size: the upper part is 30 cm in diameter, the opening is 17.5 cm in diameter. The berets were knitted of black wool, but it seems that they had been stamped in a mill so that later the eyes did not show. They were made with a straight base and 3.5 cm wide brim around the whole opening. Such berets are known from contemporary paintings and portraits: they appear on the pictures by Caravaggio, on portraits executed by Holbein, and many Flemish paintings. They used to be worn by men of all classes, and were ofted decorated with a medallion or a feather.

The shirts, made of white linen, were also for men's wear. All the three are in bad state: in one case the whole upper part and the sleeves are missing. They had been carefully packed in smill bundles, 21 cm by 25 cm in size. It is of interest to note that the collars are made of a different type of cloth, which is of higher quality: on the body we counted 20 threads per square centimetre, and 30 threads on the collar. This is probably due to contemporary fashion, when the collar showed out only.

The shirts are very long and comfortable, 114 cm, (No. 27). The front and the back are cut of a single piece of width (from 66 cm to 69 cm, which is difficult to ascertain with precision because of the damage). In the lower part the shirt has two slits at the sides, 38 cm long. Around the neck opening (No. 28) the shirt is plaited in small folds to ensure proper shoulder width. The folds are decorated with oblique stitches. The breast cut is not very deep: 20 cm on one shirt, and slightly deeper on the other. The edge is trimmed with zig-zags. The shirt was fastened around the neck by a thin plaited cord. The sleeves are 65 cm long, narrowing toward the wrists. The edge of the sleeve is cut roudly and is also trimmed with zig-zags. At the armpit the sleeve is widened by the insertion of two small triangles. The collar is cut straight, and is somewhat larger than the neck opening so that the ends are loose and can fold down. The edge is trimmed with hemstitch and lace. The collar is 9.5 cm high.

Both shirts (the third is in such bad state that nothing can be said about it) are of the same cut, but differing in size slightly. They are nearly of the same length, but the other is slightly wider than the one just described. The wider shirt has a slightly wider collar (10.5 cm) trimmed with a simpler lace.

The shirts have been thoroughly rinsed of salt so the process of decay has been arrested. After cleaning the layers of rust and the reconstruction of parts that have been damaged their appearance will be completely different.

Sofija PETRICIOLI

GLASSWARE

The ship transported large quantities of glassware. The greater part were articles de luxe, such as goblets, bottles, bowls, and reliquaries, and the rest, while still in considerable numbers, were simple objects: round window panes, square plates of raw glass, and small round mirrors.

Unfortunately, only a few objects were not damaged. Although the glass is of the best quality, it could not survive the rough treatment it had had on the sea-bottom for centuries.

There can be no doubt that the glass is of Venetian provenance. During 16th and 17th cent. world production of glassware was dominated by the Venetian factories at Murano. The quality and beauty of Murano glass were so extraordinary that all European factories at the time were under strong influence of Murano and attempted to follow its products as closely as possible and were in fact its imitators, which becomes clearer when it is remembered that new factories had been founded by Murano glassmakers.

The principal qualities of Murano glassware were exceptional thinnes and transparency — the two qualities not possessed by glassware manufactured in classical antiquity or in the Middle Ages.

The articles of Murano glass represented in our find date from the period of greatest beauty, when their shapes were simple and elegant without the superfluous additions which appear in the baroque age. Besides the beauty and richness of form, there are also several techniques of decoration that are typical of Murano glass, i. e. insertion of white glass filaments and engraving by diamond point.

We shall start our description with articles which were the most numerous. These are two types of goblets, both of very simple form. The stems are practically identical in both types: from a thickened foot it tapers and rises to the cup. The cups are dissimilar: one is shaped like a bell (No. 29), the other is larger and wider, in the shape of a bowl, (No. 30). Unfortunately, out of a large number of goblets (there are 406 smaller goblets and 218 larger ones) not a single specimen has been found undamaged.

Next in number (75 specimens) are somewhat more luxurious goblets hawing a cast foot decorated with two lion's heads, (No. 31). The cup is round but not exactly bowl-shaped.

Of some other types, only three or four specimens have been found. One type has a cast foot decorated with vertical rows of minute beads; the other, smaller type, has the cup shaped like a pine cone.

Of bottles, we first note the tall specimens with very long, narrow necks (No. 33) decorated with white filaments. To be sure, only long necks, decorated in one or two places with wavy glass bands, and bottoms which entered the body with their conical parts, have been preserved. The thin belly could not stand various pressures and blows to which it was subjected. But it is easy to reconstruct the shape on the basis of the contemporary paintings, e. g. The Last Supper by Ghirlandajo in the refectory of the monastery next to the church of Ognissanti in Florence, (No. 32).

Next come numerous fragments of bottles that had better be classified as vases. The reconstruction of their shapes was facilitated on the basis of comparison with a green vase of the same type: the vase is part of a private collection in Vienna. These were very decorative vessels with a low foot with a node and three beautiful handles. The upper part of the handle was arched and bound to the turned neck, the lower part was in the form of a shell and bound to the body. The vessel itself was slightly oval in shape; in the upper part it was decorated with a thin edge. Some vessels have the edge of the neck and the body decorated with small appliques in the shape of rosettes. Some simple necks, about ten in number, without any decoration but slightly widening at the mouth, have also been found. It is difficult to reconstruct the shapes of the bottles for want of any comparative materials.

There are also two types of small bottles which have been preserved whole or slightly damaged. One type has a foot and a specially formed neck (No. 34) of uncertain length (there are 26 specimens). The other type has a low foot and a low belly tapering to a very narrow neck ending in a small flat rim.

Many fragments were salvaged of some interesting vessels which seem to have been modelled in imitation of silver or pewter tankards, (No. 36). They have also been found without bellies, but judging from the parts of the body preserved together with some necks and feet, they seem to have been spherical. The necks of these tankards are cylindrical with a moderately curved handle. The tankards could be covered with a lid having a globule on top, (No. 35). A narrow grooved band is impressed in the area between the neck and the belly. Besides this decoration, the whole tankard was decorated with white glass filaments laid vertically.

The most beautiful among all glass articles found on the ship is a separate group decorated with engravings. Engraving by diamond point is also a specialty of Murano, which had later spread to many European workshops. While still soft, the article was decorated with a delicate design all over its surface. Stylized plant motifs were used most frequently, but animal forms also appear though not on our articles. All drawings are very neat. Although they were made fast and as routine, great attention was paid to shading so that the lines are drawn parallelly, almost never crossing the outline (which is almost regular otherwise).

In the first place we mention a tureen (No. 37), the most beautiful article of the whole find. To our surprise, it is complete, although equally thin as all the articles described hitherto. It is 7 cm high and 15.5 cm across. It is perfectly simple of shape: a half-sphere with a small, thin foot. The whole surface is covered with engravings which are arranged in three horizontal bands, with the central band dominating the rest. It is decorated with a continuous tendril which is highly stylized. The beauty of the vessel stems from its perfect simplicity: the drawing is soft and inconspicuous and no detail obtrudes or disturbs the pure outline of the vessel. Unfortunately, a thin dull scale has partly covered the surface. This sign of the deterioration of glass has affected more than a half of all articles which were decorated with engravings.

Some of the shapes described earlier reappear among the engraved articles, such as tankards with lids (two necks and one lid), decorative vases with three handles (one neck and five feet), and goblets with lion's heads on the foot (two specimens only). But then some shapes are new, such as the above-mentioned tureen. Another new shape are elegant small bottles (No. 39) having the foot decorated with a node. Only one complete specimen has been found, and five other specimens were found in fragments. The bottle has a long narrow neck decorated with a twisted garland.

The body is oblong and is richly decorated by engravings arranged in three horizontal bands. The upper and the lower bands carry the motif found on the tureen, but the central band is different. It is divided into squares, every other of which is decorated with a drawing. All bottles had identical arrangements, but differed in the motif in the squares.

The third specific shape is a shallow round tray with low, flat sides. Its bottom is relatively thick in comparison with other articles, but the sides are thin. The whole surface is decorated. The bottom is covered with three Renaissance garlands arranged concentrically among three marked ribs. The sides are decorated with a soft ornament which has already been mentioned as the final ornament on the tureen and the small bottles. Almost the whole bottom of another such tray has also been found. It also has three ribs, but the decoration is different. Instead of garlands, we find again squares, every other of which is decorated with drawings. The spaces between the ribs determine the sizes of the squares: the largest squares are in the central band, gradually diminishing towards the outher rim.

Articles of blue-tinted glass constitute a group of their own. Only two types have been found: small half-spherical cups and small bottles with long, narrow necks. Three cups were found, all of them of similar size: 7 to 8 cm across, low sides and small foot. One specimen is complete, another is inlaid with minute fragments of red and white glass. The bottles had long, narrow necks widening at the mouth, (No. 38). About twenty necks have been found, but only one of them continues into the body which, unfortunately, is not sufficient to reconstruct the shape with precision. Nevertheless it can be deduced that the bottle was not spherical but flattened.

Large quantities of round window panes have been salvaged (648 specimens, of which 205 are whole). The panes were quite simple with turned sides (20.5, 18.5, and 17 cm across respectively).

Plate glass, of which 50 specimens were found, is roughly rectangular in shape. Plate glass was cast on a flat surface.

A number of small round mirrors has also been salvaged. Unfortunately, the mercury has been washed away, and the mirrors are cloudy or almost clean. They were made by applying a thin film of mercury between two round pieces cut rather rougly and then cemented together with a gypsum-like substance.

This brief outline is only informative of the shapes and the methods of decoration of articles found on the ship, without attempting to evaluate or date the articles. However, it can be stated that the articles of glass exhibit high professional skill. The beautiful simplicity of their shapes indicate the period when Murano glassware was at its highest.

The articles can be dated to the closing years of 16th cent. by comparison with other objects found on the ship on the one hand, and on the other by comparison with exhibits in the Glass Museum of Murano.

Sofija PETRICIOLI

EARTHENWARE

In contrast with the other articles which the ship transported in very large quantities, some thirty specimens of earthenware have been found only. Roughly one half of them are articles de luxe, and the rest are ordinary pots of various shapes intended for household use.

It is known that Venice was one of the major centres of pottery production in Italy from 15th to 18th century, and it is very likely that these objects were manufactured in Venetian workshops and then loaded on board the ship there.

Engraved pottery with engobe as well as painted pottery was produced in like quantities, and both types are represented in the find.

Prior to describing the articles it is necessary to state that they are damaged to a considerable degree. The dark silt in which they lay had penetrated below the glaze so that the colours have darkened; in addition, the glaze itself is corroded and the surface is no longer smooth or transparent enough for the colours, originally very vivid with some specimens, to show out fully.

The engraved specimens were made of red clay, with a white engobe, then engraved, and finally glazed. Several such specimens have been found, such as three small bowls, decorated with engravings on either side. All the three have an identical ornament consisting of a stylized tendril with leaves, and differing only in the decoration on the bottoms. One bowl has a small rabbit crouching in the grass, the other has a tree with three boughs, the third has a geometrical ornament executed in the shape of a twisted narrow band.

Somewhat different is a large flat dish (No. 43) light green in colour, decorated with a geometric or geometrized plant ornaments. The decoration is excuted in the technique known as »a fondo abassato«, which means that the drawing appears on the white engobe only, while completely removed from the base. This creates the effect of a low relief, whereas the green slip appears in two tones: lighter on the engobe and darker on the cleared base.

The second group comprises bowls, cups, and saucers decorated with drawings painted in blue over a bluish-grey base. The drawings are executed with great skill and show fine taste: it can be generally noted that the articles had been made in a wokshop of high quality. Two ornaments are prevalent, thus dividing the articles into two sets: one set is decorated with entwined oak leaves over the whole surface (No 40), and the other with a somewhat stylized landscape (No. 41) with a round tower in the left half, (No. 40), the ornaments are so alike that the articles appear to be parts of two sets.

The third group comprises three bowls only, unfortunately all the three damaged considerably. They are decorated with similar ornaments: fruits, flowers, and small leaves on a grey base. Large yellow lemons are most conspicuous (No. 42), arranged symmetrically yet freely among green leaves and orange-coloured berries. On the largest bowl, among the lemons are also some greenish-yellow cucumbers; and on the two somewhat smaller bowls are large flowers with white and blue petals. It is a pity indeed that these beautiful articles are damaged to such a degree because their charm lies in the free arrangement of gay and vivid colours which had been generally carried away by the action of sea-water.

Pottery intended for household use is varied: very small pots with one handle, pots with two handles and lid, and very large pots for the storage and transportation of liquids. These are very like the amphorae, i. e. with narrow necks and two handles arranged symmetrically.

Sofija PETRICIOLI

BRASS CHANDELIERS

Brass chandeliers are in the group of articles that the ship transported in larger numbers. Because of their provenance, they stand apart from the majority of other articles of which we know for certain that they come from Italy. In distinction from these, the chandeliers had been made in the north of Europe, most probably in Lübeck.

The region of Central Europe between the Maas and the Rhine had been known as early as the Roman era for zinc and copper mines. In the early Mid-

dle Ages the region saw the rise of crafts in which brass - an alloy of copper and zinc - served as the raw material. The manufacture of brass chandeliers appeared as one among the numerous other crafts. It is interesting to note that chandeliers were at the outset only a by-product in the manufacture of bells, guns, bronze sculpture, etc. Chandeliers were manufactured as early as 14th century, but the craft flourished towards the end of 15th century and reached its peak in 16th and 17th centuries.

The branched type was known in the Gothic era, but it was encumbered with varied decorative elements. The branches were adorned with oak leaves or vine tendrils, the axis was often made in the shape of a small chapel with an effigy inside.

The Early Renaissance type, to which our specimens belong, is free of all superfluous additions: the shapes of the branches gradually became slender and very functional, while the decoration in the form of a twin-headed eagle gradually retreated to the top of the axis. Besides the functional elegance, another element was very important for their expansion beyond the confines of Germany — the possibility to take them apart which was of prime importance when the articles were to be transported. The Hanseatic merchants soon saw their opportunity, so they included the chandeliers in the list of trading articles. Because of their activities, the chandeliers had soon spread not only all over North Europe but, as can be seen from the present instance, also far south.

Cities which were most notable for the manufacture of chandeliers are Aachen, Nürnberg, and Lübeck — all the three of them also noted for workshops manufacturing other metal articles: brass sheets were made in Aachen and Nürnberg, the latter was also the home of a well-known family of bronze casters, the Vischers, who manufactured small bronze sculpture and brass trays, and Lübeck was known for its bell and gun foundry. Since two of the purest specimens of Early Renaissance chandeliers are in Lübeck, the type became known as »Lübecker Krone« — The Crown of Lübeck.

To facilitate the dating of our specimens, it is necessary to outline the development of the constituent parts of the chandeliers. Since the ceiling type is more complex than the wall type, we describe here the constituent parts of the former.

As it has been stated above, the branches gradually got rid of unnecessary decoration. The only decorative element which remained is placed at the lower bend of the branch, and is mostly in the shape of a daisy. The branch has an S curve; its outer end rises verically carrying a simple saucer and a cup to receive the candle. In the course of time, the vertical end gradually descended and in 17th century the candle finally came at a point below the level of forking. The axis also shows traces of development. Balusters on the axis appeared as early as the latter part of 15th century; but it was not untill the Renaissance, in the latter half of 16th century, that the shape was perfected, turning the piece on a lathe driven by water-power. Among other globular elements, a sizable sphere was gradually set apart. It had no fixed position with earlier specimens; so it appeared around the middle of the axis or at the lower end, sometimes not separated rigidly from the other elements. In the Lübeck cathedral, the sphere on the chandelier is somewhat flattened and had descended below the forking point of the lower set of branches, where it was to remain in all later specimens. On the chandeliers made in 17th century which are known as »Flämischer Krone« — The Flemish Crown — the sphere is perfect, much larger than the other decorative elements on the axis, and is set apart from the rest of the axis by a narrow neck. A lion's head, which had adorned the lower half of the sphere since the Gothic era, had disappeared and was repla-

ced, close to the end of 16th century, with a decoration shaped like an acorn or like a button which was turned on the lathe.

Among the chandelier parts discovered on the ship, of which there are more than 300, three axes were found: two larger ones and one smaller. All the three axes are practically identical in section, with the sphere set below the forking point of the branches. The spheres are slightly flattened, like the one in the Lübeck cathedral. The lower part of the sphere is decorated with a lion's head holding in its mouth a hand decorated with two fishes. Only one lion's head has been found, but eight hands with fishes; which implies the same number of axes and lion's heads, only we have not been fortunate enough to find them. The upper end of the axis terminates in a twin-headed eagle with outstretched wings, (No. 47). Three eagles have been found and one smaller wing which suggests that the chandeliers with smaller axis had a smaller eagle.

All the three chandeliers from the ship had branches arranged in two sets of six. Upper branches are always shorter. One chandelier (No. 45) is further decorated with elements in the shape of the letter S, arranged in two sets of three. Six such S-like elements have been found, but they did not belong to one and the same chandelier because of different decoration: some are decorated with small horizontal lines, the others with semicircular incisions resembling fish scales.

Ten types of branches have been found. They mostly differ in size, but are otherwise alike, with a daisy at the bend. There are a few very small branches without the daisy, but only with a small bend.

The branches differ from the wall--type chandeliers in an essential construction detail, besides different decoration. They are coupled to the axis by a trapeze-like projection on the inner end of the branch which is inserted into a corresponding notch. The notches and the corresponding projections are numbered. On the whole, all parts are numbered: branches, eagle wings, S-like elements, candle cups. This is a common feature with all chandeliers which could be taken apart, and so it is not a special characteristic of our specimens.

Wall chandeliers differ from these in the manner of coupling the arm. Instead of the axis, the arm is set into a semi-spherical part not unlike a plate which carries in its centre a small closed fist with a notch in the middle which receives the wedge-like end of the arm.

Since wall arms were used individually, there was no necessity to manufacture them in large series; thus we find great variety. It is difficult to find several identical arms: 62 specimens that have been found can be classified into 17 types. Yet this great variety cannot be noted at first sight as there are only three basic groups of types which differ in some details.

The largest arms (No. 44) are decorated in the middle with a ring which seems to tie together a bunch of leaves to the left and right of it. Engraved into the surface of the arm are additional large and small leaves running in the direction of the bend in the arm and its end. The bend is simple and it ends in a decoration like a fish tail.

The second type partly similar to the first type. It is without the decorative ring and the bunch of leaves, but only with a bulge identical with the one on the branches of the chandelier. Left and right of it are engraved leaves in many variants. A trefoil is located at the bend.

All the arms belonging to the third type (No. 46) are identical in size and details, but they differ completely from the first two types. Instead of the plant ornament in the bend, they carry a stylized dolphin head in profile. Around the middle of the arm are two volutes so arranged as to create the impression that the arm is

made of two twisted parts. The end of the arm, where the candle cup was screwed on, was not decorated with any type except here where it is decorated with a volute. A wavy line was engraved below this volute, reaching as far as the first volute in the centre of the arm.

The cups also appear in about ten varieties, but only the most typical will be mentioned. The most frequent ones are of the type known in literature as »urn-shaped cup«. Some are larger, others are smaller, narrower, or wider, but they are essentially alike. The other type is cylindrical, with four holes. This type had appeared before the former one, but here they are contemporary. The third type of cup is also like an urn, but of a more elaborate form.

Finally, we ought to mention three arms which differ totally from all objects described hitherto. Since the site has not been studied exhaustively, it is not possible to state if other such specimens exist, or whether they are part of a ceiling chandelier or are individual wall arms. While all previous articles are of the yellow colour of brass, these are of bronze colour; they are probably made of brass with a higher percentage of copper. They have the shape of the branches found with the advanced chandeliers of the Flemish Crown type, where the candle is below the level of the forking point. The arrangement for coupling at the inner end also differs from the types described above.

It is difficult to state the port of embarkation until the port of registry of the ship is known. Two possibilities offer themselves: the chandeliers could have reached Venice by land and then taken on board, or they had been shipped in a northern port, Antwerp or Lübeck, and forwarded by sea to eastern Mediterranean. Venice had always been a link between Europe and the Orient; so goods from all parts of the world were brought there and further shipped east and west. German merchants had their seat in the so-called Fondaco dei Tedeschi where Venice permitted them to make business transactions with their partners from the East. The Hanseatic League had developed their commercial network mostly in the north, and did business with all Baltic states, England, and Russia, and it is not improbable that their ships were sent sometimes to the southern ports.

Thus the question of the route by which our brass chandeliers reached the Adriatic remains unsolved for the present, but the question of their provenance is elucidated almost completely.

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BALANCE AND WEIGHTS

Besides the articles of textile, the iron-bound chest contained a wooden box of moderate size. It fell apart upon discovery: the top and bottom panels fell off, and the contents scattered. The box contained a small precision balance and two sets of weights.

This paper is not concerned with weight values, their marks, or their provenance. It is only an ordinary description, and the expert evaluation will be left to dr. Z. Henkov, of Zagreb, who has undertaken to study the problem.

The box (No. 48) was given its original shape, after conservation, because the material of which it is made (teak wood) has been preserved admirably.

Beside a simple profile running along the edges of the bottom panel and the lid, the latter is decorated with small inlaid sqares of different wood, we believe it is bamboo. The interior is divided into four unequal parts with one longitudinal and two transverse partitions. The central partition is largest, and it served to receive the pans, one fitting into the other. The lever and the pointer were kept in the narrow longitudinal parti-

tion, and the two smaller partitions at the sides served for the weights. The arrangement can be seen in No. 70, showing the balance at the moment of discovery when the box was taken out of the chest. A small prop was attached to the right-hand side of the lid, and when turned on its pivot it served to hold up the lid when open. The box was secured with a small iron hook.

The inner side of the lid was lined with a piece of rough cloth on which traces of cotton were found. As is the case today, the cotton served to prevent damage to the delicate instrument from shocks.

The balance (No. 49) consists of two semi-spherical brass pans which were suspended from the ends of the horizontal lever by three cords. The lever was made of iron (it is reconstructed now) and has brass hooks in the shape of the figure-of-eight at the ends to attach the cords, and another fine brass hook in the middle, so that the balance could be suspended when desired. On the lower side it has an iron pointer and a thin iron frame serving to indicate the state of balance when weighing.

Two kinds of weights have been found. One group constitutes a set; the other consists of individual weights of the same shape. As they were made of brass, they have been preserved admirably.

The set (No. 50) consists of nine pieces shaped like small hollow cups which fit into one another. The largest weight is of the same shape, only it has a lid which can be secured, and a small handle for carrying. The lid is stamped with the mark of a crown.

The other group (No. 51) consists of six weights; two are larger, and four are smaller. They are shaped like prisms with slanting edges. They are marked 100, 50, V, 2, and 1 respectively, and each is stamped with the Venetian seal.

Sofija PETRICIOLI

THE RAW MATERIALS

The assortment of the raw materials found on the sea-bottom and on the deck of the sunken ship, as well as the period of sinking, can suggest several possibilities as to the intended destination of the cargo, separately by kind. Namely, the middle of 16th century marks the beginning of a new era in technology. Raw materials were put to new uses, new methods of processing were applied side by side with the traditional methods from classical antiquity and the Middle Ages. The invention of printing facilitated propagation of new knowledge which thus ceased to be the private property of guilds or individuals, so that new inventions were made use of in places which were remote from the principal manufacturing centres of the Middle Ages.

There can be no doubt that the ship had sailed from Venice for one or more of the rich manufacturing centres, where ready sales could be made of the large quantities of valuable materials that she carried on board, as well as of the expensive final products which had been manufactured in Venice and elsewhere (mirrors, chandeliers) and which were in great demand at the period.

The following materials have so far been found on the site:

Brass. Rolled brass sheet (No. 52), from .8 to 1 mm thick, has been found in 11 flattened rolls. Each roll consists of a strip some 16 m long and 170 mm wide, of the following chemical composition: 72.6% Cu, 23.6% Zn, 3,8% Pb. Next were found more than 70 rolls of brass sheet (No 54 from .3 to .4 mm thick, each consisting of a strip some 14 m long and 100 mm wide, of the following composition: 70.5% Cu, 24.1% Zn, 5,2% Zn, 2% Sn. A sample of each type was analyzed, and variations can be expected from sample to sample, depending on the stock from which the sheet had been made. High percentage of lead is characteristic.

Fifty coils of brass wire, varying in gauge but not exceeding 1.2 mm, have also been found. The coils vary in size. A notable feature of the alloy is a high proportion of lead, up to 6 per cent.

In spite of the expected damage due to the action of sea-water, the surface finishes of the sheets and of the wire (No. 55) show a high quality of work in the process of drawing, and metallographic polishing revealed full mastery over heat treatment. The proportion of lead, though inadmissibly high for present-day purposes, was bound to create difficulties in drawing; yet it must be admitted that the old masters possessed great skill in view of the processing methods available to them. The high proportion of lead could be ascribed to imperfect metallurgic treatment of zinc. The rolls of brass bear a mark (No. 53) which could, if supplemented with the analysis of the alloy, help to ascertain its provenance.

The manufacture of drawn brass sheets was well-developed in Central Europe at the period, especially so in Saxony, although the »Messing-Hütte« in Reichraming, in Upper Austria, was already in existence at the time, i. e. around 1600.

Brass sheet was produced in three commercial forms:

— Tafelmessing, thick brass plates;
— Bugmessing, flattened rolls of brass sheet of medium thickness;
— Rollmessing, rolls of thin brass sheet.

The material found at the site belongs to the last two types.

Tin plate. A piece of metal sheet of silvery colour has been found sticking out of the sand. It was partly corroded but otherwise in good state after three and a half centuries. It could not be extracted from the sand beca use it was deeply buried and probably weighted by some heavy objects. So a piece was cut, which revealed tin plate, from .5 to .6 mm thick, of nice pearlite-ferric structure, covered with a tin film about .1 mm thick on either side. It is partly amalgamated because of mercury which was found scattered on the site. Mercury has damaged some brass sheets as well.

Although the process had been known to Pliny, the manufacture of tin plate started in Bohemia in 13th century, and by 1620 it had developed in Saxony as well. Tin plate was highly valued, just as it is nowadays, because of its exceptionally high resistance to corrosion. The quantity carried on board will remain unknown until further investigation is made.

Mercury. Although a large quantity has been found on the mirrors, some of it must have constituted a separate item of the cargo. The amalgam of tin was in fact used as the reflecting surface in the manufacture of mirrors. Production began in 13th century, and from 1507 onwards it is the privilege of Murano glassmakers in Venice, but a corporation of mirror manufacturers was established in 1563. Mirrors were made as follows: mercury was poured on a thin sheet of tin which was laid on a flat surface, covered with a sheet of paper and a glass plate. Pressing the glass plate down and extracting the sheet of paper, mercury came in contact with the glass plate and formed the metallic surface that reflected light. The surplus of the mercury which had been pressed out could be used again, and what remained on the plate formed the tin amalgam of the reflecting surface. It is natural that the tin in the amalgam was subject to corrosion due to hydrogen sulphide contained in the sea-water on the site. But the amalgam itself cannot explain large quantities of mercury scattered on the sea-bottom. Difficult as it is, over 2 kg of mercury have been gathered; part of it is still shining in the sand, and certainly a great part of it has sunk into the sand. The sample contains 2% of tin only. Therefore, mercury constituted a separate item of the cargo.

Beside the manufacture of mirrors, mercury served as a pharmaceutic basis for the »unguentun mercuriale«, a very valuable medication in the treatment of skin diseases, and for a long

time the only remedy for syphilis. It was also used for the extraction of gold by amalgamation of minute quantities of the metal found in ores or sands that contained gold.

Mercury probably originated from Idrija, where a mine was started in 1497, which coincides almost exactly with the sudden flourishing of mirror manufacture in Venice. It is hard to conceive that it was imported from Bohemia, where mining started in early 16th century, or from the ancient mines at Almaden.

Tin. Quantities in excess of 1,000 kg have been found, in bars 70 cm long (No. 56), almost pure: 99% Sn, .04% Pb, other ingredients just in traces. The bars bear stamps representing the lion of St. Mark (No. 57). Tin was not smelted in Venice, only refined perhaps, the stamp serving as the mark of quality. The purity of tin meets the highest standards of the period: »Pig Tin, First Grade« and »Sachsischer Stangenzinn«.

The Etrurians mined for tin at Campiglia Marittima in Tuscany, Italy, from mines which were highly esteemed during the autarchic era again; but the Romans mined in Britain, like the Phoenicians and the Phrygians before them.

British tin found a competitor in Saxony as late as the latter half of 15th century, though some tin had been mined in Bohemia as early as 12th century.

Tin served in the coating of copper and brass vessels used for keeping human food, then in the manufacture of pewter with the admixture of 10% of lead in 16th century, or with the admixture of 9% of antymony for the same purpose, and in the manufacture of mirrors. At the same time, an alloy of tin and lead found its use for soldering. In view of the large cargo of sheet metal, it was most probably intended for soldering and coating of vessels.

Cinnabar. The divers' attention was attracted by 10 large bell-shaped objects of red colour (No. 58) consisting of a hollow conical core, each 100 kg in weight. The cones were of mercuric sulphide, HgS, of red modification, composed of 85% of Hg, known as early as Biblical times as a valuable red pigment (cinnabar, vermillion). In the period of dating the ship it was used in the preparation of paint which covers well, is of constant, bright red hue. It was also used in the manufacture of sealing wax, even in cosmetics. However, the quantities found at the site contain some 850 kg of mercury, which could easily be extracted by distillation. Was this not a suitable form for transportation? Cinnabar is very expensive; other cheap red pigments were known at the time. The quantity found is rather surprising, but the manufacture of paints was well on its way, and the search for new materials was a sufficient impulse for the conquest of colonies in the newly discovered lands.

It probably originated from Idrija, and had been made by mixing equivalent quantities of mercury and sulphur and heating the mixture in rotating bell-shaped vessels. The constituent parts then entered a compound, and the conical hollow is the result of rotation. Grinding produced a fine pigment.

White lead. Like cinnabar, small black cones (No. 59), each cca. .25 kg in weight, and each bearing traces of casting on its base, were soon noticed. The cones were found in barrels, but also scattered over the sea-bottom. The quantities are difficult to estimate except by stating that there is a lot of it. It has been gathered like ordinary stones, without weighing.

A cut across a cone revealed a thin black layer, only few millimetres below the surface, and the white core, of the specific gravity of 4.2, the sample containing 65.5% Pb, 6.1% Ca, .8% Mg, traces of other metals, and the rest consisting of CO_3'' and OH'. Stoichiometric calculations indicate the following composition: 82% of basic lead carbonate and 18% of chalk.

The black crust consists of black lead sulphide, probably derived in the interaction with hydrogen sulphide

which is characteristic of the site. The reason for such view is the fact that it was not until 19th century that protection from lead poisoning was mentioned, and it consisted in the artificial creation of a sulphide layer on the surface of the mold. White lead is unstable and turns black in the air by the interaction with hydrogen sulphide, even when used as a pigment. Traces of hydrogen sulphide are always present in the air, so molding into such cones was a good method of protection during transportation and storage as the surface could be scraped easily. Protracted exposure to sea-water is indicative of the value of this method. It is supposed that the sulphide crust developed in the same manner as tin developed its yellow crust, and brass its black patina. The cones were molded by mixing white lead with slaked lime, and the material hardened during interaction.

Manufacture of white lead was known to the Romans. Later the monopoly passes to the Dutch and Venice. In the Dutch process, which had long remained in use, lead gratings were placed in earthen pots containing diluted vinegar in the bottom, and the pots stacked in fermenting manure which generated the necessary heat and carbon dioxide. In a few weeks, it is turned first into lead acetate and then into basic lead carbonate in the shape of fine powder. Water is then extracted by boiling the powder in linseed oil, and the resulting paste serves as a pigment which covers exceptionally well.

The material was probably intended for the purpose, although it could be used to glaze pottery. However, cheaper materials could be used in glazing. White lead could be used in the manufacture of excellent glue and cement, but never when molded as in the present instance, as the chemical processes are identical with the processes of molding. However, excellent pigment pastes can be made by grinding and boiling in oil.

Antimony sulphide (stibnite, Crude antimony). A chunk of almost pure antimony sulphide has been found. It is of grey colour, with Sb content of up to 78%. This indicates that the material is the so-called antimony crude, a sulphide compound refined by smelting, which had long been used commercially, and from which pure antimony can be extracted easily.

In antiquity, it was used as eye-liner, a cosmetic of great value in the Near East; in the Middle Ages it was used as medicine (tartar emeticus). However, at the period of the voyages of the sunken ship, it was used in alloys from which bells were cast, in the preparation of printing type, in the manufacture of mirrors, and also in pyrotechny for bluish-white effects. A book published in 1604, allegedly a reprint of a two-century old book by Basilius Valentinus, indicates that the latter property was very well known. The shape of the find (a chunk of a larger cast of regular shape) shows that it constituted part of a cargo which has not been discovered in its entirety but which, if larger quantities are attested at the site, was doubtless intended for use in metallurgy.

Its provenance is hard to establish, because the material is mined in many places. Yugoslavia is nowadays one of the most important producers of antimony, and the greatest majority of mines that are still productive have been exploited since the Middle Ages.

Miscellaneous. A large number of barrels, of which many were broken, contained Flowers of Sulphur. The staves of the barrels which were broken are also impregnated with sulphur and show traces of charring, while the quantity suggests cargo for commercial use. This sulphur, subjected to centuries of anaerobic bacterial action, is the source of the high content of hydrogen sulphide, which had caused the decay of many kinds of goods at the site.

It is evident from this account that only such materials have been defined as have been found in good state. Some samples, i. e. their shapes, chemical composition, and the degree of sulphi-

de decomposition, do not give a firm basis from which to ascertain the nature of the material, because small quantities have been found only, and it cannot be assumed with certainty that they were part of the ship's cargo. What the sea-water has decomposed and left in negligible quantities only, or what is still buried in the sand or hidden in the ship's interior. can perhaps be brought to light by further investigations, which could specify and define the history and the intended destination of the sunken ship on her last voyage.

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COPPER UTENSILS

This is the only group of objects of which we are not certain as to whether they were part of the ship's inventory or of the cargo. Twenty different objects have been found, all in bad state. On the one hand they were corroded by sea-water to which copper is more susceptible than its alloys, bronze and brass, and on the other they were not buried in sand and were covered with growth of shells which has also greatly damaged the metal.

They are on the whole largish objects of various shapes: one ladle (No. 60), a pan with one handle (No. 62), a pan with two handles (No. 61), two wash basins, a tub, a baking pan, several lids, several large kettles and bowls, a beaked kettle with lid.

Although the ship was large and had large crew, it is hard to believe that all of these objects were used on board when it is remembered that fires on board were avoided because of danger. Yet there is a detail which favours the assumption that they were part of the inventory: one pan was mended, and it is certain that used articles were not for sale.

However, experts who are cognizant of life on board ships in 16th century will have more to say on the matter.

Here are the dimensions of some articles in centimetres: the ladle is 28 by 20, the pan with one handle is 33 by 47, the pan with two handles is 35 by 44, the large kettle is 45 by 45, the beaked kettle is 50 by 30. It is difficult to measure some of the articles, as not all have been cleaned and restored and many of them are deformed.

Sofija PETRICIOLI

MISCELLANEOUS SMALL OBJECTS

Although the find has not as yet been explored systematically or brought to conclusion, a large number of very small objects has been salvaged from the sea-bottom.

The smallest objects are multicoloured glass beads (No. 63) which had been scattered over a large area. They have been discovered in the sand which had filled the guns, in the mud deposited in copper pots, or have been collected by divers from the sea-bottom. The beads are white, blue, or brown, but most frequently of several colours: dark and light blue tints with an admixture of white, or transparent and milky white. The beads vary in size, too: from 12 to 4 mm. So many of them have been collected that two strings can be made. White and blue beads are predominant.

Since a large quantity of Murano glassware had been found on the ship, it is most probable that the beads come from the same source.

Some ten thimbles have also been found. They had also scattered on the sea bottom or had stuck to other

objects. Most of them have been removed from small coils of brass wire. The thimbles were made of brass and do not greatly differ from present-day specimens.

Pins were found in slightly larger number (some 80 specimens). They were stuck together and covered with lime crust (No. 64). They were separated after careful cleaning. The pins were made of thin brass wire, are 5.5 cm long, with a small head made of the same kind of twisted wire.

Wether-bells were found in large numbers. They had been salvaged in large clusters and had to be separated with care. Although they were made of thin brass sheet, many of them are damaged. Three types have been found (No. 67). The largest are 2 cm across, perfectly circular, with several concentric circles incised. On one side they have a fastening loop, and on the other the usual elongated slit. The smaller type is completely alike, but only 1.7 cm across. The smallest type is slightly different: they are made of two parts fastened in the middle and forming here a small bulging rib. They also have a fastening loop and the characteristic slit. This type is 1.5 cm across.

The most numerous are shaving razors. They had not scattered because of careful packing. The larger package is a rectangular chest (81 x 53 x 37 cm) with a vaulted lid and two carrying handles. Sea-water has damaged the bottom and the handles of which only traces remain. The razors had been neatly stored in groups of ten. The method of packing is very interesting: five razors were neatly arranged on either side of a thin slat (No. 66) and tied with a piece of string. Each slat had a small base to support the razors and prevent slipping. The other package is an oval box made of very thin wood (54 x 30 x 18 cm). The method of storing the razors cannot as yet be ascertained because the box has not been cleaned yet and the razors can barely be seen.

The razors are identical with present-day types (No. 65): a long, narrow wooden handle with a slot for the steel blade, the blade fastened to a brass part which has been preserved while the blade itself has disappeared. Judging by the impression that the blade left on the handle, its shape can be reconstructed with ease. (The handle was 16 cm long, the blade was of 8.5 cm, and the brass part was of 7 cm.)

Last we mention the pair of dividers which was probably part of the ship's equipment rather than an article for sale. It is 16.5 cm long, while the legs are 13 cm long. It is made of two parts which form a circle at the upper end, continuing into the points. In the upper end of the circle is the pivot. The legs are decorated with horizontal grooves in the upper half.

Sofija PETRICIOLI

PREPARATOR'S REPORT

The short account of the methods applied in the processes of cleaning and conservation would be incomplete without some introductory remarks concerning the general state of the objects and the degree of damage prior to treatment. A certain monotony was noted, but polarized in opposite directions. The objects that had remained in larger groups as the result of better packing, or because they had soon sank into the sand, were damaged to a lesser extent. Much damage was done to the objects that were found lying on the sea-bottom which had scattered and had been exposed to mechanical action, water movement, and quick disintegration of packing. The methods of cleaning and conservation depended partly on the state in which the objects were found and partly on the nature of the materials: there were six different kinds of metal (iron, copper, brass, lead, tin—here enumerated in the descending scale of their susceptibility to corrosion), organic materials, glassware, and earthenware.

The limestone crust had to be removed first. On articles of wood this was done mechanically by means of a chisel and gentle taps; likewise on the

bronze guns. Glassware (No. 68) and tin were treated with a mild solution of hydrochloric acid. Copper, brass, and earthenware were subjected to heat treatment and electric reduction.

However, the degree of corrosion of some articles had changed the metallic structure of some articles, especially so of the thinner ones, that nothing could be attempted but an intensive desalting and impregnation, which alone could strengthen the objects and prevent disintegration. Such was the case with a large number of wetherbells; a further step could be taken with chandelier cups, i. e. heat treatment, but without the search for the surface of the metal.

Heat treatment consisted in placing the article into an electric oven, preheated to 400 degrees centigrade, leaving it there for several minutes, depending on the thickness of the material, and sudden immersion into cold water while still hot. The crust then fell of by itself, or after gentle scrubbing and brushing. Reductive atmosphere inside the oven is desirable in the treatment of metals.

Next stage in the treatment of most metal articles was electric reduction in a bath containing 5 to 10 per cent. solution of sodium hydroxide acting as the electrolyte for the rectified current of 5 to 10 Volts. After the heat treatment and thorough drying, earthenware was cleaned and impregnated.

Large objects, such as laminated brass sheets, coils of wire, and brass kettles (No. 62) which could not be subjected to electric reduction because of size, were cleaned with a 10 per cent. solution of sulfuric and nitric acids. The same treatment was also applied to heavily corroded objects when their patinae had proved resistant to electric reduction.

After the application of the acids, all objects were neutralized by the application of bases, either in ordinary baths or by repeated electric reduction. The softened crust was then removed in wet state by scrubbing with iron, brass, or nylon brushes, depending on the strength of the object.

The objects were rinsed in ordinary water with frequent changes of bath, and finally with distilled water. The process took up to several weeks on occasions. After drying, the objects were polished with soft brass brushes. Impregnation was done in most cases by means of polyvinyl actetate, except ith wooden objects where linseed oil was used.

Iron is completely corroded, no matter where found. The metal core could not be found in a single instance, except the anchors. Moreover, the metah had oozed out, so to speak, in the form of clusters, and had left holes in the material. This happened even on the breechblocks of the smaller guns where, because of contact with bronze, iron was subjected to the action of galvanic current generated by the agency of sea-water acting as electrolyte, so that the iron parts received rough treatment indeed.

Articles of bronze, brass (Nos. 52, 55, 54), and copper were either preserved completely owing to the protection of sand into which they had sunk, and receiving a slight patina only which had subsequently developed in most cases because of exposure to air; or were heavily corroded, especially when thin objects are concerned.

Articles of tin are well preserved (No. 56), thus also articles of lead.

Such wood as has been treated so far is probably walnut and conifer. Articles of wood are preserved well with slight shrinkage due to drying. Several small pieces were treated with alcohol and ether, but no difference could be noted of such articles with those dried in the air. Wood was stained with the oxide of iron.

With the exception of breakage, glassware is preserved fairly well. The surface of the articles is slightly matted as the result of the decomposition of alkaline matter.

With the exception of breakage, earthenware has a slightly altered slip and weakened connection of the slip with the base.

Some specific instances:

The only article of iron which has been completely cleaned and restored is the precision balance (No. 49). The pans and the hooks were subjected to electric reduction; the iron lever, the pointer, and the bearings were almost wholly deformed (No. 70) with the growth of metal resulting from the disappearance of the core and secondary deposits of such corrosion. X-Ray photograph was essential (No. 71) and it revealed the approximate outline and mutual relations of the constituent parts. The parts were partly hollow inside. The remaining matter had concentrated on either side of the original surface which had to be followed in the process of cleaning. The cross section of the lever, octogonal and square, was established through accidental breaks. Cleaning and separation of layer was done mechanically with the use of a chisel following the X-Ray outline. The cords for the suspension of pans were first softened and partly bleached with oxalic acid and then linked and impregnated with polyvinyl acetate. The iron parts were restored with araldite.

The weights found together with the balance (No. 50), presented some difficulty during separation. They were finally separated after electric reduction and gentle taps along the outer edges and the sides, so that they gradually fell out of the hollows within the progressively larger weights receiving the smaller ones. Electric reduction alone was applied in the case of the rectangular weights; so also with the calibre gauge, compasses, pin, thimbles, and lead seals securing the articles of textile.

Large and small coils of brass wire (No. 55), large laminated sheets and small rolls of the same material were treated by heat and chemicals, supplemented with electric reduction in the case of smaller articles. The smaller rolls of laminated brass sheet (No. 52) were first uncoiled and cleaned, then given their original shape, and finally impregnated. Vessels made of copper were repaired with copper sheet when parts were missing.

The stamps on the tin bars are fairly well-defined. The lower parts still show traces of the simple molds in which they were cast.

The wooden box (No. 48) with inlays of bamboo which served as the depository of the balance and weights was partly intact. First it was taken to pieces and cleaned. Iron oxide stains were removed in a bath consisting of a mild solution of hydrochloric acid, then neutralized and washed. Slow drying between thin laths under pressure restored the original size of the constituent parts with only 2 or 3 mm of shrinkage in transverse direction to the annual rings. The parts were then assembled with glue and impregnated with linseed oil.

Razors, (Nos. 65, 66). The problem was rather complex as it implied simultaneous treatment of wood, a wholly corroded iron blade, its brass slot and rivets. Razors in a package of ten, in two groups of five separated by a wooden lath and bound with cord of which traces remain, were separated by gentle taps and sawing. The brass parts which had separated were treated by electric reduction, the wooden parts and the box were treated with hydrochloric acid. In contrast with the wooden box containing the balance, which had been kept in the chest, here the box was covered with limestone crust. The blade itself was not affected. X-Ray photographs revealed the shape of the blade, which was substantiated by accident: five blades had fallen off their handles, possibly due to shocks, and were preserved within a compact agglomeration of sand. They were later separated by sawing through the mass. After washing and impregnation with paraloid, grinding and polishing, a well-defined shape of the blade, wholly corroded, appeared on the background of the agglomerate of sand. Acids were not used in this specific instance. The blade was reconstructed on the basis of these da-

ta. With other specimens the constituent parts have been returned to their original positions.

CONCLUSION

Corrosion has not reappeared on any of the articles treated so far, except on the large axis of the chandelier; but it appeared in those places only where the metal remained full of pores due to faulty casting and was in contact with the large mass of the core in the interior, from which the corrosive elements could not be removed in spite of protracted neutralization of acids and repeated washing. An adequate method of removing the core and inactivation will yet have to be stet.

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Izdao: NARODNI MUZEJ ZADAR

Tisak: »NARODNI LIST« - Zadar, 1970.

Sitotisak: GOJKO BAŠIĆ

Tiskano: u 1000 primjeraka