

&DVH 5HSRUW

2SHQ \$F

2YHUODS 6\QGURPH 6\VWHPLF 6FOHURVLV DQ
\$FKDODVLD \$Q 8QXVXDO \$VVRFLDWLRQ

'DQLHO 5XL] 5RPHUR 6RILD 9LOODU &KDYH] 0LJXHO \$QJHO 9DOGRYLQRV 'LD] DQG (QULTXH &RVV \$GDPH
7KH 1DWLRQDO \$XWRQRPRXV 8QLYHUVLW\ RI 0H[LFR 0H[LFR

&RUUHVSRRGLQJ D\XVXDO 5XL] 5RPHUR 6SHFLDOLVW LQ ,QWHUQDO 0HGLFLQH 7KH 1DWLRQDO \$XWRQRPRXV
GDQLHOBUXL]FK#KRWPDLO FRP

5HF GDWH)HE \$FF GDWH 0D\ 3XE GDWH 0D\

&RS\ULJKW 5XL] 5RPHUR ' HW DO 7KLV LV DQ RSHQ DFFHVV DUWLFOH GLVWULEXWHG XQGHU WKH WH
XQUHVWULFWHG XVH GLVWULEXWLRQ DQG UHSURGXFWLRQ LQ DQ\ PHGLXP SURYLGHG WKH RULJLQDO D

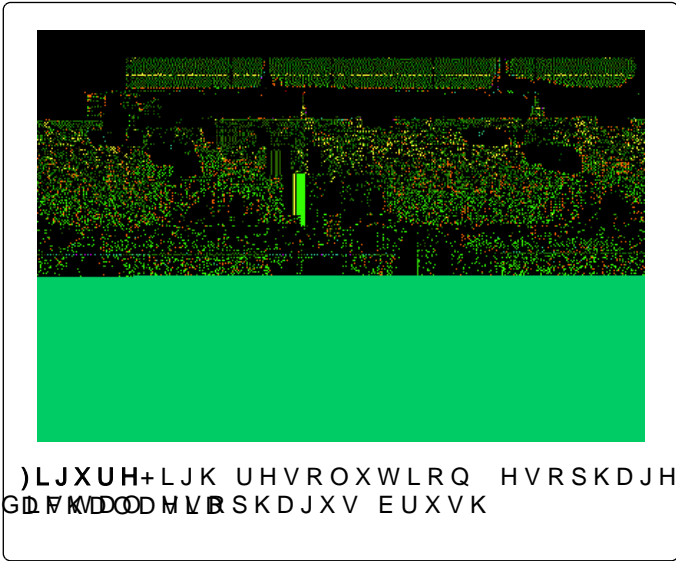
\$EVWUDFW

%RWK SDWLHQWV ZLWK DFKDODVLD DQG V\VWHPLF VFOHURVLV FDQ FRPSODLQ
PDQRPHWHU UHPDLQV WKH PRVW DFFXUDWH PHWKRG WR HYDOXDWH HVRSKDJHDO
V\VWHPLF VFOHURVLV DV DQ RYHUODS V\QGURPH KDV QRW EHHQ GHVFULEHG \HW
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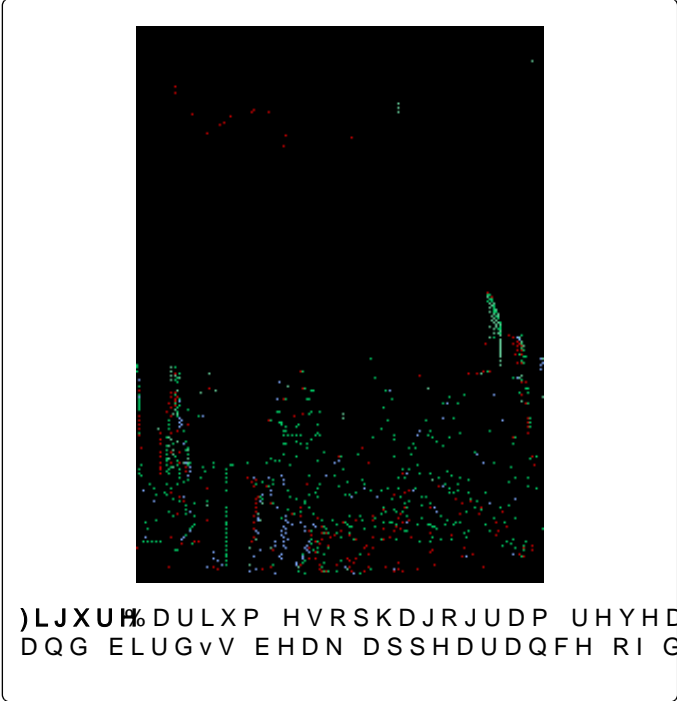
K\SHUSLJPHQWDWLRQ LQ~DUPRODQG OERXWDWLR
\HDUV RI HYROXWLRQ)LYH \HDUV DJR ZDV GLD
+HU SDVW PHGLFDO KLVWRU\ LQFOXGHG XVH R
WKH EHJLQQLQJ PJ GD\ RI SUHGQLVRQH GXU
DOVR UHFHLYHG RPHSUD]ROH&DQDQVGD\ZDWW \$
FKDQVHSDWR SDXWRSUD]ROH PJ GD\ K\GUR[\]
DQG OHYRWK\UR[LQH PFJ GD\ &XUHQWQO\ V
WZR GUXJV VLQFH WKUHH \HDUV DJR 6KH DO
G\VSKDJLD ERWK WR VROLGV DQG OLTXLGV LO C
SOVR D EDULXP HVRSKDJRJUDP URYHDO
/DEFRVLFFRMLRQSHPHDOFH RQGLVDFHDE



)LJXUH+LJK UHVROXWLRQ HVRSKDJHDO P



)LJXUH+LJK UHVROXWLRQ HVRSKDJHDO P
GDFKDDMLBRSKDJXV EUXVK



)LJXUH% DULXP HVRSKDJRJUDP UHYHDOHG GLODWHG HVRSKDJHDO ERG\
DQG ELUGvV EHDN DSSHDUDQFH RI GLVWDO HVRSKDJXV

'LVFXVVLRQ
2QH KDOOPDUN \IPSWRP RI ERWK DFKDO
HVRSKDJHDO GIVSKDJLD VR LW LV LPSRU
HVRSKDJHDO IXQFWLRQ WHVWLQJ LQ WK
HQRVURSRQLWRULQJ DQG PDQRPHWHU
EHFDXVH LW LV ZHOO UHFRJQL]HG WKD
LQGLYLGXDOV DQ DXWRLPPXQH UHVSQRV
SHUKDSV D YLUDO LQHFWRQ FDQ EH WK
,Q SDWLHQWV ZLWZKLWVPHWHUWFOHUSKD
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HVRSKDJHDO SHULVWDOVLV DQG K\SRWH
VKRZQ WKDW RI SDWLHQWV ZLWK DEC

+LJK UHVROXWLRQ HVRSKDJHDO PDQRPHWHU ZDV SHUIRUPHG ZLWK WKH
IROORZLQJ IDLOHG SHULVWDOVLV GLVWDO FRQWUDFWLOH LQWHJUDO
'& PP+J V FP ,53 PP+J /(6 SUHVXUH PP+J
GLDJQRVLV RI W\SH , DFKDODVLD FODVVLF DFKDODVLD ZDV HVWDEOLVKHG)LJX
:LWK DOO WKDGLDORVWLVWZDV RYHUODS \IQQURPH
V\VWHPLF VFOHURVLV DQG UKHXPDWRLG DUWKULWLW ZLWK FODVVLF DFKDODVLD
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JDVWURHQWHURORJLVW 2Q 0DUFK VW D +HOHU \RWRP\ ZLWK 'RU
IXQGRSOLFDFWLRQ ZDV GRQH GIVSKDJLD KDG D SDUWLDO UHVSQRVH
SURFHGXUH 6KH FRQLQXHV WNLQJ OHYRWK\UR[LQH PFJ GD\
SDQWRSUD]ROH PJ GD\ DQG K\GUR[\FKORURTXLQH PJ GD\ 6KH ZLOO
EH IROORZ XS DV RXWSDWLHQW E\ UKHXPDWRLVW DQG JDVWURHQWHURORJL
YHU\ VRRQ

9DH]0) 3DQGRO{QRHOD 0) \$&* FOLQLFDO JXLGHOLQH
'LDJQRVLV DQG PDQDJHPPHQW RI DFKDODVLD \$P - *D VWURHQWHURO
.DKULO~~DKRVK~~.3DQGRO{QR (VRSKDJHDO PRWLWLW\
GLVRUGHUV LQ WHUPV RI SUH~~OXUHLWRSRU~~DSK\ WKH &KLFDJR