אוסף עזרא אוריון
ארכיון אמנות במרחב הציבורי
Ezra Orion Collection
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כותרת: בין גלאקטי - פיסול על מאדים, בין גלאקטי
טקסטים

מיקום בארכיון
ארגז: 24
תיק: 4
תת תיק: --

Title: Intergalactic - Mars sculpture, Intergalactic
Texts

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Box: 24
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Sub folder: --

עזרא ביקש ממני להתייחס לפרק הפיסול הבין-יקומי שלו ואני אעשה את זה, לצערי במהירות ובשטחיות למרות שמגיע לפרק החשוב הזה עיון מעמיק ונמשך.

יש עקביות מדהימה בשינויים שעברו על היצירה של עזרא אוריון. פול ולרי אמר "לו הייתי יודע כיצד תראה השירה בעתיד הייתי כותב אותה עכשיו", אבל כשמסתכלים על תקופות מאוחרות ביצירה של אוריון נדמה שאפשר היה לנחש את התפתחותם כבר מניתוח של ראשית היצירה. היצירה הזאת מתגלגלת ומתפתחת במשך השנים בדרך בעלת היגיון פנימי מרשים כשפרק אחד נובע כמסקנה מן הפרק הקודם לו והיא נמתחת ומתקדמת כמו סרגל מקופל שהולך ונפתח. מה שעושה את עזרא ליוצר גדול הוא שאף אחד לא היה יכול לנחש את הפרקים האלה לפני שהם התגלמו באופן ממשי ונבעו רק ממנו ורק בדיעבד מתגלה ההיגיון הפנימי של ההתפתחות. נדמה לי שאוכל להעיז ולומר שהעיקרון המוביל של ההתפתחות הזאת הוא בעצם מה שמוליך כל אמנות טובה ומה שהוליך וכיוון את הפיסול מראשיתו: השאיפה להיאבק בכוח הכבידה ויותר מזה המודעות לביטוי הטרגי ביותר של הכבידה – הסופיות של הקיום. המוות. המאבק הזה נותן ליצירה של אוריון ממד הרואי. אני חושב שלכל אמנות טובה יש ממד הרואי כמו שלרבים כל-כך מן ההישגים האנושיים יש ממד כזה.

שדה הפסלים של עזרא מ-1968 נבע מן ההתנגדות [illegible] הסוציולוגית של המצב האורבני הבורגני. הוא היה חלק ממגמת ההתנגדות הרומנטית לעיר הגדולה, לכרך. הוא דיבר אז על פיסול שמעוצב בידי הכרכים, שהגלריות הן איי הקיום שלו, מגרשים נמוכי תקרה, מוקפי קירות. זהו פיסול זמני, קטן שצריך לעבור דרך דלתות. פיסול מיניאטורי ובורגני.

כדי לחולל חוויות בעוצמה רוחנית גבוהה הפיסול צריך להיות גדול אמר אז עזרא. הרחק מעל האנשים. משתרע על מאות מטרים. הוא חייב לשלוט בכל החלל שבו נמצאים האנשים, להכיל את האנשים בחלליו הפנימיים והחיצוניים. הוא דיבר על שדה הפסלים שלו במונחים של פריצות אור לתוך מסות גבוהות של חושך. חושך עטוף בבטון. קתדרלות של אור ואבן. דיבר על מערכות פסלים, על קהילות פסלים וכמובן על שדות פסלים.

בתוך הטקסטים שלו זוהר משפט אחד שמי שהיה שם לב אליו אז היה יכול לנחש את הפרק הבא. הוא אמר: "קתדרלה היא תהום אנכית. ביטוי של דחף להמראה". מה אומר המשפט הזה? שקתדרלה היא קליפת אבן של יצר.

דחף ההמראה הוא מושג מפתח. זהו הביטוי הגבישי ביותר של ההומו ארקטוס. האדם המתרומם. האדם שכפות רגליו נטועות באדמה אבל משהו גורם לו לקום, לעמוד, להתמתח, להתנגד לכניעה לכבידה, לברוח מבית הסוהר של הגוף. לברוח מן הסופיות ומוודאות המוות.

מכאן לפיסול הטקטוני.

הרעיון של תפיסת הפיסול כעיצוב של מסות בידי כוחות במובן הרחב ביותר של המלה, תפיסה שהובילה אותו לראות בפעולות הטקטוניות פיסול ולהצטרף אל הפיסול הזה – הרעיון הזה היה תובנה נחשונית ויהודית בכל קנה מידה. מערכות הרכסים בנגב, בהימאלאיה, בארדש, נתפסים בידי עזרא אוריון ככני שיגור של ההכרה מעבר לבועת היקום הנראה. יותר מזה, הפיסול החדש, או המתחדש של אוריון, שבילי האבן העצומים שהוא מעמיד מול הרכסים הם בעצם כני השיגור האמיתיים אל הטווחים האינסופיים. הם

מטווחים את הגוף, העין וההכרה של המתבונן – לאו דווקא אל האינסוף אלא אל האין. זהו תהליך של שיגור – המראה – דאייה – נסיקה אל קצות הטווחים של ההכרה אל האין – אל הכרת מהותו של הרף הקיום האנושי. האמן הגרמני קספר דוד פרידריך צייר את הנזיר המפורסם שלו על שפת תהום מול רכס אלפיני או מול האוקיינוס מתוך מגמה דומה אבל הנזיר הזה מבקש להצטרף אל אלוהים מוגבל. הוא מצוייר בתוך ריבוע בד קטן וממוסגר. הכל כאן סופי. הפסל החשוב כל-כך ברנקושי יוצר פסל שנקרא "העמוד האינסופי". גם העמוד הזה הוא משגר תודעה לטווחים אחרים. אבל העמוד הזה הוא גוש אבן סופי. עזרא מייצר מטה-פיסול. כמו לוחם ג'יו ג'י טסו הוא מצטרף לכוח קיים, לרכס ההרים ומשם הלאה ומבצע תרגיל מבריק לפיסול ההיסטורי. האמנות שלו יכולה להשתייך לקטגוריית אמנויות הלחימה הקוסמיות. הוא מבטא את השאיפה האנושית לברוח הכי רחוק שאפשר מן המוגבלות. עזרא תכנן ליצור שורת אבנים על שפת מצוק הואליס מארינריס על המאדים באמצעות רכב החלל של הנאסא. זה היה אמור להיות מבצע של קידום כני השיגור של ההכרה אל תחומים רחוקים יותר, אבל בבסיסו של הרעיון הוא חלק מן הפיסול הטקטוני.

לגלי האבנים האלה הייתה מטרה רוחנית והכרתית – אבל גם מימד קונקרטי: הזכרתי אתמול את ממד העלייה לרגל, עם המסע הארוך מארץ לארץ עד לקטמנדו, ההליכה האיטית של המשלחת אל האתר, הטיפוס המפרך עם האבנים על הגב לרמה מול ההר – כל ההתגלגלות האיטית והקשה עד להקמה של מה שהוא לא אחר מאשר מזבח חילוני --- ואז, השיגור של ההכרה אל הבלתי נתפס. זהו שילוב של זיעה, שרירים, קושי, אבן --- עם מושגים כמו הכרה אנושית ורוח האדם. זהו גם שילוב של העבר של כולנו, הגנים התרבותיים שמחברים אותנו עם אבותינו שבנו גלי אבן דומים כדי להתחבר עם כוחות גדולים מהם – שילוב של הקדמוני והקמאי – עם מודעות מאוד מערבית, מאוד עכשווית, מאוד אתאיסטית, מאוד מודרנית.

בכל יצירת אמנות גדולה יש משהו פגאני, מחולל רוחני. הקתדרלה שהוא דיבר עליה בעבר היא גם מושג מתחום הקדושה. אבל ההצטרפות לאינסוף היא ביסודה אתאיסטית. עזרא אוריון הוא אנטי דתי באופן עמוק ומובהק. אלוהים, כתב פעם, הוא רעיון שהופק באולפני הכרת האדם, הוא תהליך אוטופורטרטי. במקום אחר כתב ש"אני מאמין באמונה שלימה באי ביאתו של המשיח"
אם יש משהו רליגיוזי בנסיקה הזאת אל טווחים אינסופיים הוא טמון יותר במה שפרויד כינה החווייה האוקיינית – אותה תחושת איבוד עצמי שאנחנו חווים מול אוקיינוס ללא סוף ושנמצאת ביסודה של חוויית הקדושה.

ההבנה שמסה היא בעצם גם אנרגיה אפשרה לו לפתח את הפיסול הבין-יקומי, הפיסול הבינגאלאקטי הוא פריצה של הפיסול מתוך ההיסטוריה שלו, מן החומרים שבהם עוצב מאז הפרהיסטוריה.

ב-27 באפריל 1992 שוגרה קרן אנכית ממשגר לייזר של רשת וגנר העולמית ממצפה הכוכבים בר גיורא ליד ירושלים בתמיכת מוזיאון ישראל וסוכנות החלל הישראלית. השיגור נמשך 55 דקות ו-33 שניות. זה היה עצם מטיל אור, או אובליסק אנרגיה שקוטרו 15 ס"מ ואורכו מיליארד ק"מ. הוא נטש את מערכת השמש תוך חמש וחצי שעות, חלף על פני החללית וויאג'ר 2 ששוגרה חמש שנים קודם לכן חדר דרך מפתח ביקום הנראה ונורה אל תוך האינסוף הגלקטי. זהו מסע אינסופי שיש לו ממד אנושי כי הוא נוצר בידי אדם (הוא רצה שיהיה במידות גופו הוא וזה מעניין) אך הוא מתקיים בממד הביניקומי. וגם בממד הבינזמני - קתדרלת האור הזאת תגיע לזמנים קדומים כשעוד לא היה אדם על פני כדור הארץ. ממדי החלל-זמן של הפיסול ההיסטורי מתהפכים, משתנים. וזהו פיסול כי אם מסות הן אנרגיות על-פי איינשטיין הרי שפיסול יכול להיות מעצב אנרגיות. אבל בואו נודה שמדובר במצב צבירה אחר של הפיסול מזה שאנו מכירים ומדובר במעמד אחר של הפיסול.

כשאנחנו נמצאים בתחום הגאלאקסיות אנו מודעים לכך שכולנו מיקרוגאלאכסיות. האדם של עזרא אוריון יודע שהוא אינו אלא "טרמינל חלקיקי אבק בינגאלאקטי - פלנקטון אנושי דואה" – כמו העולם. אנחנו בנויים מאותו חומר ונענים לאותה חוקיות.

היידגר כתב שהישות האנושית היא ישות של מושלכות קיומית. להיות קיים זה להיות קיים שם. קיומו של האדם הוא הוויה מושלכת לעבר המוות

אנחנו מודעים לכך שאנו חלק מן היש הכללי, אבל איש יוצר אחד מלמד אותנו להסכים לזה, לקבל את זה, אבל לא מתוך גישה מתרפסת.

קנה המידה הגאלאקטי מאפשר לנו להבין את עצמנו כאלומות וקטורים. מצד אחד מחוברים לעבר הקמאי לטומולים ולגלי האבנים שיצרו אבותינו כדי להתחבר למה שמעבר להם ומצד שני חוברים למיקרוקוסמי ולמקרוקוסמי.

מכיוון שמוזיאון ישראל היה המטריה האווירית של פרוייקט השיגור מבר-גיורא הייתי נוכח בשיגור וגם אמרתי שם כמה מילים לפני הלהרצה על הכפתור.

בדרך לבר-גיורא נדהמתי מכמות התנים שהסתובבו לפני השער. המונים. מן פרוות מדבר מייללות. באתר עצמו התרוצצו המון עקרבים עם זנבות זקורים.

אני זוכר שכשהבטתי בקרן המשוגרת חשבתי על העקרבים ושמעתי את התנים ובאותה עת ניסיתי, והצלחתי, להתחבר לחוויית הנסיקה לאינסוף. ניסיתי להתחלק, לשכוח את העקרבים שהזכירו לי את כפות הרגליים, את העובדה שאני נטוע באדמה עם רגלי ונוסק עם חלק ממוחי. ואז הייתה לי הארה. הבנתי שהפיסול הגאלאקטי לא נועד להגיע לשום מקום. הוא לא נועד לגעת באינסוף כמו באיזה קיר וירטואלי. הוא נועד להיות חוויה כולית. לגרוף אתו את האדמה והעקרבים והתנים ולהיות בעצם יצירת אמנות טוטאלית. גזאמטקונסטוורק.

מישהו אמר באותו ערב לעזרא שבעצם גם פנס כיס היה יכול לבטא בעצם את אותו הרעיון. זוהי שגיאה. מה שחשוב כאן הוא הטוטאליות. זו איננה אמנות קונצפטואלית. זוהי אמנות קונקרטית.

13/11/98

מילדות לבגרות בשביל החלב

טימותי פריס

המין האנושי ותודעת היקום Timothy Ferris 1991

הטלסקופ הראשון – גלילאו, 1609.

גלילי

(עמ' 75)

פרק 18, מוצא היקום

"... אנשים פנים לא מה דיה המפץ לשחרר את שאלת הבריאה

מסכן הדתות הרבות והמלאות אותיות שם היא לכובה...

השאלה כיצד התחיל היקום היא מדעית ממקום הדתי...

צאת היקום ותרמות לעולם קוסמולוגיה (חקר היצורות של היקום)...

אחר האסטרונום אלן סנדג' הוא אירוע בריאה – בריבה

להיות לו A. Sandage, 1991 ... מה אומרים האסטרונומים?

מאומה ... אירוע שהגיח מהאין אל תוך המפץ האמצעי

המפץ הגדול ... משוך ים ולא איננו יכולים

להגיע אל החרוג מחזרת המפץ ... (עמ' 319)

... יש יסוד להקדים שלנו יעבם (אם יעשה אין שיכסה אותו) ...

הבנות תרדמתו – תבונת היקום בלתי

ועם זאת, כפי שאנו הרתיים אין מיקומנו אל אודות היקום,

כך אנו מקיימים להבין מה מעט אנו יודעים ...

בשהתמים ... עד יכלנו למות לעצמנו שאנו עשויים להבין

מפל האינוך

13/11/98

מילדות לבגרות בשביל החלב

טימותי פריס

המין האנושי ותגלית היקום Timothy Ferris 1991

הטלסקופ הראשון – גלילאו, 1609. "גלילאי"

(עמ' 75)

פרק 18, מוצא היקום

"... אדם פונים לא מה דרך הטבע להתדר את שאלת הבריאה
מסתבר הדברות הבאות ושאלות הראשונות עשו היא לבעיה ...
השאלה כיצד החל היקום היא תעלומה מבקרים רבים היום.
צאת היקום ופרקי התפתחותו קוסמולוגיה (הוא דבר היווצרותו של היקום) ...
אמר האסטרונום אלן סנדג' אין היה אירוע בריאה – בריבה
להיות לנו (A. Sandage, 1981) ... סיפור מה אומרים האסטרונומים
מאומה ... אירוע שהגיח מחוץ לעפר אל תוך הזמן המאבחן
המבנה הגדול ... משהו יש ולא אין. אינם יכולים
להגיד על לחרוג ממראות הנפש ... (עמ' 389)
... ים יסוד לתודעתנו שלנו יצבה (אם יש את מי שיספר אותו) ...
תצפות תרנים – תבנית היקום מתגלגלת
ועם זאת, בכל שאנו חרדתי ים אין מפותכו אם-אודות היקום,
כך אנו מגיעים להבין מה מעט אנו יודעים ...
פשה, ממוס ... עד יכולו לשכות לעצמנו שאנו מסוגלים להבין

מסע האיוורן

יום מן הימים הן או תפניט והן את פרטיה. ביום

אין סוף הימים לאשליה הזאת... לעולם לא נבין את היקום

לפרטיו... לעולם לא נעבור ממנו יותר מחלק זעיר של ספור

הגלאקסיה שלנו... ומהגדר של מאה גלאקסיות...

הסוד הגדול של מדע המאה העשרים הוא תגלית מגלת

הגבולות האנושית... (עמ 345) הדורות האנושית...

הפולמוס של המדע (בספר K.Popper) שלפיו: - מחבר

בכל שלמותו יותר... כך הדורות יותר יודעים את

יודעים מעט יותר של מה שאנו יודעים

אין לעולם לא יוכלו לנבא שלם ומתקן - כל של היקום.

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בזמן ובמרחב —

CRUSTAL DYNAMICS DATA INFORMATION SYSTEM

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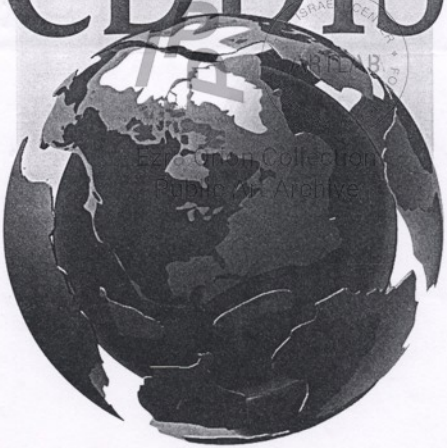

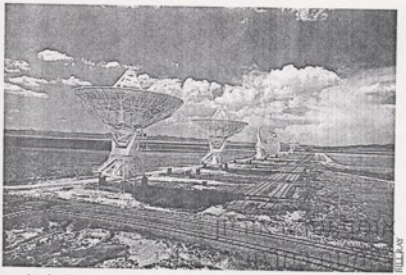

A few of the radio telescopes of the Very Large Array, Socorro, New Mexico, operated by the National Radio Astronomy Observatory. The telescopes move on railway tracks; their separation determines the resolution of the resulting radio image.

are also looking far back into time, back toward the horizon of the universe, back toward the epoch of the Big Bang.

The Very Large Array (VLA) is a collection of twenty-seven separate radio telescopes in a remote region of New Mexico. It is a phased array, the individual telescopes electronically connected, as if it were a single telescope of the same size as its remotest elements, as if it were a radio telescope tens of kilometers across. The VLA is able to resolve or discriminate fine detail in the radio regions of the spectrum comparable to what the largest ground-based telescopes can do in the optical region of the spectrum.

Sometimes such radio telescopes are connected with telescopes on the other side of the Earth, forming a baseline comparable to the Earth's diameter—in a certain sense, a telescope as large as the planet. In the future we may have telescopes in the Earth's orbit, around toward the other side of the Sun, in effect a radio telescope as large as the inner solar system. Such telescopes may reveal the internal structure and nature of quasars. Perhaps a quasar standard candle will be found, and the distances to the quasars determined independent of their red shifts. By understanding the structure and the red shift of the most distant quasars it may be possible to see whether the expansion of the universe was faster billions of years ago, whether the expansion is slowing down, whether the universe will one day collapse.

Modern radio telescopes are exquisitely sensitive; a distant quasar is so faint that its detected radiation amounts perhaps to a quadrillionth of a watt. The total amount of energy from outside the solar system ever received by all the radio telescopes on the planet Earth is less than the energy of a single snowflake striking the ground. In detecting the cosmic background radiation, in counting quasars, in searching for intelligent signals from space, radio astronomers are dealing with amounts of energy that are barely there at all.

Some matter, particularly the matter in the stars, glows in

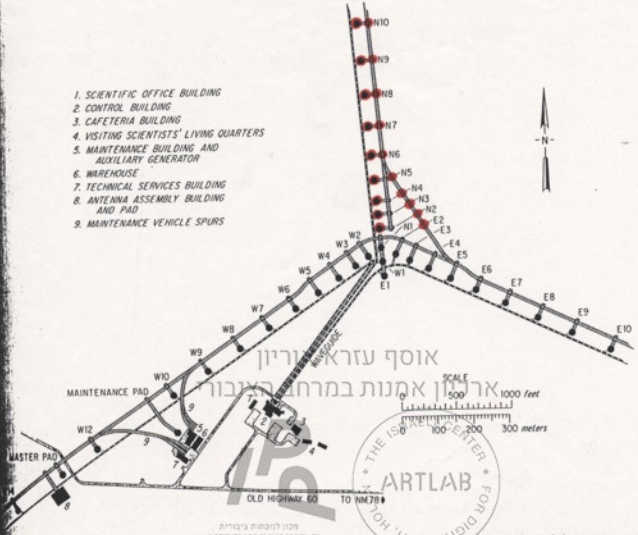

FIG. 4.—Rail track, antenna stations, buildings, and roads near the center of the array. The central electronics and the computers are located in the Control Building.

The surface-accuracy specification is 0.07 cm rms, which includes the accuracy of the panels, the panel setting, and an allowance for gravity, wind, and thermal distortions of the structure. Optical surveying of the surfaces during acceptance tests shows that the accuracy achieved is better than this; it is typically 0.05 cm rms.

The Cassegrain subreflector is a modified hyperboloid, designed so that the Cassegrain focus is 0.97 m from the axis of the main reflector and in a plane 1.68 m in front of the vertex. When the subreflector is tilted about the axis of the main reflector, the focal point moves around a circle of 0.97 m radius. The feeds are placed on this circle and changes between frequency bands can be made by rotating the subreflector. The subreflector motion is under computer control and also includes an axial adjustment for focusing.

The receiving system being installed during construction includes feeds for operation in the four frequency bands in Table 3. Each of these receiving bands contains one of the bands assigned to radio astronomy by international agreement. The 18–21 cm feed is a corrugated horn illuminating a hybrid lens of dielectric and waveguide elements. The 6 cm feed is a corrugated horn with a dielectric lens. The 2 and 1.3 cm feeds are multimode horns. A description of the feeds, which includes a preliminary design for the 18–21 cm band, is given by Weinreb *et al.* (1977*a*). A description of the final 18–21 cm feed is given by Gustincic and Napier (1977). The feeds can be seen in Figures 3 and 6; the circular structure near the vertex in Figure 3 is the lens of the 18–21 cm feed, and the other three feeds are enclosed within the rectangular structure. The antenna aperture efficiencies with these feeds are given in Table 4. The shaped-reflector design produces almost uniform illumination in the aperture of the main reflector. This, combined with the blockage resulting from the subreflector and feeds, gives rise to a high first sidelobe

15/10/90 מתוך ספרי-קיבוץ

Fig. 718 — THIS PHOTOGRAPH OF THE GREAT NEBULA IN ANDROMEDA IN REALITY SHOWS US WHAT THE NEBULA LOOKED LIKE 1,500,000 YEARS AGO — THE TIME TAKEN FOR ITS LIGHT TO REACH US. The observation of distant nebulae carries us far into the past. *(Photo, C. D. Shane, Lick Observatory, 20-inch astrograph; 23 September 1946.)*

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THE VERY LARGE ARRAY

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ABSTRACT

The VLA, located on the plains of San Augustin in west-central New Mexico, provides the capability of mapping the sky at centimeter and decimeter wavelengths with resolution down to tenths of arcseconds and sensitivity of approximately 100 microjanskys. The 27 antennas, each of 25 m diameter, are arranged on a three-armed array. They are movable, using a rail-mounted transporter, to allow the resolution of the array to be varied in four discrete steps. In the resulting configurations the most distant antennas are located 0.59, 1.95, 6.4, or 21 km from the intersection point of the three arms. A single 8 hour observation is required to map a source using any one configuration.

The electronic receiving system provides a choice of four frequency bands covering 1.34–1.73, 4.5–5.0, 14.4–15.4, and 22-24 GHz. Various bandwidths from 50 MHz to 97 kHz, center frequencies, and polarization options are available. The correlator system operates in either a continuum or spectral line mode. The choice of center frequency, bandwidth, and most other parameters can be selected on command through the on-line computer that controls the array. Transformation of the visibility data to obtain radio brightness distributions is performed in a separate, asynchronous computer system.

Construction of the array was commenced in 1972, and since early 1977 it has been sufficiently advanced to allow astronomical research to be performed. The paper describes the array at the completion of construction at the end of 1980.

Subject headings: image processing — instruments — interferometry

I. INTRODUCTION

The Very Large Array program of the National Radio Astronomy Observatory is designed to provide astronomers with the capability of mapping the sky at radio wavelengths, with angular resolution comparable to that obtainable with a large optical telescope. The array is very much a general-purpose astronomical tool having both continuum and spectral line capabilities, and it is useful for the study of almost every type of celestial object that radiates at centimeter and decimeter wavelengths.

The completed array will consist of 27 steerable antennas of 25 m diameter, located on three radial arms forming an equiangular Y. The most distant antennas will be 21 km from the center of the Y. The antennas can be moved between different sets of foundations, using a rail-mounted transporter vehicle, to vary the scale of the array in four steps. These are referred to as the four configurations of the array and they cover a total range of scale of 35:1. Electronic receiving equipment is installed for wavelength bands of 18–21, 6, 2, and 1.3 cm. Construction will be completed at the end of 1980, but since early 1977 a sufficient part of the instrument has been operational to allow some astronomical observations to be made. This paper describes the planned capabilities of the instrument at the completion of construction, except as otherwise noted. It is expected that the array will continue to evolve beyond that point, particularly in areas such as frequency coverage and data processing capability.

[1]The National Radio Astronomy Observatory is operated by Associated Universities, Inc., under contract with the National Science Foundation.

II. HISTORY OF THE VLA PROGRAM

The concept of a large radio astronomy array as a US national facility dates back to the early 1960s, and results in part from the recommendations of an advisory panel of the National Science Foundation chaired by J. R. Pierce in 1960 (Keller 1961). In NRAO the idea was under discussion in late 1961, and in the latter half of 1962 D. S. Heeschen, the Director of the Observatory, initiated a study in which a number of NRAO staff members undertook to define goals in greater detail and determine the most feasible techniques. The development of the interferometer at Green Bank was commenced in 1963, and this instrument provided much essential experience for the array study.

TABLE 4

ANTENNA EFFICIENCIES AND SYSTEM TEMPERATURES

Wavelength	Aperture Efficiency	System Temperature[a]	Type of Feed
18–21 cm.....	52–50%	50 K	Dielectric and waveguide lens illuminated by horn
6 cm.....	65%	50 K	Lens-corrected corrugated horn
2 cm.....	54%	240 K	Multimode horn
1.3 cm.....	46%	290 K	Multimode horn

[a]Values given apply to the band center and increase by approximately 20% at the band edges for the three longest wavelength bands, and by 40% for 1.3 cm.

temperatures at both wavelengths by 4 K and reduces the aperture efficiencies by a factor of 0.97. The system will be one of the new features to be added to the array after the completion of the main construction phase.

The electronic receiving equipment at the antennas is mounted in the vertex room shown in Figure 6. The room is octagonal in shape and has dimensions 4.66 m between opposite walls and 2.21 m from floor to ceiling. The temperature in the room is controlled to ±1°C. The roof of the vertex room is a rigid structure that supports both the feed horns and the electronic equipment racks. A second room in the antenna pedestal houses the drive control equipment.

The antennas were manufactured by E-Systems of Dallas, Texas, and assembled in a special erection building at the site. This building is large enough to house a complete antenna and has built-in hoists and a rail spur to the main track so that antennas can be moved onto the array. Since completion of the antenna construction, the building is used for maintenance. A total of 28 antennas has been built so there will be one extra to allow a continuous operation of periodic maintenance in which each antenna is brought into the building every three years.

VII. ELECTRONICS

The instrumentation for controlling the array and receiving and processing the signals is designed primarily for Fourier synthesis mapping. This technique requires that signals from the antennas be brought to a common location where the cross-correlation of the signals from every pair of antennas within the array is measured. The cross-correlation data, after appropriate sorting and integration, provide the fringe visibility function from which the sky brightness is obtained. This section is concerned with the electronic receiving system from the front end input stages at the antennas to the outputs of the correlators. A simplified schematic diagram of the signal paths is shown in Figure 7.

The front ends are designed to provide low noise inputs for the four frequency bands in Table 3. The first-generation design being installed in the construction phase of the VLA is intended to optimize performance and minimize cost. This is accomplished by using one set of cooled parametric or GaAs FET amplifiers for all four bands. These amplifiers have a frequency response covering 4.5 to 5.0 GHz, and for reception in the 6 cm band the feeds are connected directly to their inputs. For the 18–21 cm band, the signals go first to parametric upconverters which increase their frequencies by 3.2 GHz so that they can then be accepted by the parametric amplifiers. For the 2 cm and 1.3 cm bands, the signals are converted down to the parametric amplifier band using diode mixers. Coaxial switches at the inputs of the parametric amplifiers allow the desired band to be selected. Two sets of upconverters, mixers, switches, and parametric amplifiers are provided at each antenna for simultaneous reception in two polarizations. These components are mounted in an evacuated Dewar chamber and cooled to 18 K by a close-cycle helium refrigerator. The system noise temperatures achieved are given in Table 4. The upconverters are inherently low-noise devices and provide approximately the same noise temperatures as the parametric amplifiers do at 6 cm. A more detailed description of the system is given by Weinreb *et al.* (1977). For solar observations it is possible to insert attenuators by computer control to reduce the receiver gain to a lower value consistent with the increased system temperatures that result from the sun (Archer 1980).

From each antenna, four IF bands (only two until 1981), each of maximum bandwidth 50 MHz, are brought to the Control Building near the array center. Two of these are selected from each of the two polarization outputs of the front-end amplifiers. These signals undergo several frequency conversions, both at the antennas and in the central electronics system, before reaching the correlators. The conversions at the antennas use local oscillator signals which are tunable in discrete steps in such a way that for a given polarization the two IF bands can be located to encompass any required frequency in the receiving band. To preserve the coherence of the signals received by different an-

tennas, the local oscillator signals must be synchronous in phase. This is achieved by deriving them all from reference signals provided by a master oscillator in the Control Building.

In designing the receiving system, the goal has been that the rms phase error in the correlation data resulting from instrumental causes should be no more than 1° per GHz of observing frequency. This rms error applies to a time interval of no more than 2 hours between calibration observations, and with the above criterion atmospheric effects should dominate the accuracy achieved. The local oscillators, more than any other parts of the electronics, affect the phase stability. Great care has been taken to minimize variations by stabilizing the temperature environment of the electronics and eliminating where possible components with high temperature coefficients of phase. Narrow band filters, in particular, have been avoided for this reason, and in several areas the need for them has been eliminated by the use of phase locked oscillators or image-rejecting mixers.

Three precisely controlled phase shifts are applied to the signals at the antennas. The first is a continuous one at computer controlled rates to compensate for the rotation of the Earth, which causes the relative path lengths from the source to the antennas to vary. In interferometer terminology, the fringes then track the center of the field of view. The second phase shift consists of a series of 180° reversals which are used to implement a phase switching scheme. This eliminates unwanted outputs which can result from certain forms of spurious correlation. The switching sequences take the form of Walsh functions to minimize the range of switching rates required (Granlund, Thompson, and Clark 1978). The third phase shift corrects for variations in the electrical path length to the antennas. Local oscillator reference signals transmitted to the antennas are transmitted back to the Control Building so that phase variations in the round-trip path can be measured. Based on this round-trip phase measurement, a correction is applied to the phase of the local oscillator at the antennas.

Signal transmission between the antennas and the Control Building takes place in a buried TE_{01} mode waveguide that runs down each arm of the array. The waveguide is a circular pipe with an internal diameter

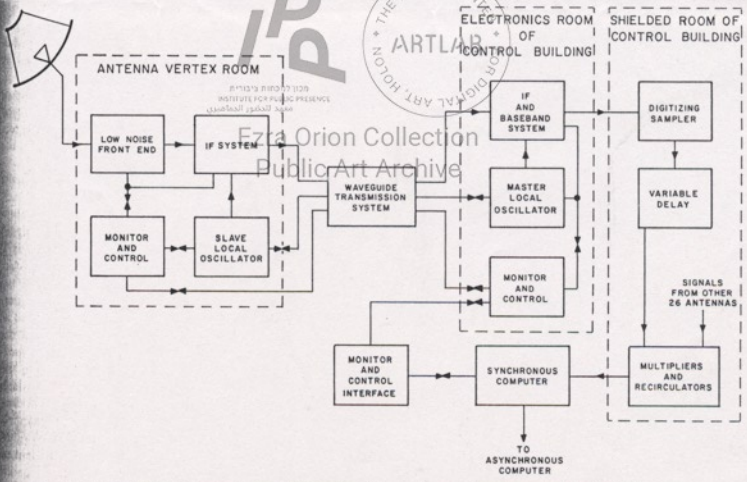

FIG. 7.—Basic block diagram of the electronic receiving system. One device per antenna is required for all blocks shown except the master local oscillator, the synchronous computer and the monitor and control interface.

The interferometer initially consisted of two 26 m diameter antennas, and it was later developed as a four-element synthesis array (Hogg *et al.* 1969). The experience with the interferometer, and in particular with its extension by radio link to baselines of 11 and 35 km, confirmed the possibility of synthesizing beams of less than 1″ resolution through the Earth's atmosphere (Basart, Miley, and Clark, 1970: Wesseling, Basart, and Nance, 1974). In 1964 an advisory committee of the National Academy of Sciences, chaired by A. E. Whitford and studying the requirements of ground-based astronomy over the succeeding decade, recommended a large array as first priority for radio astronomy (National Research Council 1964). By that time, the goal for angular resolution had progressed from 1′ at the 21 cm wavelength mentioned by the Pierce committee, to 10″ at a few centimeters wavelength.

The Whitford report resulted in an intensification of design effort at NRAO during the years 1965–1967, funded by the National Science Foundation. The leader of the study group during these years was G. W. Swenson, and others involved were E. Blum, Y. L. Chow, B. G. Clark, D. S. Heeschen, D. E. Hogg, W. G. Horne, H. Hvatum, N. C. Mathur, W. C. Tyler, C. M. Wade, and S. Weinreb. This phase of the design study culminated in publication of Volumes 1 and 2 of the VLA Proposal document in January of 1967. At that time the concept of the array included 36 antennas, the equiangular Y configuration with arms 21 km long, and a resolution of 1″ at a wavelength of 11 cm (Heeschen 1967). It was also clearly established that the Fourier synthesis mode of operation developed by Ryle (1962) was the most appropriate. For a detailed discussion of the principles involved see, for example, Swenson and Mathur (1968), or Fomalont and Wright (1974).

In 1967 August, a panel under the chairmanship of R. H. Dicke convened to advise the National Science Foundation on radio astronomy projects and recommended continued study, but not immediate funding, of the VLA. The design study at NRAO was continued, but at a reduced level, and in 1969 January Volume 3 of the VLA Proposal was published. This new volume described technical advances in all aspects of the system that had occurred since 1967, the most important being a reduction in the number of antennas from 36 to 27. A second meeting of the Dicke committee in 1969 June recommended construction of the VLA, along with a number of other projects, all of which were given equal priority. Early in 1971 a further committee of the National Academy of Sciences, chaired by J. L. Greenstein, ranked the VLA as first priority among all astronomy proposals then pending (National Research Council 1972). In 1971 January Volume 4 of the VLA Proposal, devoted to site selection, was published, and later that year the National Science Foundation requested funding for the array. In 1972 the first appropriations were made and J. H. Lancaster was appointed Program Manager. The plan established at that time to complete the construction at the end of 1980 is currently being followed. A more detailed account of some of the events outlined above has been given by Swenson (1978).

Some major milestones of the construction phase of the VLA Program are as follows. In 1974 April construction of rail track and general facilities at the site was begun. In the spring and summer of 1975 the major relocation of scientific and technical staff from Charlottesville to New Mexico took place. The first antenna was completed at the site and accepted by NRAO in 1975 September. Interferometer fringes were first recorded in 1976 February, with the first two antennas operating at 6 cm wavelength over a baseline of 1.2 km. The first synthesis map of an extended astronomical object, the planetary nebula NGC 40, was made in 1977 May (Balick, Bignell, and Hjellming 1978). By 1978 the array was in use for scheduled observing by NRAO staff and visiting astronomers for approximately 50% of the time. A description of the array in the early stages of construction has been given by Heeschen (1975).

III. PERFORMANCE CRITERIA AND MAJOR DESIGN FEATURES

The principal performance specifications for the array, as they had evolved at the completion of the feasibility and design studies, can be summarized as follows:

1) The angular resolution, which varies linearly with the observing wavelength, should be as fine as 0.″6 at a wavelength of 6 cm.

2) The scale of the instrument should be variable to allow observation of broad, low-brightness objects as well as bright, compact ones.

3) Maps with the specified angular resolution in both dimensions should be achievable over all areas of the sky north of declination −20°.

4) No more than 8 hours of observations with one fixed configuration of antennas should be required to obtain a map.

5) The peak sidelobe levels of the synthesized beam should not exceed −16 dB, except at declinations close to 0° where the loci in the spacial frequency plane degenerate to straight lines.

6) The beam of the individual antennas, which defines the area of sky to which the array responds, should allow a field of view of at least a few square arc min. The circularity of the antenna beam contours should be similar to that commonly achieved with circular paraboloid antennas.

7) The sensitivity of the instrument in at least one wavelength band should be sufficient to allow detection

of point sources of flux density close to 10^{-4} jy[2] in no more than 8 hours of observing time.

8) Full polarization characteristics of the incident radiation should be measurable.

9) It should be possible to change between different wavelength bands within a few seconds, under computer control. It should also be possible to observe simultaneously on two wavelength bands, but not necessarily with full polarization characteristics.

10) The receiving system should be capable of making spectroscopic observations over a range of bandwidths and frequency resolutions in addition to operating in a continuum mode.

The first five of the above criteria are the main factors in determining the number of antennas and their arrangement in the array. The declination range requires that the array be two dimensional. The movability of the antennas to vary the scale of the array, as well as general considerations of power and signal distribution between the antennas and the main data processing location, suggest an arrangement in which the antennas are located on a series of straight lines which meet at a central point. A three-armed Y avoids the spatial redundancies of a symmetrical cross and is about the simplest configuration which meets the requirements. Such general considerations were supported by an exhaustive empirical study of the transfer functions of many possible antenna arrangements. This study further indicated that the angles between the arms of the Y should be 120°, and that one arm should be at an angle of 5° with the north-south direction. The maximum length of the arms (21 km) follows mainly from the resolution requirement and the number of antennas (27) from the sidelobe levels of the synthesized beam. A study of the number and location of the antennas was made by Mathur (1969) in which a computer program was used to choose the antenna positions on the Y to optimize the transfer function over the specified declination range. The final system of antenna locations, however, is based on a study by Yen and Chow (1980). The distance of the nth antenna on each arm from the center of the Y is proportional to n^{α}. Yen and Chow showed that for the three-armed array the performance is broadly optimized over a large declination range if α has a value of about 1.6. In the VLA, $\alpha = 1.716$, which is equal to the logarithm to base 2 of the scale factor between adjacent steps in the four configurations. With this arrangement, the antenna station for the nth antenna in one configuration coincides with that for the $2n$th antenna in the next smaller configuration. The total number of antenna stations in the array is thereby reduced from 108 ($=4\times27$) to 72, which significantly decreases both construction costs and reconfiguration time. The performance of the power-law array is not significantly different from that of Mathur's empirically optimized design.

Each antenna pair provides, at any instant, two measures of fringe visibility which are complex conjugates and refer to points symmetrical about the origin of the spatial frequency plane. The 702 points resulting from 351 antenna-pairs constitute the instantaneous transfer function of the array, and are concentrated along six radial lines as a result of the location of the antennas on three linear arms. The Fourier transform of this pattern defines the beam for observations of short duration, sometimes referred to as observations in the snapshot mode. This beam has six radial sidelobes with equal angular spacing, the peak sidelobe response being 27% of the main beam. In the usual mode of operation data are accumulated for several hours, and as the earth rotates the data loci sweep out 702 elliptical tracks. Examples of these transfer functions are shown in Figure 1 for several different declinations. The angular resolution remains essentially constant with declination in the east-west direction, but in the north-south direction the resolution deteriorates in the southern hemisphere, and at declination $-30°$ is about a factor of 3 worse than the east-west resolution. At $-40°$, which is close to the southern limit of the useful observing capability, it is a factor of 4 worse.

The size of the antennas, 25 m in diameter, is a compromise between sensitivity on one hand and field of view and cost on the other. The sensitivity also depends upon the characteristics of the electronic receiving system which are described in § VII. The combination of sensitivity and resolution achieved provides a balance of capabilities which allows a large number of sources to be studied at the shorter wavelengths, while limitation by source confusion is mainly encountered at wavelengths of 21 cm and greater with the more compact configurations.

IV. THE ARRAY SITE

The main requirements of the site are a large, relatively flat, and undeveloped area, at a low latitude to maximize the sky coverage, and at a high elevation in a dry climate to minimize atmospheric phase fluctuations. In choosing the site, maps of the United States south of latitude 40° and west of the Mississippi were intensively searched. Over 80 locations were initially considered, but the number of possible sites was rapidly reduced when details of other activities in the areas were examined. Finally, three sites were studied in great detail. The site chosen, which was judged to be significantly better than any of the others, is in the plains of San Augustin approximately 80 km west of Socorro, New Mexico. The nearest major airport is in Albuquerque, from which the site may be reached by traveling 120 km south on Interstate Highway 25 to

[2] 1 jansky $= 10^{-26}$ W m^{-2} Hz^{-1}.

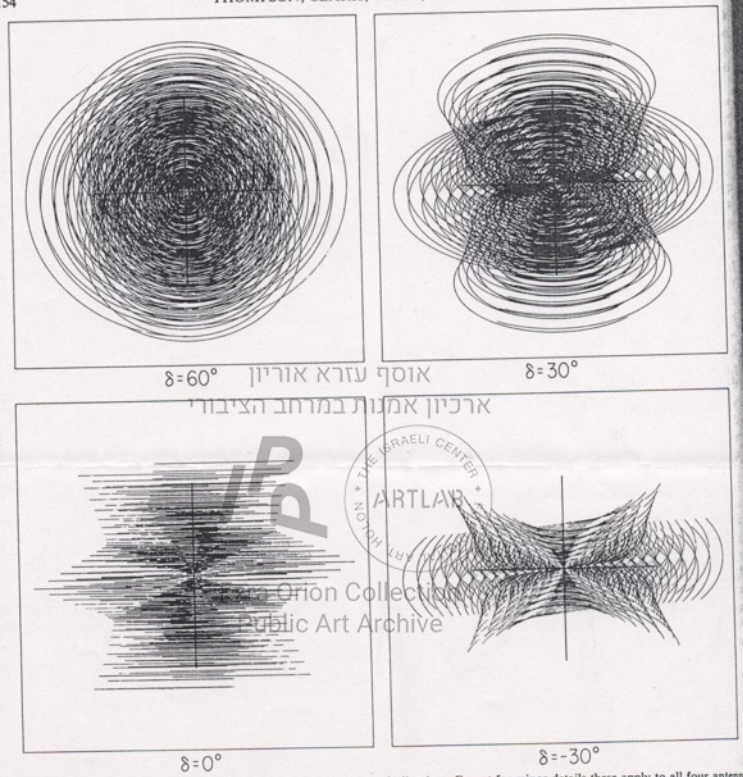

FIG. 1.—Examples of the transfer function of the array for four declinations. Except for minor details these apply to all four antenna configurations, the lengths of the axes indicated by the central cross being ±21 km for the A configuration, ±6.4 km for the B configuration, ±1.95 km for the C configuration, and ±0.59 km for the D configuration. The hour-angle coverage corresponds to the full range of the source above 29° elevation (±6^h) for 60° declination and above 20° elevation for the other three cases. Observations can be made down to 8° elevation, but the quality of the data is impaired by atmospheric effects. In the usual terminology the abscissa in these diagrams is the u-axis and the ordinate the v-axis, the quantities u and v being measured in wavelengths.

Socorro, 80 km west on US Highway 60, and 7 km south on New Mexico Highway 78. Features in the vicinity of the site are shown in Figure 2.

The geodetic coordinates of the center of the array are: latitude, 34°04′43.497″ north; longitude, 107°37′03.819″ west. The elevation of the center point is 2,124 m above sea level, and height variations along the arms lie within ±32 m. The area has an average annual rainfall of 27 cm, and temperature extremes throughout the year are typically −23 to +35°C. The vegetation is rather sparse and characteristic of the Upper Sonoran desert region. The only other major

TABLE 1

DISTANCES IN METERS OF ANTENNA STATIONS FROM THE ARRAY CENTER[a]

Station		Distance (m)	Station		Distance (m)
W1	(DW1)	38.98	E16	(CE8-BE4-AE2)	1,589.92
W2	(DW2-CW1)	44.85	E18	(CE9)	1,946.03
W3	(DW3)	89.93	E20	(BE5)	2,331.65
W4	(DW4-CW2-BW1)	147.33	E24	(BE6-AE3)	3,188.09
W5	(DW5)	216.07	E28	(BE7)	4,153.40
W6	(DW6-CW3)	295.43	E32	(BE8-AE4)	5,222.90
W7	(DW7)	384.89	E36	(BE9)	6,392.69
W8	(DW8-CW4-BW2-AW1)	484.00	E40	(AE5)	7,659.48
W9	(DW9)	592.40	E48	(AE6)	10,472.87
W10	(CW5)	709.79	E56	(AE7)	13,643.80
W12	(CW6-BW3)	970.50	E64	(AE8)	17,156.99
W14	(CW7)	1,264.35	E72	(AE9)	21,000.00
W16	(CW8-BW4-AW2)	1,589.92	N1	(DN1)	0.85
W18	(CW9)	1,946.03	N2	(DN2-CN1)	54.86
W20	(BW5)	2,331.65	N3	(DN3)	94.86
W24	(BW6-AW3)	3,188.09	N4	(DN4-CN2-BN1)	134.86
W28	(BW7)	4,153.40	N5	(DN5)	194.82
W32	(BW8-AW4)	5,222.90	N6	(DN6-CN3)	266.38
W36	(BW9)	6,392.69	N7	(DN7)	347.04
W40	(AW5)	7,659.48	N8	(DN8-CN4-BN2-AN1)	436.40
W48	(AW6)	10,472.87	N9	(DN9)	527.59
W56	(AW7)	13,643.92	N10	(CN5)	639.99
W64	(AW8)	17,157.23	N12	(CN6-BN3)	875.12
W72	(AW9)	21,000.00	N14	(CN7)	1,140.10
E1	(DE1)	79.97	N16	(CN8-BN4-AN2)	1,433.67
E2	(DE2-CE1)	44.85	N18	(CN9)	1,754.77
E3	(DE3)	89.93	N20	(BN5)	2,102.44
E4	(DE4-CE2-BE1)	147.33	N24	(BN6-AN3)	2,974.59
E5	(DE5)	216.07	N28	(BN7)	3,745.12
E6	(DE6-CE3)	295.43	N32	(BN8-AN4)	4,709.48
E7	(DE7)	384.89	N36	(BN9)	5,764.29
E8	(DE8-CE4-BE2-AE1)	484.00	N40	(AN5)	6,906.51
E9	(DE9)	592.40	N48	(AN6)	9,443.37
E10	(CE5)	709.79	N56	(AN7)	12,302.69
E12	(CE6-BE3)	970.50	N64	(AN8)	15,470.64
E14	(CE7)	1,264.35	N72	(AN9)	18,935.66

[a]Values given here are correct to a few cm only. W1 and E1 are on a southern extension of the north arm, and the distances of N2, N3, N4, and N24 have been slightly modified from power-law values.

foundations and rail track near the center of the array is shown in Figure 4.

Each transporter has four six-wheeled trucks, two of which run on each track. The wheels can be raised and lowered hydraulically a distance of 15 cm and this action enables the vehicle to lift an antenna off the foundation piers. The trucks can also be rotated through 90° with respect to the main body of the transporter, and this feature, together with the ability to raise and lower the wheels, enables a transporter to move between the main track and the foundation spurs. Diesel engines on the transporters provide hydraulic power to drive the vehicles and electric power to enable critical parts of the receiving system, such as the cryogenic refrigerators, to be kept running during an antenna move. A transporter weighs 73,000 kg (80 tons) and an antenna weighs 193,00 kg (213 tons). The speed of a transporter is 8 km h^{-1} when carrying an antenna and 16 km h^{-1} when unloaded. Figure 5 (PLATE 1) shows a transporter carrying an antenna. The estimated time required for a change of configuration is 1.5 to 5 days, depending on the configurations involved. At any time during such a change most of the antennas would remain available for astronomical observations. When the array is in full operation it is expected that it will be cycled through each of the four configurations in a period of about 15 months.

VI. THE ANTENNAS

The antennas are altazimuth mounted and fully steerable. The principal structural features are shown in Figure 6 and mechanical performance parameters are given in Table 2.

The main reflectors are 25 m in diameter, and are modified paraboloids shaped to maximize the efficiency in the Cassegrain mode (Williams 1965). For wavelengths longer than 23 cm the profile is sufficiently close to parabolic that a prime-focus feed can be used

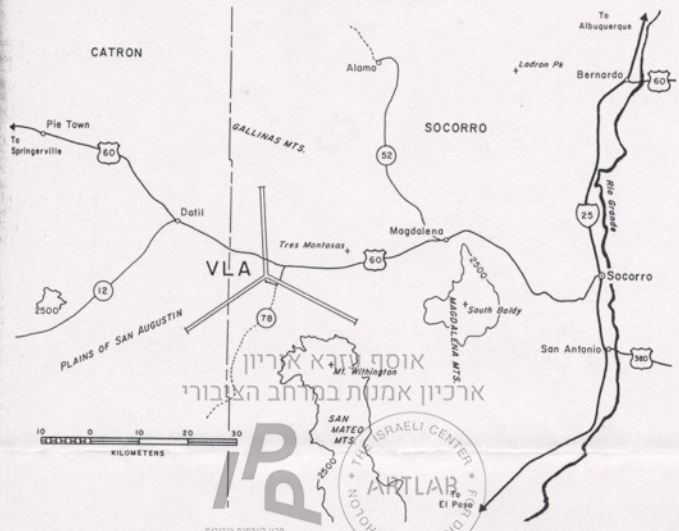

FIG. 2.—Geographical features in the vicinity of the VLA Site. The 2500 m elevation contour is shown, and north is toward the top.

activity in the site area is cattle ranching. A view of the site is shown in Figure 3 (PLATE I).

V. ANTENNA STATIONS, RAIL TRACK, AND TRANSPORTER

The positions of the 72 antenna stations required for the configuration scheme described in § III are given in Table 1 in terms of their distances from the center of the array. Two designation schemes for the antenna stations have come into use. In the first, the stations are designated by A, B, C, or D for the configurations, D being the most compact; N, E, or W for the arms; and 1 to 9 for n, the number of the antenna in a particular configuration, counting outward along the arm. In the second N, E, or W designates the arm followed by a number equal to βn where β is 8, 4, 2, or 1 for configurations A, B, C, or D, respectively. The true azimuths of the arms from the point of intersection are as follows: north (N), 354°59′42″; southeast (E), 114°59′42″; and southwest (W) 236°00′03″. Stations W1 and E1 are on a short southern extension of the north arm to avoid shadowing in the most compact configuration. Distances of all stations on the north arm have been reduced by a factor of approximately 0.9, and positions of N2, N3, N4, and N24 have been modified from the power-law values to accommodate the rail track, US Highway 60, and other features of the site. On the east arm the end station, E72, has been displaced normal to the line of the arm by approximately 140 m towards the north and east to avoid bridging a canyon.

At each station three concrete piers form a foundation on which an antenna can be mounted. The base of an antenna is triangular with sides 15 m long, and the piers support the three corners at a height of 1.94 m above the rail track. The antennas can be moved between foundations by two specially designed transporter vehicles. The transporters run on a double rail track that extends the full length of each arm. The double track consists of two standard gauge (1.435 m, 4 foot 8½ inch) tracks spaced 5.486 m (18 feet) apart. The center of the two tracks on each arm is displaced 30.48 m (100 feet) from the center line through the foundations, and a spur section of the same type of track runs from each foundation to the main track, which it intersects at right angles. The arrangement of the

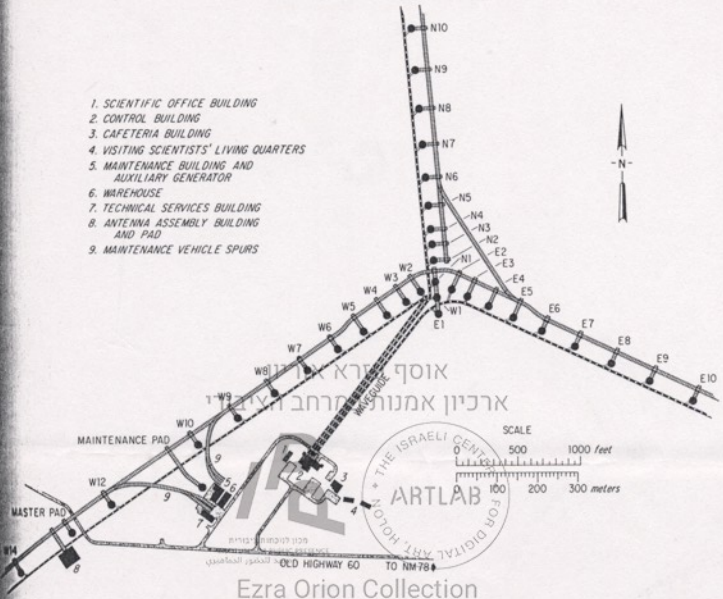

FIG. 4.—Rail track, antenna stations, buildings, and roads near the center of the array. The central electronics and the computers are located in the Control Building.

The surface-accuracy specification is 0.07 cm rms, which includes the accuracy of the panels, the panel setting, and an allowance for gravity, wind, and thermal distortions of the structure. Optical surveying of the surfaces during acceptance tests shows that the accuracy achieved is better than this; it is typically 0.05 cm rms.

The Cassegrain subreflector is a modified hyperboloid, designed so that the Cassegrain focus is 0.97 m from the axis of the main reflector and in a plane 1.68 m in front of the vertex. When the subreflector is rotated about the axis of the main reflector, the focal point moves around a circle of 0.97 m radius. The feeds are placed on this circle and changes between frequency bands can be made by rotating the subreflector. The subreflector motion is under computer control and also includes an axial adjustment for focusing.

The receiving system being installed during construction includes feeds for operation in the four frequency bands in Table 3. Each of these receiving bands contains one of the bands assigned to radio astronomy by international agreement. The 18–21 cm feed is a corrugated horn illuminating a hybrid lens of dielectric and waveguide elements. The 6 cm feed is a corrugated horn with a dielectric lens. The 2 and 1.3 cm feeds are multimode horns. A description of the feeds, which includes a preliminary design for the 18–21 cm band, is given by Weinreb *et al.* (1977*a*). A description of the final 18–21 cm feed is given by Gustincic and Napier (1977). The feeds can be seen in Figures 3 and 6; the circular structure near the vertex in Figure 3 is the lens of the 18–21 cm feed, and the other three feeds are enclosed within the rectangular structure. The antenna aperture efficiencies with these feeds are given in Table 4. The shaped-reflector design produces almost uniform illumination in the aperture of the main reflector. This, combined with the blockage resulting from the subreflector and feeds, gives rise to a high first sidelobe

TABLE 2

MECHANICAL PARAMETERS OF THE ANTENNAS

Parameters	Values
Main reflector diameter	25 m (82 ft)
Total geometric aperture	491 m^2
Focal length of main reflector	9 m
Maximum width of subreflector (asymmetric)	1.83 m (6 ft)
Angle subtended by subreflector at feeds	18°
Effective Cassegrain magnification	8.8
Efficiency factor resulting from blockage by feeds, subreflector and support legs	0.85
Surface accuracy for panels	<0.38 mm rms
Surface accuracy for panel setting	<0.46 mm rms
Surface accuracy for gravity, wind, thermal effects	<0.36 mm rms
Total surface accuracy	<0.70 mm rms
Nonrepeatable pointing errors[a] (for wind <6.7 m s^{-1} and temperature differences of structure <2.8°C)	$<15''$ (azimuth and elevation combined)
Slew rate, azimuth	40° min^{-1}
Slew rate, elevation	20° min^{-1}
Drive	Servo-controlled 3.7 kW motors, 2 per axis
Minimum elevation	8°
Maximum elevation	125°
Minimum zenith angle for tracking	0.5°
Azimuth limits relative to azimuth of arm	±270°
Total weight of antenna	193,000 kg (~213 tons)
Resonant frequency, torsional	2.4 Hz
Resonant frequency, rocking	2.3 Hz
Wind speed limits	
Precision operation	<6.7 m s^{-1} (15 mph)
Normal operation	<20 m s^{-1} (45 mph)
Survival at stow with snow or ice load 98 kg m^{-2} (20 lbs ft^{-2})	<50 m s^{-1} (110 mph)

[a] Pointing errors as large as 1′ can occur when there is direct solar heating of the antenna structure. Efforts are in progress to reduce this effect.

TABLE 3

VLA OBSERVING BANDS

VLA Band	Wavelength	Primary[a] Radio-Astronomy Allocation	Atomic and Molecular Lines Within VLA Band[b]
1340–1730 MHz (L)[c]	18–21 cm	1400–1427 MHz	CH_2CHCN, vinyl cyanide, 1372MHz; H, neutral hydrogen, 1420.4 MHz; NH_2CHO, formamide, 1538–1541 MHz; $HCOOCH_3$, methyl formate, 1610 MHz; OH, hydroxyl radical, 1612, 1665, 1667, 1720 MHz; HCOOH, formic acid, 1639 MHz
4500–5000 MHz (C)	6 cm	4990–5000 MHz	H_2CO, formaldehyde, 4.592–4.593, 4.829 GHz; NH_2CHO formamide, 4.617–4.620 GHz; OH, hydroxyl radical, 4.660–4.766 GHz; HCOOH, formic acid, 4.916 GHz
14.4–15.4 GHz (U)	2 cm	15.35–15.40 GHz	H_2CO, formaldehyde, 14.488 GHz; HC_9N, cyanooctatetrayne, 14.526 GHz; HC_7N, cyanohexatriyne, 14.664 GHz
22.0–24.0 GHz (K)	1.3 cm	23.6–24.0 GHz	H_2O, water, 22.235 GHz; NH_3, ammonia, 22.653–23.872 GHz; HC_7N, cyanohexatriyene 23.688 GHz; OH, hydroxyl radical, 23.818, 23.827 GHz; HC_5N, cyanobutadiyne, 23.964 GHz

[a] Other bands allocated to radio astronomy on a secondary basis, or with footnote protection, also occur within the VLA bands.
[b] From Lovas, Snyder, and Johnson 1979.
[c] Band designation letter used in the VLA.

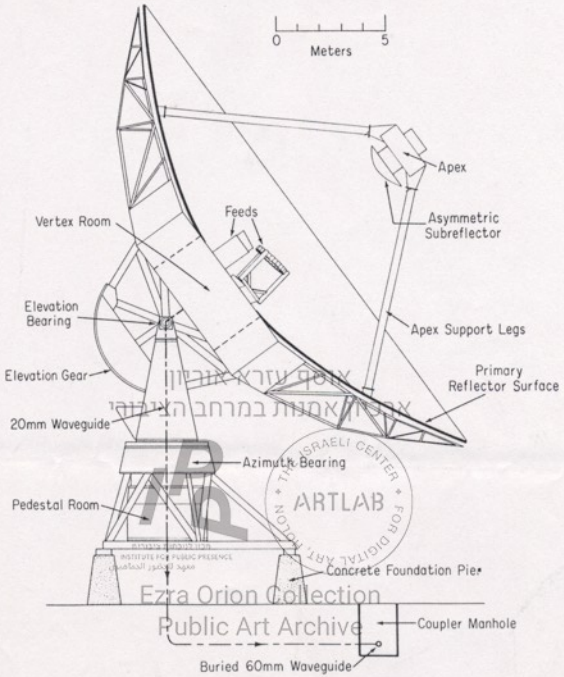

FIG. 6.—Principal structural features of an antenna. The lower feed is for the 18–21 cm band and the rectangular structure above it contains the other three feeds.

level of −15 dB. The uniformly illuminated aperture also produces a slightly narrower beamwidth than would be obtained with a conventional paraboloid. The half-power beamwidth in arcmin is closely equal to 1.43 times the observing wavelength in centimeters.

Each feed provides outputs for two polarizations which can be either opposite-circular or orthogonal-linear. Changing between these two modes involves changing the polarizer manually. Circular polarization is commonly used. With the offset feed arrangement, the two circularly polarized beams are separated by 0.06 ± 0.005 beamwidths, if no special compensation is made for this effect (Napier and Gustincic 1977). The beam separation is perpendicular to the plane containing the axis of the main reflector and the feed. The instrumental linear polarization for a correlated antenna-pair has a four-lobed structure which, for the 18–21 cm, 6 cm, and 2 cm observing bands, has been measured to be 2% on-axis and 4% at the half-power level of the main beam.

A system for simultaneous operation in the 6 cm and 2 cm wavelength bands has been designed using a frequency-sensitive reflector mounted over the 2 cm feed which transmits 2 cm radiation but reflects 6 cm radiation to an ellipsoidal reflector which directs it to the 6 cm feed. This arrangement increases the system

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sculpture today is ready for a spaceward breakthrough - reaching extreme abstraction, immense physical dimensions, light velocities, and nearly eternal duration --
Now is the time for sculpture to extend in two dynamic environments - the Solar System - and the Milky Way --
towards the inter galactic vastness --
Four years have passed since the launch of "Super Cathedral I" from the northern hemisphere - vertically to the plane of the Milky Way --

Now four light-years from earth, it cruises the intergalactic infinity -- y --

We now propose:

The launching of "Super Cathedral II" on April 16, the year 2000, by numerous Laser Ranging Stations, and vertically positioned Radio-Telescopes;
The execution of Robotic Sculpture on Mars by the future Mars-Rover spacecraft, incorporated into the Sample Collection Mission scheduled for the year 2000;
The launching vertically to the plane of the Milky Way, of "Super Cathedral III" by future network of Laser Ranging Stations - on Earth, Moon, and Mars - on the year 2019.
The launching of "Super Cathedral IV" by this network, when Mars is on the same axis beyond the Sun - on the year 2020 --

All events will have extensive media coverage.

Brancusi created in 1924, his 'Genesis' of marble stone, highly polished. I stood a long time in front of it, in Musee d'Art Modern, Paris, 1978. There, then, I grasped the power of the laconic, of laconism in sculpture. Few hours later I visited his reconstructed atelier near Pompidue Center. There I saw the first three links - from the ground up - of his 'Endless Column'.Plaster made, 1 m. each. I saw his 30 m. column in Tigru-Jiu, Romania, 1937-8, only in photos.
Vertical Laconic --
On March 1956, he was approached by Chicago citizen committee to erect 400 m. tall Stainless-Steel 'Endless Column', to stand on the shore of Lake Michigan. He stated: "....if realized, it will be one of the wonders of the world..." ('Brancusi / Eric Shane, Abbevill Press, 1989, p. 199)
Laconism is one of the Power-Poles of the Human-creation-field -- But Brancusi was wrong: There was no genesis - no beginning of these clusters of universes --
We have to break-through beyond these human mythic-historic intuition --
Meaningful sculpture is a generator of consciousness creative storms - -
Meaningful architecture is the same - - toward a depth insight of what we are - -
What is MAN - - What is the meaning of our existence - -
Homo-Erectus-Sapiens shaped during the last 5-7 millenniums of his existence here, vertical obelisks, pyramids, totems, cathedrals - toward infinity - -

Beyond the Christian Meaning of their medieval epoch, I am thrilled by the monumental dark vertical interiors of cathedrals - - of cathedrality - -as a launch dark verticality towards the infinite - -

The tallest stone cathedral that was built on the surface of this planet, was the 161 m., Ulm one - - Homo-Erectus is Homo-Cathedrallicus - -
in every deep-conscious man there is a cathedrallic dimension - -
The Empire State Building, New-York, is 448 m. tall - - The Twin-Towers, there, are .....tall - - The Needles of ..... are .....m. tall.
This is an Earth-bounded architecture - - Now comes the time for Energy-Architecture - -
On 22 June 1989, from a Laser Ranging Station of Bar-Giora, ISRAEL - an energy obelisk, 1 billion km. tall - was launched, vertically to the plane of the Milky Way (55 minutes, 33 seconds long) - -
On 27 April 1992, energy Super-Cathedral I, 1 billion km. tall - light hour - was launched vertically to the plane of the Milky-Way, from 7 Laser Ranging Stations on the Northern Hemisphere - light speed - -

Super Cathedral II from 30 Laser Ranging Stations is planned for mid-April 2000, and III, Iv for 2019, 2020 - -
Virtual Energy Architecture is a terminal of universal-cosmic intuitions - launched by the Energy Architecture beyond it - - to the vast random infinity of Universes - -
Following Anri Bergson - Grasping 'Intuition' as a lightening-enlightenment of the total endless, boundless, entity - - Toward which the Meta-Acropolis - - the Meta-Intuition; the Meta-Cathedrality is launched - - Meta-Architecture - - Meta-Catharsis - -

If Super-Cathedral I was Billion km. tall - one light hour - - the Meta-Cathedrals are (infinity tall - - Crossing Meta-Light-Speed the innumerable clusters of universes - vertically to the plane of the - Local-Group - of universes - -
- - Within the endless Endlessness - -

Ezra Orion

Midrashat Sde-Boker

Negev Desert,

ISRAEL

November

1993

INTER-GALACTIC SCULPTURE
- A documentary Film -
A film description of an extreme Sculptural Process, that develops here about 30 years -> from architectural Sculpture -> to Desert Sculpture, related to the Nomands Archaeology -> to a Geo-Sculpture, related to the global Tectonics by a sculpture in the Himalaya -> to Astro-Sculpture in the Solar System, on

the Moon and Mars -> to Inter-Galactic Sculpture by launching laser energy Super-Cathedrals vertically to the plane of the Milky Way.

The Target Audience: all the Museums of Modern Art, all the Fine Arts Faculties, the international Arts Community.
Toward the April 2000 AD launch of Super-Cathedral II -> to produce a 90 Minutes film that will vitalize this Geo-Sculptural process:
Desert Sculpture:
A one-man climbing to sun-rise, or sun-set, to the Hod-Akev peak near Sde-Boker Campus. A dialogue.
Models for desert 'Sculpture Field' including the interior of The Abstract Cathedral, in the personal studio in Sde-Boker.
A one-man walk in Ein-Avdat cathedralic canyon. A dialogue.
A description of the dialogue with Henry Moore on my 'Sculpture Field' at his studio, July 5, 1969 (see later).
A group walk along the stone line desert work (1 km.) near Sde-Boker.
A group climb to sun-rise to the desert work on Ardon table-mountain, at the cliff edge of the Ramon Crater.
A rocky Alley to the edge of the Ramon Crater, near Mitzpe-Ramon.
A stone staircase towards Arif-a-Naka mountain, Northern Sinai (Egypt), an expedition for reconstruction.
The 20 m. tall white twin-obelisk at Yerucham, Northern Negev.
The 25 m. Tall steel obelisk and 230 steel rail-road slippers, from the Turkish-German 1908 line here, on the Dead-Sea Works observation point.

A Northward Flash-Back
The 18 m. tall 'Staircase' of Jerusalem and an interview with Teddy Kollek.
An 25 tons massive anchor chains semi-cube in Tel-Noff air-base, Southern Israel.
14 m. tall concrete, 6 Days War 1967, monument in the Golan Hights.
Monumental 'Horse-Shoe' in Tel-Aviv, a play-ground.

Tectonic Sculpture
Towards the 'Syrian-African Rift' Earth work, with an heavy bulldozer in Tel-Hai, Northern Galilee.
A reconstruction expedition to Annapurna Base-Camp, central Himalaya, Nepal, October, 1994.
High-Altitude Brain-Storming on various aspects of INFINITY of 15 philosophers and Art Historians in Annapurna Base-Camp - synchronically; including Maurice Herzog - Annapurna I conqueror, June 3rd, 1950.

Sculpture in the Solar System:
A filmed interview with Carl Sagan (President of the Planetary Society) and John Lomberg, the Project Director of the CD-ROM for MARS 1994 -> including a photo of my stone line here, proposed to be erected there by 2000 AD MarsRover of NASA.
Filming of desert exercises of the MarsRover in U.S. desert toward that mission.

Inter-Galactic Sculpture:

Filming a night launch of laser beam from NASA observation station in Bar-Giora, near Jerusalem + interview with Philip Leider, founder-editor of 'Art Forum', N.Y. on the spot.
Improving the video cassette of the Super Cathedral I, April 27, 1992.
Filming the 27 Vary Large Array, radio-antennas, Socoro, New-Mexico, U.S., vertically positioned - as part of Super Cathedral II launch.
Filming Mount Palomer Observatory, U.S., as part of .....
Filming Arecibo Observatory, Poerto Rico, as part of .....
Producing a video animation of the proposed Super-Cathedral II, III, IV - 2000-2020 AD

This - is - total - Sculpture - -

Ezra Orion
Geo-Astro-Sculpture

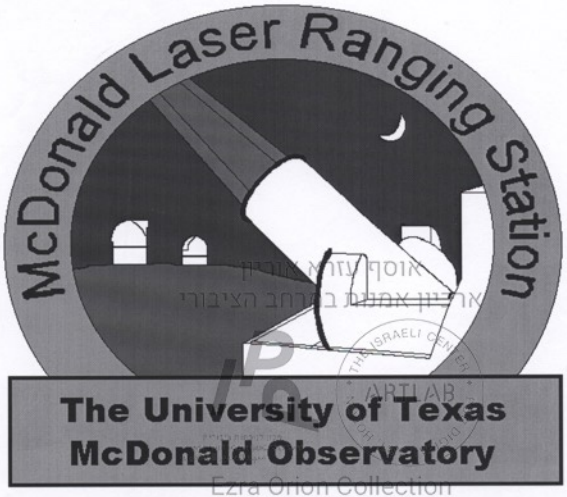
entities, cruising at lightspeed the intergalactic vastness - the beam lost of its power while breaking through the atmosphere, cruising out of the Solar System in 5 hours, passed the 'Voyager 2' spacecraft (launched 29.7.1977) - on to the cosmic infinity - -

B. The third launch, on April 27th 1992, within the Internatioanl Space Year activities, sent a billion km. tall **SUPER-CATHEDRAL** - roofless, lightspeed, vertically to the gravity plain of the Milky Way. The 'Cathedral' was launched, cynchronically, by the European Wegener Satellite Laser Ranging stations:
Bar-Giora, Israel; Helwan, Egypt; Simeiz, Russia; Zvenigorod, Russia; Graz, Austria; Wettzell, Germany; Potsdam, Germany.
A Super-Shaft parallel energy beams - vertically to the plain of the Milky Way - an **Intergalactic Architecture** toward the infinity of universes - -
It is now light-year from here - -

C. Toward the end of this century, combined with the landing of the not yet developed MarsRover on Mars for the Sample Collection Mission - we propose to incorporate into its working program, after the successful take-off of the Mother Space Craft back to Earth, carrying his harvest with her - a desert geometric stone lines, right-angled to the cliff-edge of the abyssmall Valles Marineris - -

D. On April of **the year 2000** - the end of this millenium - on the clearest possible night - - we propose to launch from all the future Laser Ranging Network Stations - **SUPER-CATHEDRAL 2** - vertically to the plain of the Milky Way - -

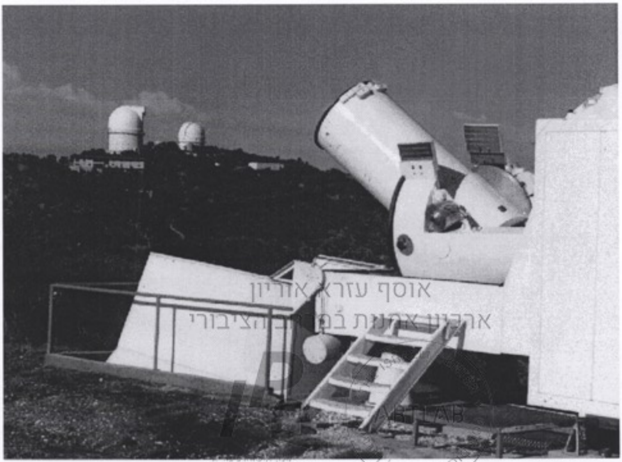
Some time during the first or the second decades of the 21th century, the international scientific community will install research, bases on the Earth's moon and Mars. These will probably include future types of Laser Ranging Stations.
Ones in two years - Earth - Moon - Mars are posted on one architectonical axis. On one of these hours we propose to launch synchronically from them **SUPER-CATHEDRAL 3** - vertically to the plain of the Milky Way - -



Introduction

The McDonald Laser Ranging Station (MLRS) is a dedicated laser ranging station capable of measuring round trip light travel times to a constellation of artificial earth satellites and lunar retro-reflectors to a precision of about 1 centimeter and time of laser firing to about 35 picoseconds. Data from this station as well as 30-40 similar satellite-capable systems and one other regularly contributing lunar-capable system around the world are used for a variety of scientific pursuits including study of the earth's gravitational field, plate tectonics, earth's orientation in space, high precision time transfer, relativity, lunar and solar system dynamics, and providing high precision orbits for GPS and ocean top mapping missions.

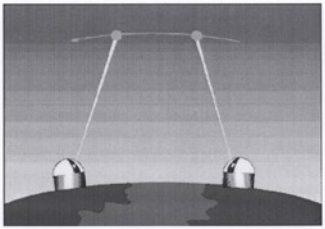
- MLRS History
- Facilities



McDonald Laser Ranging Station

University of Texas McDonald Observatory

Near Ft. Davis, Texas



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מגאזין חובק עולם

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V.L.A.

...Because acne lesions begin as comedones, most topical treatment is designed to loosen and dissolve the plugs in the blocked follicles. Regular application of tretinoin (retinic acid, a derivative of Vitamin A) in the form of a cream, liquid, or gel over a period of a few months often helps dissolve most of the plugs. Benzoyl peroxide gels help both to dissolve comedones and to kill skin bacteria. Salicylic acid creams and gels and sulfur creams also may tend to dissolve comedones. Other topical lotions are designed to reduce the numbers of bacteria—specifically *Proprionobacterium acnes*—in the follicles. These lotions usually contain an antibiotic such as tetracycline.

Internal Medications. Two basic forms of internal medication generally are of great help in treating inflamed blemishes and cysts in acne. Antibiotic pills have been used for this purpose for several years. These antibiotics also reduce the bacteria present in the follicles. It may be necessary to continue the treatment for months or years, but with careful monitoring by a physician antibiotics have few side effects and are remarkably safe.

A retinoid drug taken by mouth—13-cis-retinoic acid—has a profound effect on severe cystic acne and is now widely used for this devastating disease. The therapeutic effects of this drug—unlike those of antibiotics—continue long after it is discontinued. Thus treatment may be required for only four to five months.

Vitamins and trace-metal supplements such as zinc have not been found useful in acne treatment.

Physical Agents. Because ultraviolet light in ...part of the treatment.

BARRY S. GOLDBERG, M.D., *Yale University*

Further Reading: Cullen, S. I., ed. *Focus on Acne Vulgaris* (Longwood 1985); Fulton, James E., and Black, Elizabeth. *Dr. Fulton's Step-by-Step Program for Clearing Acne* (Harper 1983).

ACOMA, ak'ō-mə, an Indian pueblo (village) in Valencia county, New Mexico, about 55 miles (88 km) west of Albuquerque. Archaeological studies indicate that it was established by 1100 A.D., making it the oldest continuously occupied village in the United States.

The pueblo is situated on a steep-sided sandstone mesa 357 feet (108 meters) high, called Acoma Rock. The Acoma population in the mid-1980's was 3,156, but except for special occasions, few Acoma people remain on the Rock. Most of them inhabit the farming communities of Acomita and McCartys in the surrounding Acoma Indian Reservation (245,672 acres, or 99,420 hectares) or work elsewhere in the Southwest.

Ancestors of the Acomas probably inhabited the region before the 1st century A.D. Their legends, like those of many Southwest Indians, tell of a migration from the north. These may refer to peoples who arrived about 1300 A.D. Documentary history begins in 1540 with the visit of Hernando de Alvarado of the Coronado expedition. In 1599, Vicente de Zaldívar destroyed much of the pueblo. Father Juan Ramírez may have built the first church here in 1629. Acoma took part in the Pueblo Rebellion of 1680, but the Spanish regained control in 1692.

Keresan is the native Acoma language, but almost everyone speaks English or Spanish. Social organization is based on clan affiliation with matrilineal descent. Kinship partly controls

Time 84 נובמבר 26

Reagan: A manned mission to Mars early in the 21st century

Unmanned missions... מומחים אמריקאים משלימים

יתכן ציוד חדש של NASA לקראת התכנסות הקונגרס בינואר.

המאמר מצטט תגובות של קארל סגן (באסטרונום)

מה ברור לא ... מאדים ...

תפקידו הנוכחי, ... מאדים

Sculpture in the Solar System: From Geologically Based Earthworks to Astro-Sculpture

Ezra Orion

Abstract—The author conceives of the geologic structures in the Negev desert in southern Israel and the Sinai desert as 'launching pads' for the mind. This concept first evolved from his interpreting global plate tectonics as sculpture and then motivated him to produce a stone staircase in the Annapurna basin of the central Himalayas. The process has culminated in a project proposal to the U.S. National Aeronautics and Space Administration for the execution of sculptural works by the future Mars Rovers as a first step towards sculpture on other planets in the solar system.

I. DESERT-TECTONIC SCULPTURE

I am an environmental-desert sculptor. For 18 years I have lived in a desert campus in the rocky silences of the Negev desert in Southern Israel. Most of the works I have done in these years are in this region or in Northern Sinai. My desert sculpture is an attempt to create laconic presences using stones carried by erosion. The decisive factors I use in creating these geometrical entities are the geographical location, the characteristics of this location and the rise of the axis of the artwork toward the tectonic ascents.

By experiencing the desert's blurred life-edge line—the diminishing, thin, soft film of living textures on the silent rocky substances—and the rocky, barren terrains shaped by tectonic and erosional forces, one slowly comes to grasp the immensity of geologic time and scale. In the last ten thousand years, human "sculpture", conscious and miniscule, has joined the shaping geological processes. A sculptor creates small intentional environments during his or her fleeting existence and transmits messages to the contemporaneous civilization. The micro-sculptor uses the small-scale force at his or her disposal to shape small-scale environments and thus for a short time participates in these formation processes.

A mile from where I live on the fluvial plateau of Sde Tzin the cracked loessic crust with low scattered bushes slowly rises toward a cliff which drops sharply. Far beyond rises another set of cliffs, the Avdat heights. Here I shaped a group of six local limestone lines to create *The Tzin Plateau* (Fig. 1). The 800-meter axis (the longest of the work) crosses the plateau toward the Hod Akev peak. This artwork

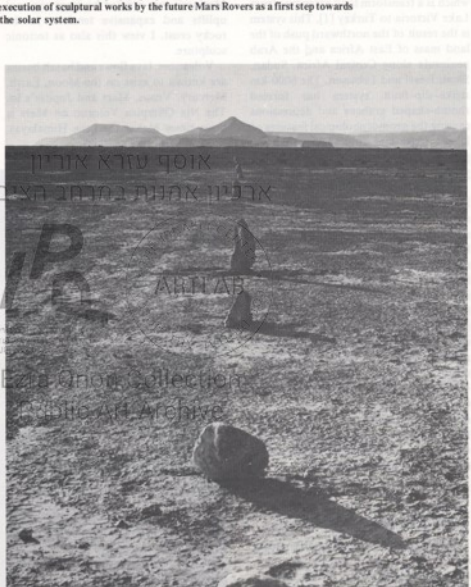

Fig. 1. ***The Tzin Plateau***, local limestone, 800 × 400 × 0.5 m, ongoing construction/modification since 1978. (Photo: Avraham Hai.)

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is conceived as an ongoing process and I continue to modify it.

Mount Arif-en-naka in northern Sinai, a steep tectonic hump, rises sharply from a vast flat hamada of the Kuraya basin. Its last uplift occurred five million years ago. My work *Toward Arif-en-Naka* (Fig. 2) is located at the southern foot of this ascent. The axis of this 'staircase', again of local limestone, is directed toward the summit. When I reworked the staircase a year after first constructing it, I combined its low flat end with a few low horizontal terraces of unknown semi-nomads.

The most powerful feature across the Negev is the Syrian–African Rift system, which is a transform fault extending from Lake Victoria to Turkey [1]. This system is the result of the northward push of the land mass of East Africa and the Arab peninsula along Central Africa, Sudan, Sinai, Israel and Lebanon. The 6000-km strike-slip-fault system has formed rhomb-shaped grabens and depressions causing the geomorphological features of lakes, ridges and gulfs. This sculptural process has continued for 40 million years.

In the region of the Syrian–African Rift I chose to create a work in a narrow gully near Tel-Hai, northern Galilee, which slopes toward the huge opening of the Rift valley trough. My earthwork *Toward the Rift* (Fig. 3), created using a heavy bulldozer, consisted of a cleared, widening runway with a group of local limestones erected midway and a 'heel-stone' 3.5 meters high at its end. The axis, an earth channel, crosses the work riftward. For three winters I observed the results of the floods running through the work and modified it slowly, in relation to the weathering process. In 1983, as part of an international art meeting at Tel-Hai, I pushed out the central rocks and, working again with a bulldozer, deepened the trench toward the heel-stone.

II. FORMS OF GEO-SCULPTURE

While along the mid-oceanic ridges molten substances are up-welling, cooling and creating a new, young, basaltic crust, along other pressure fronts continents of rocky crust are subducting back to the hot interior, to well up again through the mid-oceanic ridges. Above the subduction fronts, the lines of earthquakes and volcanic activities, rise the major crustal ridges of this planet [2].

The strongest tectonic pulses have occurred over the last 40 million years, starting near the end of the Eocene period. These have lifted the Rocky Mountains, the Andes, the Atlas chain, the Alps, the Tauros and the 3000-km Himalayas and at the same time created the Syrian–African Rift. The most recent of these upward pulses, in the last half million years, raised the Himalayas an additional 3000 meters, to their present altitude. These icy deserts are still rising toward the abysmal vastness. I view these as natural 'tectonic sculpture'.

There is no definite evidence yet of active plate tectonics on other planets today. On the smaller planets, which cooled faster, the rocky crust is thick and the molten interior is too weak to activate plate tectonics. But on the Martian surface the 4000-km rift system of Vales Marineris was created by huge regional uplifts and expansive tensions in the rocky crust. I view this also as tectonic sculpture.

Volcanoes, lava flows and basalt basins are known to exist on the Moon, Earth, Mercury, Venus, Mars and Jupiter's Io. The Nix Olimpica Volcano on Mars is three times higher than the Himalayas, the highest in the solar system. I view these as 'volcanic sculpture'.

Vast deserts on Mars are covered by shifting dunes. The best known among them is the North Polar sand sea. Storms of 500 km/hr are scourging these arctic landscapes, carving and sandblasting clifflike reliefs. I view these as 'Aeolian sculpture'.

All the planets in the solar system are bombarded by meteorites. This process covers these surfaces with millions of craters, some hundreds of kilometers in diameter, some thousands of meters from rim to bottom. I view this cratering as 'meteoric sculpture'.

III. SCULPTURE AS GENERATOR

A work of human sculpture is a generator, an entity that initiates associative processes, far beyond itself in time and space. One creates a generator, which is then confronted with a sensitive other—the viewer. This encounter depends upon a common infrastructure—

Fig. 2. *Toward Arif-en-Naka*, local limestone, 30 × 5 × 0.8 m, 1981–1982. (Photo: Avraham Hai.)

emotional, conceptual, cultural—between the creating individual and the receiving other. In the latter, a host of keyed-up, divergent, multi-level associations wait to be triggered by the sculpture. Events of the imagination fan out in a delta of associations.

In October 1981, I trekked with a small expedition to the Annapurna base-camp in the central Himalayas. This basin, 35 × 15 km, the bottom of which is 4000 meters above sea level, is ringed by seven summits of 7000–8000 meters. This icy, rocky area, the expression of the sub-continent India goring against the massif of Asia, is the most powerful 'tectonic sculpture' on this planet's crust. *Toward Annapurna I* (Fig. 4) was done with local stones (schist) and carved slabs. It is axised toward the Annapurna I summit, 8091 meters, and is intended to act as a generator, a launching pad for the mind which is accelerated by the huge, rocky, icy take-off toward the astronomical distances.

In October 1983, my assistants and I climbed a second time to the artpiece to rework it and found it covered with fresh snow. I rebuilt it with some modifications aimed at simplifying it and combining it more with the boulder/rock on which it is resting.

IV. ASTRO-SCULPTURE: MARS

These activities and ideas discussed above brought me to consider relating creatively to tectonic sculpture on other planets. In August 1982 I proposed to the U.S. National Aeronautics and Space Administration (NASA) the reactivation of one of the Viking Lander's sampling arms to perform a sculptural act on Mars: putting one stone vertically on top of another stone within the Lander's sampling fields.

In order to use the Lander's arm it is necessary to involve NASA's deep space facility network. An estimated 200 individual radio commands would be needed to perform the placement of one

Fig. 3. *Towards the Rift*, local soil and rocks, 250 × 40 × 3.5 m, 1980–1983. (Photo: Avraham Hai.)

Fig. 4. *Toward Annapurna I*, local schist, 32 × 5.7 × 0.8 m, 1981–1983. (Photo: Avraham Hai.)

carefully chosen stone (basalt) on top of another carefully chosen stone. Radio signals travel from Earth to Mars and back in about 40 minutes; the Remote Act would take about a day. This act would extend the radius of human sculpture by 90 million km.

NASA is developing mobile Landers, Mars Rovers, for future missions on Mars. The possibility of using a Mars Rover for a robotic sculptural act entices me as an environmental sculptor in a three-fold manner: (1) The ability to survey systematically the surface of this distant desert combined with the data already received from the various Mars orbiters would enable the sculptor, as on earth, to select sites for works. (2) The ability to lift, carry and handle stones would enable the Mars Rover to execute sculptural works akin to those I created on the Tzin plateau (Fig. 1), thus creating a new kind of human extension. (3) The ability to maintain a long-lasting contact with the Mars Rover would enable the sculptor to develop a dialogue between the artworks and their environments—they could be modified, reworked and changed.

The gigantic canyon-graben system of Vales Marineris, in the equatorial region of Mars, stretches 4000 km east to west and contains chasms 4000–9000 meters deep [3]. This huge cliff labyrinth of tectonic sculpture was created by contraction of the Martian crust billions of years ago. In the event my project is undertaken, I would instruct the first available Mars Rover to survey the cliff edge of the flat plateaus running toward these chasms, locate sites and execute stone runways toward the cosmic vastness. *This will be astro-sculpture.* The process could first be modeled and simulated in the southwestern deserts of the U.S.A.

It will be possible in the near future to activate radio-controlled devices to perform sculptural works in the solar system—on the desert surfaces of the Moon, Mars and Venus. The materials for these remote acts could be stones, gravel or dust. Tectonic, erosional, Aeolic, vulcanic and meteoric sculpture extend far into the solar system.

Acknowledgements—I would like to thank Yosef Bartov, Director of the Geological Survey of Israel, for his assistance with geological terms in the manuscript and Frank Bristow, Director, Public Information Officer, Jet Propulsion Laboratories, for his hospitality.

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GLOSSARY

graben—a steeply sloping cliff along a strike-slip-fault.

hamada—a chalky plane covered with flint gravel.

loessic—composed of a fine-grained, yellowish-brown, extremely fertile loam deposited by the wind (loess).

From Tectonic Sculpture Via Sculpture in the Solar System to Intergalactic Sculpture

Ezra Orion*

Abstract - The author conceives of the geologic structure in the Negev desert, in Southern Israel, and Sinai desert as 'launching pads' for the mind. This concept first evolved from his interpreting **global plate tectonics as sculpture** and then motivated him to erect a stone staircase in the Annapurna basin of the central Himalayas. The process has culminated in a project to the U.S. National Aeronautics and Space Administration for the execution of sculptural works by the **Mars Rover** as a first step towards sculpture on other planets in the solar system.

The author assesses the situation of contomporary sculpture; Reports on a **lazer beam launch,** a billion km. long, which he sent vertically to the plane of the Milky Way, 22.6.1989; Reflects on the substence of this energy and void infinity; and propose two more powerful launches. He terms these acts and concept "An Intergalactic Sculpture".

1. DESERT-TECTONIC SCULPTURE

I am an environmental-desert sculptor. Since 1967 I have lived in a desert campus in the rocky silence of the Negev desert, Southern Israel. Most of the works I have done in these years are in this region or in Northern Sinai. My desert sculpture is an attempt to create laconic presences, using stones carried by erosion. The decisive factors used in creating these geometrical entities are the geographical location, the chracteristics of the site, and the rise of the axis of the artwork toward the tectonic ascents.

By experiencing the desert's blurred life-edge line - the diminishing, thin, soft film of living textures on the silent rocky substances - and the rocky, barren terrains shaped by tectonic and erosional forces, one slowly comes to grasp the immensity of geologic time and scale. In the last ten thousand years, human 'sculpture', conscious and miniscule, has **joined** these shaping geological processes. A sculptor creates small intentional environments during his or her ephemeral

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* Abstract of this text was published in LEONADO, Volume 24, Number 4, 1991.

existence and transmits existential massages to the contemporaneous civilization. The micro-sculptor, with the small scale force at his or her disposal, shapes small-scale environments, and thus for a short time **participates** in the global formation processes.

A mile from where I live, on the fluvial plateau of Sde Tzin, the cracked loessic crust with low scattered bushes, slowly rises toward a cliff which drops sharply. Far beyond rises another set of cliffs, the Avdat heights. Here I shaped a group of six local limestone lines - **The Tzin Plateau**. The 800 m. axis (the length of the work) crosses the plateau toward the Hod Akev peak. This atwork is conceived as an ongoing process and I continue to modify it (from 1980 onward).

Mount Arif-en-Naka in Northern Sinai, a steep tectonic hump, rises sharply from a vast flat hamada of the Curaya basin. Its last uplift occurred five million years ago, during the geological age Pliocen. My work **toward Arif-en-Naka** (1981) is located at the southern foot of this ascent. The axis of this 'staircase', of local limestones, is directed toward the summit. When I reworked it a year after I combined its low flat end with a few low horrizontal terraces of unknown semi-namads.

The most powerful feature across the Negev, is the Syrian-African Rift system, which is a transform-fault extending from Lake Victoria to Turkey [1]. This system is the result of the northward push of the land mass of East Africa and the Arab peninsula along central Africa, Sudan, Sinai Israel and Lebanon. This 6000 km. strike-slip-fault system has formed rhomb-shaped grabens and depressions causing the geomorphological features of lakes,ridges and gulfs. This geo-sculptural process has continued for 40 million years.

In a section of the Syrian-African Rift I chose to create a work in a narrow gully, near Tel-Hai, northern Galilee, which slopes toward the huge opening of the Rift valley trough. The earthwork **Toward the Rift** (1980), created using a heavy bouldozer, consisted to a cleared, widening 300 m. runway, with a group of local limestones erected midway and a 'heel-stone' 3.5 meters tall at its end. The axis, an earth channel, crosses the work riftward. For three winters I observed the results of the floods running through the work and modified it slowly, in relation to the weathering process. In 1983, as part of an International art meeting at Tel-Hai, I pushed out the midway rocks and, working again with a bouldozer, deeping the trench toward the heel-rock.

2. FORMS OF GEO-SCULPTURE

While along the mid-oceanic ridges molten masses are up-welling, cooling and creating a new, young, basaltic crust, along other pressure fronts continents of rocky crust are sub-ducting back to the hot interior, to well up again through the mid-oceanic ridges. Above the subduction fronts, the lines of earthquakes and volcanic activities, rise the major crustal ridges of this planet [2].

The strongest tectonic pulses have occured over the last 40 million years, starting near the end of the Eoence period. These have lifted the Rocky Mountains, the Andes, the Atlas chain, the Alps, the Taouros and the **Himalayas,** and at the same time created the Syrian-African Rift. The most recent of these upward pulses, in the last half million years, raised the Himalyas an additional 3000 m. to their present altitude. These icy deserts are still rising toward the abysmal vastness. This icy, rocky ridge, the expression of the sub-continent India goring against the massif of Eur-Asia, is the most powerful **'tectonic sculpture'** on this planet's crust.

On the Martian surface the 4000 km. yawns the rift system of Vales Merineris. This cathedralic labyrinth was created by huge regional uplifts and expansive tensions in the rocky crust, billions of years ago. I view this also as tectonic sculpture.

There is no definite evidence yet of active plate tectonic on other planets in the solar system today. On these smaller planets, which cooled faster, the rocky crust is thick and the molten interior is too weak to activate plate tectonics.

Volcanoes, lava flows and basalt basins are known to exist also on the Moon, Earth, Mercury, Venus, Mars and Jupiter's Io. The Nix Olimpica Volcano on Mars is three times higher than the Himalayas, the Highest in the solar system. I view these as **'Volcanic sculpture'.**

Vast desert on Mars are covered by shifting dunes. The best known among them is the North Polar Sand Sea. Storms of 500 km/hr are scourging these arctic landscapes, carving and sandblasing dunelike reflies. I view these, and the sand seas here, as **'Aeolian sculpture'.**

All the planets in the solar system are bombarded by meteorites. This shapes these surfaces with millions of craters, some hundreds of kilometers in diameter, somethousands of meters from rim to bottom. I view this cratering as **'Meteoritic sculpture'.**

These geo-sculpture processes are shaping innumerable planets in innumerable solar systems in the universe. To extand the term **'sculpture'** to any **shaping of mases by forces in space and time** - it includes the shaping of galacsies and super-clusters of galacsies in this infinity.

3. SCULPTURE AS A LAUNCHING PAD

A work of human sculpture is a **generator,** an entity that intiates associative processes, far byond itself in time and space. One creates a generator, which is then confronted with a sensitive other - the viewer. This encounter depends upon a common infrastructure - emotional, conceptual, cultural - between the creating individual and the receiving other. In the latter, a host of keyed-up, divergent, multi-level associations wait to be triggered by the sculpture. Events of the imagination fan out in a multi-associative **delta.**

On October 1981, I trecked with small expedition to the Annapurna base-camp in the central Himalayas. This basin, 35 X 15 km., the bottom of which is 4000 m. above sea level, is ringed by seven summits of 7000-8000 m. **Toward Annapurna** I was erected with local stones (schist) and carved slabs. It is axised toward the Annapurna I summit, 8091 m. and is intends to act as a generator, a launching pad for the mind, which is accelerated by the huge, rocky, icy take-off **toward the astronomical distances.**

On October 1983, a second expedition climbed a second time to the artpiece to rework it and found it covered with fresh snow. We rebuilt it with some modifications aimed at simplifying it and combining it more with the boulder/rock toward which it is constructed.

These activities and ideas discussed above brought me to consider tectonic sculpture **on other planets.** On Augest 2,1982 I proposed to the U.S. National Aeronautics and space administration NASA the reactivation of one of the Viking Lander'ssampling arms to perform a sculptural act on **Mars** putting on stone vertically on top of another stone whithin the Lander's sampling field.

In order to use the Lander's arm, it is neccessary to involve NASA's deep space facility network. An estimated 200 individual radio commands would be needed to perform the placement of one carefully chosen stone (basalt) on top of another carefully chosen stone. Radio signals travel from Earth to Mars and back in about 40 minutes; the Remote Act would take about a day. This act would extend the radius of **human sculpture** to 50-500 million km.

NASA is developing mobile Landers, MarsRovers, for future missions on Mars. The possibility of using a MarsRover for robotic sculptural act entices me as an environmental desert sculptor in a three-fold manner:

The ability to survey systematically the surface of this distant desert combined with the data, already received from the various Mars orbiters would enable me, on Earth, to select

sites for works; The ability to lift, carry and handle stones would enable the MarsRover to execute sculptural works akin to those I created on the Tzin plateau, thus creating a new kind of **Human extension;** The ability to maintain a long-lasting contact with the MarsRover would enable me to develop a dialogue between the artworks and their environment - they could be modified, reworked and changed.

The gigantic canyon-graben system of Vals Merineris, in the equatorial region of Mars, streches 4000 km. east - west and contains chasms 4000-9000 m. deep [3]. This huge cliff labyrinth of **tectonic sculpture** was created by contraction of the Martian crust billions of years ago. In the event my project is undertaken, I would instruct the first available MarsRover to servey the cliff edge of the flat plateau runing toward these chasms, locate sites and execute stone 'runways' toward the cosmic vastness - **Astro-sculpture.**

The process could first be modeled and simulated in the southwestern deserts of the U.S.A.

It will be possible in the seen future to activate radio-controlled devices to perform **tele-sculptural works in the solar system** - on the surface of the Moon, Mars, Uranus. The mateials for these remote acts could be stones, gravel or dust.

Accordingly, I met two scientists in the Jet Propulsion Laboratories, Passadena, on 2th August, 1982. These were dialogues exploring the fisibility of performing the laconic geometrical sculptural acts by the 1976 Viking Landers I, II.

Two recent dialogues were held on 19th January 1988, and June 6th with NASA's Director of Solar System Exploration Program at NASA headquarter, Washington D.C.. It was focused on verious aspects of the future MarsRover Sample return mission.

The launching is schedueled for 1998. After cruising for 10 months and reaching near Mars, the return spacecraft will leave the Orbiter one, and land on the surface. The Mars-Rover will get slowly out of it and start one year of scientific samples collecting tour. It was emphasised how extremely complicated this tele-mission is. Completing it the Rover will unload its harvest of samples into the waiting mother-return-spacecraft. After its successful takeoff, back to Earth, the Rover will commance a less-pressured survey and information gathering on the Marsian surface. I suggested that into this tele-robotic survey a sculptural work in Marsian stones will be incorporated: A straight line of 100 m. to the edge of the Vales Merineris cliff.

The answer was: "I am sympathetic the idea. In theory it is possible, since at that juncture the Rover will have completed much of its exploratory tasks".

I asked whether this idea is proposed for the first time. The answer was: "Yes, to the best of my knowledge. There is value in the symbolism that could potenially associated with such a project if it were to be a collaborative effort on the part of several nations. Probably mainly with Russians".

Presently, I try to make progress in these direction.

4. THE SITUATION OF SCULPTURE

Malevich writes in 1919:

"At present moment, man's path lies **through space.**
Suprematism is the samaphore of colour in this endlessness...
White as the true, real, representation of **infinity**..." [4].

"The late eighties are not the time of dynamic avantgarde. They are a time in which art pauses, reorganizes itself, and recombines existing strategies.

The authenticity of this art cannot be measured by innovations in art historical styles and forms. We have to reconsider which is authentic in art: the permanent transfer of limits or power and intensity of individual work byond all art historical linearity. Documenta 8, illuminates this situation" [5].

On the contrary - the time had come for a **powerful sculptural launch forward** - beyond the Futurism of Marienti and Buchionni (1909-1913); beyond the Constructivism of Tatlin (the model for monument for the third International, 1919); and of Gabo; beyond the Endless Column of Brancusi (1937); beyond Smith, Caro, Shemi, de-Suvero (1960-1988).

Sculpture should launch itself beyond the Earth and the Environmental works of Smithson, Holt, Heizer, Moris, de-Maria, Long, Openheim (1968-1980).

Harrison (1974) suggested to NASA to perform a "Northern Aurora" above San-Francisco, and was rejected. NASA invited American artists to propose mini-sculptural projects for the shuttle that will be performed in the atmospherical hights. To this call responded Burges, Davis and others, not long before the tragedy of the Challanger on 28.1.86.

The project Roden Vulcano in Arizona of Turrel, was defined by Russel "An earthwork looks to the sky" [6]. All these projects are still bounded to planet Earth - **Earthbounded.**

5. SHAPING OF ENERGIES AND VOID

Democritus, as one of the pre-socratians atomists, stetes that **All is atoms and void.** Lau-tsu defined it as **silence and void.**

Whitehead tells us that "...today physics is annoyed by Quantum theory... that this kind of existence has no similarity to the existence of real substences... we have to change totally our notions about the **physical existence...**

...A constant discontinuity... high and low tides of **energy** vibrations... we got rid of **matter...**" (1925).

According to later physicists, matter does not exist. It is but webs of energy waves... all is webs of cosmic waves (Schrodinger).

We ohght to conceive matter and energy as synonyms that identify the physical reality (de-Broglie).

Mass and Energy are synonyms. Granite, limestone, dolomite. marble, bronze, steel - are atoms-and-void; Are webs of powerfields and energy waves.

Sculpture is shaping of masses by forces through space and time; it is **shaping of energies-and-void** through space and time - -

The universe is energies and void. A caotic suspention of supet energy clusters, power-fields and void. Human energy-and-void sculpture joins now this totality via advanced Astro-technology.

6. INTERGALACTIC SCULPTURE

The hour had come for a powerful launch forward - beyond the ranges of the solar system, to the intergalactic vastness.

On June 22[th] 1989, I launched from the Bar-Giora satellite lazer ranging station, west of Jerusalem (connected to NASA's Wegener Laser ranging global network), a **one billioin km.** tall laser beam, aimed **verically to the plane of the Milky Way.** The launching, 55 minutes, 33 seconds, sent the 15 cm. diameter beam. to cruise light-speed for some four hours before leaving the solar system toward infinity of space-time.

I propose to perform more powerful intergalactic launch - a **Super-Roofless-Cathedral** of 20 parallel Laser beams, 1 billion km. tall, on the International Space year (1992).

* * *

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GLOSSARY:

graben - a steeply sloping cliff along a strike-slip-fault.

Hamada - a chalky plane with flint gravel.

loess - composed of fine-graind, yellowish-brown, deposited by the wind.

Acknowledgements - I would like to thank Yosef Bartov, Director of the Geological Survey of Israel, for his assistance with geological terms in the manuscript; Frank Bristow, Director, Public Information Officer, Jet Propulsion Laboratories, for his hospitality (2.8.1982); Haggai Netzer, Head of School of Astrophysics, Tel-Aviv University; and Akiva Bar-Noon, Director of the Israeli Space Agency.

Midrashat SdeBoker

Summer 1991

פיסול פוֹסט-אַלפַּיִים

הַפיסוּל כַּיוֹם כָּשִיר לְהַבקָעָה אֶל הֶחָלָל - עֲנָק מֵימָדֵי אֲנֶרגִיוֹת - בִּמהִירוּיוֹת האוֹר -
בְּקִיוּם כִּמעַט אֵינסוֹפִי - - הִגִיעָה שְעָתוֹ לִפרוֹץ אֶל שְנֵי מֶרחָבֵי עֲנָק -
אֶל מַעֲרֶכֶת הַשֶמֶש - הזֹאת -
- - ואֶל שבִילך החָלָב - - הַזֶה -
עָבַר עָשוֹר מֵאָז שֶשוּגַר סוּפֶּר-אוֹבֶּלִיסק אֱנֶרגִיָה I שֶלִי - מִילִיָארד ק״מ גוֹבהוֹ -
מִרֶשֶת VEGENER העוֹלָמִית - אֲנָכִי לִשבִיל החָלָבִי, בִּמהִירוּת האוֹר - -

- - -

אֲנִי חוֹתֵר ל:

☐ שִיגוּר סוּפֶּר-אוֹבֶּלִיסק II - עוֹד יוֹתֵר אֵיתָן - מֵאוֹתָה רֶשֶת - בְּעֶרֶב תוֹם הָאֶלֶף הַשֵנִי בארגוּן אוּמוֹת הַמְאוּחָדוֹת - אֶל סַף הָאֶלֶף השלִישִי -

☐ פיסוּל מִדבָּרִי רוֹבּוֹטִי בִּזרוֹעַ הָאַחַת שֶל ה-Mars-Rover - קַו אֲבָנִים אֶל שְׂפַת מָצוֹק תהוֹם הַמַאְדִים - 2010 -

☐ שִיגוּר סוּפֶּר-אוֹבֶּלִיסק אֱנֶרגִיָה III מִתַחֲנוֹת לַיְיזֶר מִכַּדוּר הָאָרֶץ - יָרֵח - מַאְדִים - בְּנִיצָב לְמִישוֹר שבִיל הֶחָלָב - 2020 -

- פַסָלִים הֵם כָּנֵי שִיגוּר של הַהַכָּרָה -

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על רִכסֵי וּפִסגוֹת הַר-הַנֶגֶב וְסִינַי שָׂרְדוּ גַלֵי-עֵד בְּנוּיֵי אֶבֶן מִתְקוּפוֹת של נַוָודֵי מִדבָּר - גַלֵי-עֵד לְרָאשֵי שִבטֵיהֶם - וּמְשוּלָבִים בָּהֶם קַוֵי אֶבֶן אֲרוּכִּים בֵּין פִסגוֹת - הָאָרוֹך שֶבָּהֶם, בֵּין פִסגַת הַר רָמוֹן לְפִסגַת הַר רוֹמֵם, מִשתָרֵעַ עַל 4.6 ק״מ - - יַחֲסֵי אָדָם-פִסגוֹת - -

קַוֵי הָאֲבָנִים שֶלִי עַל-פְּנֵי שְׂדֵה-צִין - עַל פִסגַת הַר אַרדוֹן - 1980 -
מַדרֵגוֹת הָאֶבֶן שֶלִי מוּל פִסגַת גֶ׳בֶּל עֲרִיף-אַ-נָקָה בְּמִזרַח-סִינַי -
וּמוּל פִסגַת אַנַפוּרנָה I בַּהִימָלָיָה 1981 - שַיָיכִים לְאוֹתוֹ שְׂדֵה-כּוֹחַ - -
סְלָעִים מְכִילִים דְמָמָה בַּת מֵאוֹת מִילְיוֹנֵי שָנִים - סַלעֵי גְרָנִיט, דוֹלוֹמִיט, צוֹר, גִירִים, בַּזָלוֹת - -
פיסוּל הוּא עִיצוּב מַסוֹת עַל-יְדֵי כּוֹחוֹת בֶּחָלָל וּבִזמַן הָאֵינסוֹפִיִים - -

4 x

- נדידת יַבָּשׁוֹת קליפּת כּוֹכָב אֶרֶץ הִיא גֵיאוֹ-פיסול - נגיחת יַבָּשׁוֹת מרוֹמְמַת את
רִכסֵי הַהִימָלָיָה - האַלפּים - האַנדים - הרוֹקיס - הַחֶרמוֹן - -
הַפִּיסוּל הָאֱנוֹשִׁי מִצטָרֵף בְּהֶרֶף קִיוּמוֹ - עַכשָׁו - לַגֵיאוֹ-פיסול הַזֶה - כָּאן - -
בפלָנֵטות שביל החָלָב - - באֵין-ספוֹר היקוּמים - -
אַסטרוֹ-הַכָּרָה אֱנוֹשִׁית מִזַהָה סביבֵנו ׳יקוּם׳ שֶׁקוֹטרוֹ כּ-20 מִילְיַארדֵי שנות-אוֹר - -
אֵין-ספוֹר גָאלַאקסיוֹת - אֵין-ספוֹר שבִילֵי חָלָב - -
1/100% מִמַסַת הַ׳יקוּם׳ הַזֶה הֵם מוּצָקים - מִדבָּרִיוֹת - -
בְּאַחַת מִזרוֹעוֹת הַגָאלַאקסְיָה שֶׁלָנו - כּ-100 מִילְיַארדֵי שמָשׁוֹת - אָנו מַקִיפִים
אוֹתָה - פַּעַם בּ-250 מִיליוֹן שָׁנָה - - חָלַפנו כָּאן לְאַחֲרוֹנָה בּעִידָן פֶּרם - - ולפָנֶיהָ
בּעִידָן הַקַמבּריוּם - ונַחֲלוֹף שוּב בּעוֹד רֶבַע מִילְיַארד - -

- - -

הָאָדָם הַזָקוּף חָשׁ את כִּיווּן כַּפּוֹת רַגלָיו כּכִיווּן הַלֵאוּת - אֲפִיסַת הַכּוֹחוֹת - -
כִּיווּן הָאָבָק שֶׁמִמֶנוּ בָּא - - ואֵלָיו יָשוּב - - כּיווּן הָאֶנטרוֹפּיָה - - הַכּנִיעָה - -
ואת כּיווּן ראשוֹ - באַנטי-כּבִידָה - כּמוֹרִי אֲנָכִי - כּנסוּקָה אֶל הָעִילָאִי - -
מִכָּאן הַדַחַף הַקַמָאִי לְהַמרָאָה אֲנָכית - - הטרַנְגית - -

אֶל מֵירוּק-קַתַרסיס-קִיוּמִי - -

אֶל אֵין-סוֹף יקוּמֵי הַיקוּמִים - - ס

- - הַנִצחִי

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The Ultimate Earthwork

Philip Leider

K. Malevich, manifesto of the Supremetism 1919:
"...At the present moment Man's path lies through space...
White as the true, real representation of infinity...
(The Great Experiment: Russian Art 1863-1922 /
Camilla Gray, pp. 283).

Among the very few people who helped Ezra Orion bring the idea for this evening's extraordinary event to the attention of the officials of the International Space Year, was the American engineer, Len Arnowitz. When he first contacted them, they responded with a press-kit containing some of the ideas they had already considered to commemorate the International Geophysical Year. Some of them were:

1. "A worldwide student videoconference, organized by NASA", an event they described as "global".
2. "A special program at the National Science Teachers Association", but this was only "national".
3. "...Environmental monitoring by elementary and secondary school students", but this was, alas, only "local".

In response to these, Arnowitz sent Ezra Orion's proposal: a simultaneous release of vast bursts of laser energy from dozens of stations, from the northern hemisphere, a "Super Cathedral" - 1 billion km. tall, soaring at the speed of light, vertically to the plane of the Milky Way, and, theoretically at least, infinite in duration. The people at ISY must have been, well, stunned... They were encountering, as had several technical communities before them during the past few decades, the sudden intrusion into their domain of strange and foreign obligation: the obligation to recognize their **sculptural** potential.

Kazimir Malevich, that great visionary of art, foresaw as early as 1929, that moment when art would not be able to proceed without the co-operation of the technical community. "Technical means", he wrote then, "are penetrating into the purely painterly picture... the characteristics or functional qualities of the engineer begin to become linked with the artist". He conceived of works - of which Orion's **Super Cathedral** is certainly one - that transcended all the categories of painting, sculpture or even architecture: "Let tall needles and flying houses prepare to take off! Let wedge shapes cleave the bosom of space!..."

The American artists, **Robert Smithson,** whose Earthworks Orion has long appriciated, wrote of how, in bringing such constructions into being, the corection of the technical community would consume enormous amounts of the artist's energy. "The time and effort given over to dealing with **officials** of various kinds, the securing of permits and licenses, the dealing with committees and budget-managers, techinicians who frequently understood nothing about art whatsoever, but who also, he discovered, frenquently respected art and artists deeply. All this Smithson conceived as a new kind of studio-time. Studio-life, he realized, would consist less and less in the tedium of executing works already existing in the mind, and more and more in the equally tedious meetings and delays of meetings with entire classes of people, with whom artists had never before been so actively engaged.

Often enough, it all falls apart. But there are also moments in such artist-manager negotiations when at last the obstacles to the project are cleared and the technicians find themselves taking a surprisingly new kind of interest in the proposal, and especially in **their** part in it. In the letter from **Charles Reigber** and **Rolf Koenig** of DGFI/D-PA, Frankfurt, urging member stations to participate in tonight's luanch:

> "...At the very beginning we were also somewhat sceptical about this Laser Sculpture. But from day to day we are becoming more enthusiastic. So we would also like to see you participating..."

And, one by one, each Sasellite Laser Ranger Station become curious, then interested, and then, finally, "enthusiastic". Yet, surely the exotic and unaccustomed nature of the proposal would have discouraged their participation, except for saving elements, also stated in the same dispatch, but this with a certainty and pride the authors had no wish to conceal:

> "...This outstanding conception of art can be realized only by us scientists, engineers and technicians..."

They, not students at a global "videoconference"; **they,** not the National Science Teachers Association; **They,** not elementary and secondary school students "monitoring" the environment; **they** and they alone are the only ones who can realize **this homage to the International Space Year.**

And thus Orion and few dedicated friends in the technical community managed to secure the cooporation of the scientists, engineers and technicians, who alone could realize the astonishing work of art manifesting itself at this hour. It was, indeed, an example of the new kind of studio-life that Smithson found so curious and infuriating. For Orion's work consisted entirely of first discovering what the technicians needed, which was a way to commemorate the International Space Year, and then to seed in their minds something of the vision which had been in his own mind long before he had ever **heard** of the International Space Year. For, although the needs of the technical community and the needs of the artist meet in this work, they are, in truth, not following a single agenda: Orion has his own agenda to fulfill, and it is driven not by history of space exploration, but by the **history of art**...

What is truly remarkable is how consistent is this moment with the greatest aspirations of modern art from the earliest moments of its conception. It is as if this work a vision shared by **Malevich** with both **Kandinsky** and **Mondrian** has finally come into existence: the dematerialized work of art at last.

Malevich, Kandinsky and Mondrian, the creators of abstract art, the art of our century, never met, never exchanged ideas. Yet; all three speculated on an **ultimate work of art** that would free the artist once and for all from his dependence on **matter.** All three believed (along with millions of others at the turn of the century, and more than a few from the scientific community), that between matter and spirit there was no qualitative breake, but rether more of quantitative continuum. They believed that spirit was simply a refined form of matter, so refined, in fact, that it could be perceived, at this stage of "evolution", only in the form of "auras" or "vibrations", and these only by spiritually gifted individuals. Deeply anti-materialistic, they believed that all of history, all of life, was leading to period when all matter would return to the universe of pure spirit from which it had, so to speak, condensed itself, eons and eons ago. They also believed that **art** could help people come to understand this process more clearly, could hasten the spiritual evolution of people by, to begin with, demonstrating that art did not depend on the creation or on the depiction of **things.**

Thus Malevich called his nature work "non-objective", meaning an art that did not depict or depend upon objects. Kandinsky and Mondrian referred to their art as "spiritual", and Mondrian, chafing at the limitations of even the basic materials of painting, wrote in exasperation that "For the spiritual artist, color and brushwork sufficinetly represent matter". The ultimate work would be one hardly conceivable, in which spiritual states would be communicated by thoughts, vibrations of spiritual energy, without the use of materials at all...

Ezra Orion is not a theosophist, and does not come to the conception we honor here tonight through theosophical speculation. The meditation whose culmination we are present at tonight, began with the majestic earthworks in the **Negev desert** of 1978-79, and the artist's deepening appreciation of the relationship to be unearthed between **sculpture and geology,** especially, in Orion's case, to **plate tectonics.**

The Syrian-African rift has almost mystical connection to Orion's desert works of 1980s. With a kind of driven, relentless logic, Orion's art led him to the **Annapurna Sanctuary** in the **Himalaya Mountainas,** formed as they are, by the same **tectonic forces** that created the Syrian-African rift. What he had found he'd created in the central Himalayas was waht he called a "luanching pad of consciousness" - to the intergalactic vastness.

It must have been there that Orion began to realize where what used to be called "sculpture" had to go. But how? With what? The answer is here tonight, in the altogether improbable union of the **International Space Year and the aspirations of the noblest art of our century.**

(Spoken in the evening, at the Bar-Giora Observatory, Israel, April 27, 1992, during the hour of that station's participation of Orion's energy **Super Cathedral** launch).

Philip Leider
Founding Editor of **Art Forum,** New-York
1962-1971
Prof. of Art History, Un. of California
IRVINE, CA, 1971-1993
Prof. of Art History, Bezalel Academy
Jerusalem.

Intergalactic Sculpture

Ezra Orion

I reach the intergalactic sculpture via the "infinite of worlds" of Jiordano Bruno; Via the "Black square on white" of Malevich; the "Monument for the third international" of Tatlin; "The endless column" of Brancusi,and via lone stone lines along sky lines in the Negev desert, from the early and middle bronze ages.

Malevich writes in 1919 :

"At present moment man's path lies through space. Suprematism is the samaphore of colour in this endlessness... White as the true, real, representation of infinity..."

Essencialy the abstract visual arts did not progress beyond Malevich. Some section of it continue to produce variations of Suprematism, along the same front line.

The visual arts did not progress beyond the Futurist battle cry of Marinetti and Buccioni (1909-1913). It rather fell back to slow motion kinetic compositions.

Sculpture did not progress essencialy much beyond Tatlin's constructivism (1914-1919), and continue to produce variations of it along the same front line. It developed richness, surface heterogenity, but not depth of essence.

Earth art has been an impressive progress (late 60'es-early 70'es), but reached a cul-de-sac, has been domasticated and urbanized.

Smithson relates his Spiral jetty partly to the spiral galaxies around us (1970). De-Maria clears in the western desert of North America and in the western Sahara two-line composition aimed to be seen from orbiting satelites. N.Harison proposed to NASA to produce an aurora above San-Francisco, and was regected. NASA called for American artists to propose projects for the "Challanger" shuttle, to be executed during its orbits in the atmospheric hights. Burghes, Davis and others from the center for Advanced Visual Studies, M.I.T., did submit thiers, not long before the tragedy on 28.1.1986.

The project of the Roden Crater, Arizona, of Turrell was defind by Russell as "An earthwork looks to the sky" (1986). Still "to the sky". These projects are still earthbound ten years after the landing of Viking lander I, II on the stony face of Mars - -

"The late eighties are not the time of dynamic avantgarde. They are a time in which art pauses, reorganizes itself, and recombines existing strategies.

The authenticity of this art cannot be measured by innovations in art historical styles and forms. We have to reconsider which is authentic in art: the permanent transfer of limits or the power and intensity of individual work beyond all art historical linearity. Documenta 8 illuminates this situation".

(Manfred Schneckenburger, Documenta Press 4, Augest 1987)

On the contrary. The late eighties are the ripe time for an extreem strike forward of sculpture in two dynamic environments - the Solar System; the universe. The hour had come not for pauses but for a boom forward. Not for reorganization, recombining existing strategies, reconsidering historical styles, but for a spaceward breakthrough - to extreem abstraction, to immense physical dimentions, to light speed velocities, to eternal duration - -

The field of my activity as a sculptor developed since 1960 in five stages: Regular, architectural, desert-tectonic, the solar system and the intergalactic.

In the regular I worked mainly in welded iron, steel and stone. The main works from this stage are: two steel ones, 1.86 m. high, at the Museum of Modern Art, New-York; and the Rockeffeller collection (1964); and a steel work, 3.00 m. high in the sculpture garden of Israel Museum, Jerusalem (1966).

In the architectural stage I worked mainly in plaster (models for a sculpture field and monuments) and concrete. The main works from that stage are: a monument for a fallen comrades in the Golan hights, 14 m. tall (1972); and the "Staircase" in Jerusalem, 18 m. tall (1980).

In the desert-tectonic stage I worked mainly with local stones and rocks. Horizontal works, site-oriented, tens to hundreds m. in scale. The main ones are on Sde-Zin in the Negev desert, (1980-82); On the edge of Ramon crater, in the Negev (1980-88); At the foot of Mt. Arif-e-Naka, in Northern-Sinai desert (1981-82); And in the Annapurna basin, central Himalaya, Nepal (1981-83).

I coined the terms: Tectonic Sculpture, Erossional Sculpture, Aeolic Sculpture, Volcanic, Meteoritic and Geo-Sculpture.
The main acts in the forth stage were visits and talks in the Jet Propulsion Laboratories, Pasadena, U.S.A. (2.8.82), and in NASA headquarter, Washington D.C. (19.1.88) - Discussing the feasibility of execution with local stones desert works by the future MarsRover, on the edge of Vales Marineris, on Mars.
I coined the term: Sculpture in the Solar System.
The threshold of the fifth stage, the intergalactic, was an act of launching an unseen Lazer beem vertical to the plain of the Milky Way, in Tel-Hai, Northern Galilee (24.9.87).
I coined the terms: Astro-Sculpture, Tele-Sculpture, Intergalactic Sculpture.

This is an expanding sculpture field whithin-which I executed last years a massive steel work at Tel-Nof, air base (1987); A concrete work, 20 m. tall, at the western enterance of Yerucham, in the Negev desert (1987).
A steel and concrete work, 25 m. tall, at the Dead Sea works (1988).

For the first stage I do owe to Shemi and Caro. For the second stage I do owe to Caravan and the 18th century architect of Jantar Mantar in Delhi. For the third to Smithson, Heizer and De-Maria. For the forth to T.Johnson of J.P.L., and for G.Briggs of NASA headquarter. For the fifth to the astrophysicist J.Bekenstein.

Sinchronicaly to the sculpture process, there was an epistemological process at work. Considering the relations between the "entity in itself" and its phenomenal appearences. Some of Plato, some of Kant, some of Cassi rer, some of Whitehead - - Through which you become a nonbeliever of the phenomena - a nonbeliever of the visual and the tangible.

But contrary to that, sinchronicaly, as an homosapience, an homoerectus psychophysical human, as an co-heir of the haritage of sculpture, you do believe in the power and the tangibility of masses. You are, may be, a lucid sculptor.

These are the sculptural-epistemological processes, whithin which I reach last years the stage of tele-abstract-sculpture.

On the 22th of June 1989 night, a 1 milliard kilometer long energy beem, was launched, vertically to the plain of the Milky Way, from a radio/laser geophysical observatory of Bar-Giora, near Jerusalem. The act was sponsored by the Israel Museum. Courtecy - the Israeli Space Agency.
The launch took 55 minutes, 33.3 seconds.

It is a departure of sculpture from its visual, tangible history into the unseen sphere of extreem abstraction. It is its depature from Matter from which it was created from prehistory onward - to the unseen, unperceivable sphere of huge energetic entities cruising in the speed of light the intergalactic vastness - -

It lost quarter of its power by breaking through the atmosphere, cruised out of the solar system in 5 hours, over passed the "Voyager 2" spacecraft (launched 20.7.1977) whithin the same time - to the cosmic infinity - -

INTER-GALACTIC SCULPTURE

Today sculpture is ready for spaceward breakthrough - reaching extreme abstruction, immense physical dimentions, light-speed velocities and eternal duration - -

Now is the time for sculpture to extend in two dynamic environments - the Solar System, and the Intergalactic vastness - -

My activities as a sculptor evolved since 1960 through five stages: Conventional. Architectural. Desert-Tectonic. Solar System and Intergalactic - -

During the Conventional stage I worked mainly in weled iron, steel and stone. The main works from this stage are in steel: 1.86 m. high. at the Museum of Modern Art, New-York, at the Rockefeller Collection (1964); 3.00 m. high in the sculpture garden of the Israel Museum, Jerusalem (1966),

In the Architectural stage I worked mainly in plaster - models for a 'Sculpture Field' and monuments. The main works in concrete, are: War memorial, 14 m. high, in the Golan Heights (1972); And the 'Staircase', 18 m. high, in Jerusalem (1980); 20 m. high, white twins, in Yeruham (1990); 25 m. high, steel obelisk, overlooking the Dead Sea Works (1991).

In the Desert-Tectonic stage I worked with local stones and rocks. Horizonal works, site-oriented, ranging from dozens to hundreds of meters in length. The main works are in Sde-Zin, Negev Desert (1980-82); On the edge of the Ramon crater, the Negev (1980-88); At the foot of Mt. Arif-e-Naka, Northern-Sinai Desert (1981-82); And in the Annapurna basin, central Himalaya, Nepal (1981-93).

The main acts in the **forth stage** were visits and talks in the Jet Propulsion Laboratories, Passadena, USA (2.8.1982); And in NASA Headquarters, Washington D.C. (19.1.1988; 8.6.1990; 31.8.1996), with the Directors of the Solar System Exploration Program - duscussing the feasibility of the future Mars-Rover performing desert works, using local stones, on the edge of Vales Marineris, on Mars.

the threshold of the **fifth stage, the Intergalactic,** was the launching of a laser beam, vertically to the plain of the Milky Way, in Tel-Hai, Northern Galilee (24.9.1987).

On the night of June 22nd 1989, a 1 billion km. energy beam was launched from a laser ranging geophysical observatory of Bar-Giora, near Jerusalem. The act was sponsored by the Israel Museum; Courtesy of the Israel Space Agency; VEGENER Laser Ranging Network.

The launch lasted 55 minutes, 33 seconds - SUPER-OBELISK - vertically to the plain of the Milky Way.

The beam lost a quarter of its power while breaking through the atmosphere, cruising out the solar system in 5 hours, passing the 'Voyager 2' spacecraft (launched 20.7.1977) in about the same time - on to the cosmic infinity - -

The third launch, on April 27, 1992, within the Internatioanl Space Year activitiesc - one Billion km. tall SUPER-CATHEDRAL. Its basis was 10,000 km. long and 3,000 km. wide, roofless, lightspeed. The 'Cathedral' was launched, simultaneously, by most of the Vegener Laser Ranging Network between observatories Bar-Giora, west of Jerusalem, western Europe and the Godard Space Flight Center - vertically to the gravity plain of the Milky Way -

It marks the departure of Sculpture from its visual, tangible history into an unseen sphere of extreme abstruction. It is a departure from MATTER to which Sculpture has been bound from prehistory onward - into the unseen, imperceptible sphere of Huge Energy Entities cruising at the speed of light, through the Intergalactic Vastness - -

A Super-Shaft of parallel energy beams - an Intergalactic Architecture - towards the Infinity of Universes - - -

Ezra Orion
Desert Sculptor
Negev Desert
ISRAEL

Inter-Galactic Sculpture for the 21st Century

Ezra Orion (Environmental Desert Sculptor)

A. Sculpture today is ready for a spaceward breakthrough - reaching extreme abstruction, immence physical dimentions, light-speed velocities and nearly eternal duration - -
Now is the time for sculpture to extend in two dynamic environments - the Solar System - - and the Intergalactic vastness -

My activities as a sculptor evolved since 1960 through five stages: conventional, architectural, desert-tectonic, solar system and intergalactic.

During the conventional stage I worked mainly in welded iron, steel and stone. The main works from this stage are in steel: One, 1.86 m. high, at the Museum of Modern Art, New-York, and the Rockefeller collection (1964); and the other, 3.00 m. high, in the sculpture garden of Israel Museum, Jerusalem (1966).

In the architectural stage I worked mainly in plaster - models for a 'sculpture field' and monuments. The main works from this stage in concrete, are: war memorial, a 14 m. high, in the Golan hights (1972); and the "Staircase", 18 m. tall, in Jerusalem (1980).

In the desert-tectonic stage I worked with local stones and rocks. Horizontal works, site-oriented, ranging from dozens to hundreds of meters in length. The main works are in Sde-Zin, the Negev desert, (1980-82); On the edge of Ramon crater, the Negev (1981-88); At the foot of Mt. Arif-e-Naka, Northern Sinai desert (1981-82); and in Annapurna basin, central Himalaya, Nepal (1981-83).

The main acts in the forth stage were visits and talks in the Jet Propulsion Laboratories, Pasadena, U.S.A. (2.8.1982); and in NASA headquarters, Washington D.C. (19.1.1988, 6.6.1990) with the Director of Solar System Exploration Program - discussing the feasibility of the future MarsRover to perform desert works, using local stones, to the edge of Vales Marineris, on Mars.

The threshold of the fifth stage, the intergalactic, was the launching of a thin laser beam, vertically to the plane of the Milky Way, in Tel-Hai, Northern Galilee (24.9.1987).

On the night of June 22nd 1989, a 1 billion Km. tall energy beam, was launched from a satellite laser ranging station of Bar-Giora, near Jerusalem. The act was sponsored by the Israel Museum; and the Israel Space Agency. The launch that lasted 55 minutes, 33.3 seconds -sent a SUPER OBELISK - vertically to the plane of the Milky Way.

It is a departure of sculpture from its visual, tangible history into an unseen sphere of energy entities. It is a departure from MATTER to which sculpture has been bound from prehistory onward - into the unseen, unperceivable sphere of huge energetic entities, cruising at lightspeed the intergalactic vastness - the beam lost a quarter of its power while breaking through the atmosphere, cruising out of the solar system in 5 hours, passed the "Voyager 2" spcecraft (launched 20.7.1977) - on to the cosmic infinity - -

B. The third launch, on April 27th 1992, within the International Space Year activities, sent a billion Km. tall **SUPER-CATHEDRAL** - roofless, lightspeed, vertically to the gravity plane of the Milky Way. The 'Cathedral' was launched, cynchronically, by most of NASA Crustal Dynamics Project, and the European Wegener Satellite Laser Ranging stations -

1. Bar-Giora, Israel
2. Helwan, Egypt
3. Xrisokellaria, Greece
4. Dionysos, Greece.
5. Simeiz, Russia
6. Zvenigorod, Russia
7. Riga, Latvia
8. Graz, Austria
9. Wettzell, Germany
10. Potsdam, Germany
11. Graese, France
12. San Fernando, Spain
13. Greenbelt, USA
14. Orroral, Australia
15. Yarragadec, Australia.

The two Australian stations launched their 1 billion km. tall beams toward the South Pole of the Milky Way.

A Super-Shaft parallel energy beams - vertically to the plane of the Milky Way - an **Intergalactic Architecture** toward the infinity of universes - -

C. Toward the end of this century, combined with the landing of the not yet developed MarsRover on Mars for the Samples Collection Mission - we propose to incorporated into its working program, after the successful take-off of the Mother Space Craft back to Earth, carrying His harvest with her - a desert geometric stone lines, right-angled to the cliff-edge of the abyssmall Valles Marineris.

D. On Summer of **the year 2000** - the end of this millenium on the clearest possible night - - we propose to launch from all the future Laser Ranging Network Stations - **SUPER CATHEDRAL 2** - vertically to the plane of the Milky Way.

Some time during the first or the second decades of the 21st century, the international scientific comunity will install research bases on the Earth's moon and on Mars. These will probably will include future types of Laser Ranging Stations.
Ones in two years - Earth, Moon and Mars are posted on one architectonical Axis. On one of these hours we propose to launch synchronically from them - **SUPER CATHEDRAL 3,** vertically to the plane of the Milky Way (illustration 1).

The scientific bases on Earth's Moon will have to be covered by moon's dust, or regolite - against the sollar ultra-violet radiation. NASA plans to cover them with thick layers of moon's dust by future Robot-bulldozers.
We propose to shape these ramparts as Sculptural embankments - as sculptural dustworks.

Ones in two years Earhe - Moon - Sun - Mars are posted on one Axis. On one of these hours we propose to launch synchronically from three of them - **SUPER CATHEDRAL 4,** lightspeed, perpendiculary to the gravity plane of this galaxy - an Intergalactic Sculpture - - an Intergalactic Architecture - toward the vast random infinity of universes - - (illustration 2).

□

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I thank Dr. Jeoffrey Briggs, NASA's Sollar System Exploration Program;
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Midrashat Sde-Boker
ISRAEL 84990

See: E. Orion, Sculpture in the Solar system, LEONARDO, Vol. 18, No. 3, pp. 157-160 (1985)
Intergalactic Sculpture, LEONARDO, Vol. 24, No. 4, pp. 486-489, (1991).

1992

אדריכלות בין־גאלאקטית

הגיעה שעתו של הפיסול לפרוץ - אל מהירויות האור - אל ישויות אנרגטיות סמויות, אדירות מימדים, החוצות את החלל הבין־גאלאקטי - -

מעבר לעמוד האינסופי של ברנקוזי - שינור אלומות מטילי אנרגיה, מיליארדי ק״מ אורכן, בניצב למישור הגאלאקסיה הזאת, במהירות האור - -

שדה הפעילות שלי כפסל התפתח משנת 1960 בחמישה שלבים: פיסול קונבנציונאלי, פיסול אדריכלי, פיסול מדברי־טקטוני, פיסול במערכת השמש ופיסול בין־גאלאקטי.

בשלב הראשון עבדתי בברזל ובאבן בקני־מידה מקובלים. העבודות העיקריות מאותה תקופה:

פסל פלדה - 3 מ׳ גובה, המוצב בגן הפסלים של מוזיאון ישראל, ירושלים; ופסלי פלדה - 1.86 מ׳ גובה, הנמצאים באוסף נלסון רוקפלר ושל המוזיאון לאמנות מודרנית, ניו־יורק.

בשלב השני עבדתי בגבס (מודלים לפיסול אדריכלי) ובבטון. העבודות העיקריות מאותה תקופה הן: אנדרטה במצפה גדות - 14 מ׳ גובה, בקמפוס הגולן; פסל ״מעלות״ - 18 מ׳ גובה, ירושלים; ומודלים לשדה פסלים ליד מדרשת שדה־בוקר.

בשלב השלישי עבדתי באבנים ובסלעים מקומיים. עבודות אופקיות בקני־מידה עד מאות מ׳. העבודות העיקריות מאותו שלב הן: על־פני שדה צין, על שפת מכתש רמון בנגב, לרגלי גבעל ערוף אֶ־נקה בצפון־סיני, בניא ליד תל־חי בגליל העליון, ובבקעת אנטונינה, בגובה של 4,000 מ׳, הימלאיה, נפאל.

בשלב הרביעי קשורות פנישות במעבדות להנעה סילונית בפסדינה 2.8.1982, ובמפקדת נאס״א, וושינגטון 19.1.1988, 8.6.1990 - עם NASA Director of Solar System Exploration Program - לגבי היתכנות ביצוע פיסול על־פני מאדים, על־ידי ״מארס־רובר״, על שפת מצוק ולס מרינריס.

השלב החמישי, הנמצא עתה בראשיתו, נפתח בשינור קרן לייזר בניצב למישור שביל החלב, מחצר תל־חי (24 בספטמבר 1987). השינור השני ממצפה בר־גיורא, 22.6.1989, היה מימוש מרחיק לכת של שלב זה. זוהי פריצה של הפיסול מן ההיסטוריה שלו: מן החומרים שבהם עוצב מאז הפרהיסטוריה - לכדי ישויות אנרגיה סמויות, אדירות מימדים, המשוגרות במהירות האור, אל הטווחים הבין־גאלאקטיים, אל טווחי זמן אינסופיים - -

קוטר המטיל ששוגר - 12.5 ס״מ. משך השינור - כשעה. ההגבהה - אנכית, בניצב למישור הכבידה של שביל החלב, אל מפתח בְּיקום הנראה. אנכי, אנטי־גרביטאי, קונדרלי, אנטי־אנתרופי - הפסיד רבע מכוחו בפריצה מתוך האטמוספירה - נטש את מערכת השמש תוך כחמש שעות - חלף על־פני החללית וֹיאג׳ר 2, ששוגרה ב־1977, תוך זמן דומה - אל האינסוף הבין־גאלאקטי - -

בשינור השלישי, האחרון (27 באפריל 1992) השתתפו כ־15 תחנות של -

Wegener Network Laser Ranging

- מבר־גיורא ליד ירושלים - מרכז ומערב אירופה - מזרח ארה״ב. תוך 55 דקות, 33 שניות, שוגרה **סופר קונדרלה,** מיליארד ק״מ גוברה, ללא גג, במהירות האור, בניצב למישור שביל החלב - -

- - -

3 X

היעדים הבאים של הפיסול הזה, לקראת שנת 2000 ומעבר לה:

שיגור סופר־קתדרלה 2

לשגר בקיץ של שנת 2000 **מכל תחנות** מודדי הטווח של שתי הרשתות הנוכחיות -
אנכית למישור שביל החלב - אל הקוטב הצפוני שלו ואל הקוטב הדרומי שלו - -
לתגבר את התחנות האלה במשגרים נוספים, כמו זה של Haystak Observatory, USA;
לתאם הצבה 'סולידרית' של 27 צלחות 'השדרה הגדולה' Very Large Array , ניו־מקסיקו,
באותו כיוון, בו־זמנית, ועוד - -

שיגור סופר־קתדרלה 3

אחת לשנתיים מתייצבים ארץ־ירח־מאדים על 'ציר אדריכלי' שאורכו כ־50 מיליון ק"מ.
לכשיוקמו בסיסי מחקר על־פני הירח ועל־פני מאדים בעשורים הראשונים של המאה הבאה,
יש להניח שיופעלו מהם גם מודדי טווח לייזר, בני אותו דור. מוצע לתאם ולשגר בתאריך/
בשעה כזאת, בו־זמנית, בניצב למישור שביל החלב את **סופר־קתדרלה 3** + תיעוד ותקשור
גלובלי - -

שיגור סופר־קתדרלה 4

אחת לשנתיים מתייצבים ארץ־ירח־שמש־מאדים על ציר 'אדריכלי' שאורכו כחצי מיליארד
ק"מ. מוצע, בעקבות סופר־קתדרלה 3, לתאם ולשגר סופר־קתדרלה 4 - שני מיליארד ק"מ
גובהה - - בניצב למישור שביל החלם - -

פיסול לָקוֹנִי, קיומי, של מין אדם אקראי, חולף, החוצה אי־שם את החלל הבין־גאלאקטי - -
אל אינסוף היקומים - -

עזרא אוריון
מדרשת שדה־בוקר

עזרא אוריון

פיסול בֵּין-גָּאלַאקטי

הַגִּיעָה שָׁעתוֹ של הַפִּיסול לְפרוֹץ - אֶל מהֵימירוּיוֹת האוֹר - אֶל יְשוּיוֹת אֶנֶרגֶטִיוֹת סמוּיוֹת - אֲדֵירוֹת מְיַמְּדִים - החוֹצוֹת את החֶלֶל הבֵּין-גָּאלַאקטי במהֵימירוּיוֹת האוֹר - מֵעֵבר לָעֲמוּד האֵינסוֹפּי של בַּרנקוּזי - שיגוּר שֶׁל אֲלוּמוֹת מטִילֵי אֶנֶרגיָה - מִילְיָארד ק״מ גוֹבהָם - בְּנִיצָב לְמִישוֹר הגָּאלַאקסיָה הַזֹּאת - במהֵימירוּיוֹת האוֹר - -

שְׂדֵה הפְּעִילוּת שֶׁלִּי כְּפֶסֶל הִתְפַּתֵּח מְשְׁנַת 1960 בַּחֲמִישָׁה שלָבִים:

פִּיסול קוֹנְצֶנטְרִי-גָּאלַאקטי, פִּיסול אֲדֶרִיכְלִי, פִּיסול מִדְּבָרִי טֶקְטוֹנִי, פִּיסול בְּמַעֲרֶכֶת הַשֶּׁמֶשׁ - ופִּיסול בֵּין-גָּאלַאקטי - -

בְּשָׁלָב הָרִאשוֹן עָבַדְתִּי בְּבֶּרֶזִל וּבאֶבֶן בְּקְנֵי-מִידָּה מקוּבָּלִים. הָעֲבוֹדוֹת העִיקָּרִיוֹת מאוֹתָה תקוּפָה: פֶּסֶל פְּלָדָה - 3 מ׳ גוֹבה, המוּצָב בגַּן הפְּסָלִים ׳בִּילִי רוֹז׳, של מוֹזֵיאוֹן יִשְׂרָאֵל, ירוּשָׁלַיִם; ושְׁנֵי פְּסָלֵי פְּלָדָה - 1.86 מ׳ גוֹבה, הנמצָאִים בּאוֹסְף נֶלסוֹן רוֹסֶנְבֶּרְג ושל המוּזֵיאוֹן לְאָמָנוּת מוֹדֶרנית, נְיוּ-יוֹרק -

בְּשָׁלָב השֵׁנִי - עָבַדְתִּי בְּנְחֹשֶׁת מוּדָלִים לפִּיסול אֲדֶרִיכְלִי) ובְּבֶטוֹן. הָעֲבוֹדוֹת העִיקָּרִיוֹת מאוֹתָה תקוּפָה הן: אַנְדַרטָה במִצפֶּה גְּדוֹת - 14 מ׳ גוֹבה, בְּרְמַת-הגּוֹלָן; פֶּסֶל ׳מַעֲלוֹת׳ - 18 מ׳ גוֹבה, ירוּשָׁלַיִם; ומוֹדָלִים לִישְׁדָה פִּסְלֵי לֵיד מִדְרֶשֶׁת שְׂדֵה-בּוֹקֶר -

בְּשָׁלָב השְׁלִישִׁי עָבַדְתִּי בְּאֲבָנִים ובסְלָעִים מקוֹמִיים. עֲבוֹדוֹת אוֹפְקִיוֹת בְּקְנֵי-מִידָּה עד מֵאוֹת מ׳. הָעֲבוֹדוֹת העִיקָּרִיוֹת מאוֹתָן שָׁלָב הֵן: עַל-פְּנֵי שְׂדֵה צִין ועַל שִׁפּוֹת מכתֵּש רָמוֹן בְּנֶגֶב;

לְרַגְלֵי עֲרִיף-אֵי-נָקָה בְּצִפּוֹן סִינַי; בְּגִיא לֵיד תֵּל-חַי בְּגָלִיל העֶלְיוֹן; ובִּבקְעַת אֲנַפּוּרְנָה, בְּגוֹבה 4,000 מ׳, הִימָלָיָה, נֶפָאל - מוּל מַסִּבַּת אֲנַפּוּרְנָה I, 8,091 מ׳.

לְשָׁלָב הרְבִיעִי קשוּרוֹת פְּגִישוֹת בְּמַעֲבָדוֹת לַהֲנָעָה סילוֹנִית בְּפָסַדֵינָה, ארה״ב, 2.8.1982, ובמִפקָדַת נאס״א בוַשִׁינְגטוֹן, ארה״ב, 19.1.1988, 8.8.1990, 30.8.1996 - עִם:

NASA Director of Solar System Exploration Program - לְנְבֵי הִיתכְּנוּת בִּיצוּע פִּיסול מִדְּבָרִי על-פְּנֵי הַמַּאְדִים על-יְדֵי מְארס-רוֹבֶר, על שִׁפַּת מְצוֹק וָלֶס מֶרִינֶרִיס -

הַשָּׁלָב הַחֲמִישִׁי הנמצָא עתה בְּעִיצוּמוֹ, נִפְתַּח בְּשִׁיגוּר קָרָן לֵיזֶר **בְּנִיצָב לְמִישוֹר שְׁבִיל הַחָלָב** מחֲצֵר תֵּל-חַי, 24 בְּסֶפְּטֶמְבֶּר 1987 -

השִׁיגוּר השֵׁנִי מִמְצפֶּה בֶּר-גִּיוֹרָא, 1989, הָיָה מִימוּשׁ מֶרחִיק לֶכֶת של שָׁלָב זֶה. קוֹטֶר המַטִּיל שֶׁשִּׁגְּרוּ - 15 ס״מ; מֶשֶׁךְ השִׁיגוּר - כְּשָׁעָה; הַהַגְבָּהָה אֲנָכִית, בְּנִיצָב לְמִישוֹר הַכְּבִידָה של שְׁבִיל הַחָלָב, אֶל מִפתָּח בֵּיקוּם הנִרְאֶה - אֶנטִי-גַּרְבִּיטְצִיָה, קַתְדְּרֶלִי, אֶנטִי-אֶנתרוֹפִּי - הִפסִיד רֶבַע מִכּוֹחוֹ בִּפְרִיצָה מִתוֹךְ האַטמוֹסְפֵרָה - נָטַשׁ את מַעֲרֶכֶת השֶׁמֶשׁ תוֹךְ כְּחֲמֵשׁ שָׁעוֹת - חָלַף על-פְּנֵי החַלָּלִית וְאוֹיְיג׳ר 2, שְׁשִׁגְּרָה ב-1977, תוֹךְ זְמַן דוֹמֶה - אֶל האֵינסוֹף הבֵּין-גָּאלַאקטי - -

בְּשִׁיגוּר העִיקָּרִי (27 בְּאַפּרִיל 1992) השתתְּפוּ תַּחֲנוֹת של Wegener Laser Ranging Network- העוֹלָמִית, מִבֶּר-גִּיוֹרָא לֵיד יְרוּשָׁלַיִם - מַרְגֶּרִיטָה וּמַעֲרָב אִירוֹפָּה - ומִזְרָח ארה״ב. תוֹךְ 55 דַּקוֹת, 33 שְׁנִיוֹת, שוּגְּרָה **סוּפֶר קָתֶדְרָלָה של אֶנֶרגיָה** - מִילְיָארד ק״מ גוֹבהָה - קוֹטְרָה כ-10,000 ס״מ - בְּמהֵימירוּת האוֹר - בְּנִיצָב לְמִישוֹר שְׁבִיל החָלָב - -

זוהִי פרֵידָה שֶׁל הַפִּיסוּל מִן הַהִיסטוֹריה שֶׁלוֹ ; מִן החוֹמָרים בָּהֶם עוּצַּב מאָז הפרֶ-הִיסטוֹריה -

לְכדֵי יַשוּיוֹת אֶנֶרגִיָה סמוּיוֹת - אֲדִירוֹת מֵימָדים - המשוּגָרוֹת במהִירוּת האוֹר -

אֶל הטוָוחִים הבֵּין-גָּאלַאקטִיִים -

אֶל טוָוחֵי זמַן אֵינסוֹפִיִים - -

פִּיסוּל לַקוֹנִי, קִיוּמִי, של מִין אָדָם אַקרָאִי, חוֹלֵף, החוֹצֶה אַי-שָׁם את החָלָל הבֵּין-גָּאלַאקטִי - -

אֶל אֵינסוֹף היקוּמִים - - -

עזרא אוריון

2000

פיסול בינגאלאקטי

מחווה לג'ורדאנו ברונו

1. הכל הוא רחוסת של צפיפויות חלקיקי אנרגיה מגיל יקום - -

The everlasting darkness of the intergalactic vastness - -

מיליארדי מיליאדים של מערכות שמש במיליארדי מיליארדים של סופר-צבירי גאלאקסיות - - אינסוף של כורי אנרגיה - - אנחנו כנסים חולפים של חלקיקי אנרגיה מגיל יקום - - פלנקטון קוסמי - -

- - - -

הכל הוא אטומים ותהום (אפיקורוס, דמוקריטוס) - - דממה ותהום (לאו-טסו) - - הכל הוא הרוח אחד, אינדרפי (פרמנידס) - -

Panta Rhei (הירקליטוס) - - לעולם לא ישוב אותו חלקיק לאותו פולסאר - - לא תקיף אותה ארץ את אותה שמש - - לא תקיף אותה מערכת שמש את אותו שביל החלב - -

ההוויה האינסופית האמורפית היא דמון-פרא-הירקליטית - - יקומיות Cosmosity היא התכונה הסטטאלית שלה - -

"כיום מוטרדת הפיסיקה ע"י תורת הקוואנטים... אחת מדרכי ההסבר שלה היא כי האלקטרון אינו חג בהתמדה במסלולו שבחלל... אלא מופיע בסידרה של מסלולים אשר בהם הוא נמצא בפרקי זמן שונים... קיום זה נמצא איננו דומה כלל לקיומם המתמיד של היישים הגשמיים... עלינו לשנות את כל מושגינו על אופי הקיום הגשמי...

אי-התמדה מדהימה... שפל וגיאות של ריטוטי אנרגיה... שיטה מאורגנת של זרימות אנרגיה הפועמת מגיאות לגיאות... שבילו של יש רוטט כזה בחלל מיוצג, איפוא, ע"י סידרה של מצבים... הוא קיים קיום תנודתי על-פני משך הזמן... נפטרנו מן החומר..." (וייטהד).

"החומר איננו קיים. הוא איננו אלא צירופי גלים... הכל הוא צירופי גלים קוסמיים" (שרדינגר).

"...יש לראות חומר ואנרגיה כשני שמות נרדפים, המציינים מציאות פיסיקלית אחת..." (דה-ברויי).

2. אני מגיע לפיסול הבינגאלאקטי דרך "אין-סוף העולמות" של ברונו, דרך הריבוע השחור על לבן של מלביץ', דרך העמוד האינסופי של ברנקוזי ודרך קוי אבן ארוכים בהר-הנגב מתקופת הברונזה הקדומה והתיכונה.
מלביץ' כותב ב-1919:

"At present moment man's path lies through space.
Suprematism is the semaphore of colour in this endlessness...
White as the true, real, representation of infinity..."

האמנות החזותית המופשטת לא התקדמה מעבר למלביץ'. גזרה מסויימת שלה ממשיכה להפיק וראיאציות על הסופרמטיזם - לרוחב החזית.
האמנות החזותית לא התקדמה הרבה מעבר לפוטוריזם של מרינטי ובוצ'יוני (1909-1913). היא פיתחה את המימד הקינטי אך ורק בתחום החזותי והמהירויות הנמוכות - לרוחב החזית.

הפיסול לא התקדם הרבה מעבר לקוסטרוקטיביזם של טטלין (1914-1920) וממשיך להפיק וראיאציות בגזרה זו - לרוחב החזית.

בתחום עבודות האדמה התרחשה התקדמות מרשימה בסוף שנות ה-60 וראשית ה-70, שהובילה לרחוב ללא מוצא. סמיתסון מייחס את ה"מזח הספירלי" שלו גם לגאלאקסיות ספירליות ביקום (1970?). דה-מריה מתווה במדבר המערבי של ארה"ב ובמערב הסהרה קומפוזיציית קוים שתלאה ממבט ליוויני.

נ.הריסון הציע לנאס"א לבצע פרוייקט של זוהר צפוני מעל סן-פרנציסקו (1974) ונדחה. נאס"א מראה ב-1985 לאמני ארה"ב להציע פרוייקטים למעבורת הצ'לנג'ר, אשר יבוצעו בגבהי האטמוספירה... מצוות המרכז למחקרים חזותיים מתקדמים ב-M.I.T. נענו לקריאה בורג'ס, דוגיס ועוד, זמן לא רב לפני הטרגדיה של המעבורת ב-86/... . הפרוייקט של הר הגעש רודן באריזונה של טורל הוגדר ע"י ראסל כ-"An Earthwork Looks to the Sky" (1986). פרוייקטים סביבתיים אלו עדיין מרוחקים לכוכב ארץ.

"The late eighties are not the time of dynamic avantgarde. They are a time in which art pauses, reorganzies itself, and recombines existing strategies.
The authenticity of this art cannot be measured by innovations in art historical styles and forms. We have to reconsider which is authentic in art: the permanent transfer of limits or the power and intensity of individual work beyond all art historical linearity. documenta 8 illuminates this situation".

(M.Schneckenburger, Augest, 1987)

הגיעה השעה לפרוץ קדימה אל מעבר לסיטואציה הזאת - במימד ההפשטה של הפיסול, במימדי הפיסול ובמהירויות שלו - פריצה אל המימדים הבינגאלאקטיים.

3. שדה הפעילות שלי כפסל התפתח משנת 1960 בחמישה שלבים: פיסול קונבנציונאלי, פיסול אדריכלי, פיסול מדברי-טקטוני, פיסול במערכת השמש ופיסול בינגאלאקטי.

בשלב הראשון עבדתי בברזל ובאבן בקני-מידה מקובלים. העבודות העיקריות מאותה תקופה: פיסול פלדה - 3 מ' גובה, המוצב בגן הפסלים של מוזיאון ישראל, ירושלים; ופסלי פלדה - 1.86 מ' גובה, הנמצאים באוסף נלסון רוקפלר ושל המוזיאון לאמנות מודרנית, ניו-יורק.

בשלב השני עבדתי בגבס (מודלים לפיסול אדריכלי) ובבטון. העבודות העיקריות מאותה תקופה הן אנדרטה במצפה גדות - 14 מ' גובה, ברמת-הגולן; ופסל "מעלות" - 18 מ' גובה, בירושלים.

בשלב השלישי עבדתי באבנים ובסלעים מקומיים. עבודות אופקיות בקני-מידה של עשרות עד מאות מ'. העבודות העיקריות מאותו שלב הן בשדה צין, על שפת מכתש רמון בנגב, לרגלי ג'בל ערייף-א-נקה בצפון-סיני, בתל-חי בגליל העליון ובבקעת אנפורנה, בהימליה המרכזית, נפל.

בשלב הרביעי קשורות פעילות במעבדות להנעה סילונית בפסדינה ובמפקדת נאס"א בווישינגטון - לצבי היחכנות ביצוע פיסול על-פני מאדים ע"י מארס-רובר, על שפת מצוק ולס מרינריס.

את השלב החמישי, הנמצא עתה בראשיתו, פתח אקט של שיגור קרן לייזר סמויה, בניצב למישור שביל החלב, במפגש תל-חי (24 בספטמבר 1987).

זהו שדה פיסול אישי, מתרחב, שבתחתומו אני ממשיך בשנים האחרונות גם בעבודות ברזל ופלדה - בתל-נוף, במיצפור מפעלי ים-המלח - 25 מ' גובה, ובפיסול אדריכלי - בירוחם, 20 מ' גובה.

אקט הפריצה של הפיסול שלי קדימה הוא שיגור מטילי האנרגיה הבינגאלאקטי ממצפה הכוכבים ע"ש גליליי, כאן.

4. זוהי פרידה של הפיסול מן ההיסטוריה שלו לתוך מימד של מופשט קיצוני. זוהי פרידה שלו מן החומר, שבו עוצב מאז הפרהיסטוריה - לכדי ישויות אנרגטיות סמויות אדירות מימדים, המשוגרות מאנטנות רבות עוצמה,

במהירות האור אל הטורוחים הבינגאלאקטיים. חומר-אנרגיות מגיל יקום.
קוטר המטיל שישוגר מכאן - קומת אדם. משך השיגור - שעה. הכיוון - אנכי,
ובניצב למישור שביל החלב.

אנכי, אנטי-גרביטאי, אנטי-אנטרופי, קתדרלי - אל מפתח ביקום הנראה.
הוא יפסיד רבע מכוחו בפריצה מתוך האטמוספירה, ייטוש את מערכת השמש
תוך ..... דקות, יעבור על-פני החללית וויי'ג'ר(1977) תוך ..... דקות
אל האינסוף הבינגאלאקטי - -

מטילי אנרגיה סמויים באורך שניית אור, 300.000 ק"מ, באורך שעת
אור ..... ק"מ, באורך שנת אור..... ק"מ - -
פיסול לקוני, קיומי, של אדם בינגאלאקטי אקראי, חולף, מיקרוסקופי,
מיקרוכרוני - -

- - - - -

אינסוף היקומים - -

מדרשת שדה־בוקר

14.7.92

פיסול בין־נאלאקטי

הגיעה שעתו של הפיסול לפרוץ - אל מהירויות האור - אל ישויות אֶנֶרגֶטיות סמויות, אדירות מימדים, החוצות את החלל הבין־נאלאקטי - -

מעבר לעמוד האינסופי של ברנקוזי - שיגור אלומות מטיילי אנרגיה, מיליארדי ק"מ אורכן, בניצב למישור הגאלאקסיה הזאת, במהירות האור - -

שדה הפעילות שלי כפסל התפתח משנת 1960 בחמישה שלבים: פיסול קוֹנְצֶנצִיונאלי, פיסול אדריכלי, פיסול מִדבָּרי־טֶקטוני, פיסול במערכת השֶמש ופיסול בֵּין־נאלאקטי.

בשלב הראשון עבדתי בברזל ובאבן בקני־מידה מקובלים. העבודות העיקריות מאותה תקופה:

פסל פלדה - 3 מ' גובה, המוצב בגן הפסלים של מוזיאון ישראל, ירושלים; ופסלי פלדה - 1.86 מ' גובה, הנמצאים באוסף גֶלסון רוקפלר ושל המוזיאון לאמנות מודרנית, ניו־יורק.

בשלב השני עבדתי בבטון (מודלים לפיסול אדריכלי) ובבטון. העבודות העיקריות מאותה תקופה הן: אנדרטה במצפה גָדות - 14 מ' גובה, ברמת־הגולן; פסל "מעלות" - 18 מ' גובה, ירושלים; ומודלים לשדה פסלים ליד מדרשת שדה־בוקר.

בשלב השלישי עבדתי באבנים ובסלעים מקומיים. עבודות אופקיות בקני־מידה עד מאות מ'. העבודות העיקריות מאותו שלב הן: על־פני שדה צין, על שפת מכתש רמון בנגב, לרגלי גַּבָּל עָרִיף אֶ־נָקה בצפון־סיני, בניא ליד תל־חי בגליל העליון, ובבקעת אַנפוּרנָה, בגובה של 4,000 מ', הִימָלָיָה, נֶפָאל.

בשלב הרביעי קשורות פגישות במעבדות להנעה סילונית בפַּסַדינה 2.8.1982, ובמפקדת נאס"א, וושינגטון 19.1.1988, 8.6.1990 - עם NASA Director of Solar System Exploration Program - לגבי הִתקנות ביצוע פיסול על־פני מַאדים, על־ידי "מארס־רובר", על שפת מצוק וָלֶס מַרינֶריס.

השלב החמישי, הנמצא עתה בראשיתו, נפתח בשיגור קדן לייזר, בניצב למישור שביל החלב, מחצר תל־חי (24 בספטמבר 1987). השיגור השני, מצפון כַּרמִיאֵל, 22.6.1989, היה מימוש מֻרחָיב לָכת של שלב זה. והי פרידה של הפיסול מן ההיסטוריה שלו: מן החומרים שבהם עוצב מאז הפָּרֶהיסטוריה - לכדי ישויות אנרגיה סמויות, אדירות מימדים, המשגרות במהירות האור, אל הטווחים הבין־גאלאקטיים, אל טווחי זמן אינסופיים - -

קוטר המטיל ששונר - 12.5 ס"מ. משך השיגור - כשעה. ההנבהה - אנכית, בניצב למישור הכבידה של שביל החלב, אל מִפתח בֵּיקום הנראה. אנכי, אנטי־גרביטאי, קַתדרלי, אנטי־אַנתרופי - הפסיד רבע מכוחו בפריצה מתוך האטמוספירה - נטש את מערכת השמש תוך כחמש שעות - חלף על־פני החלליות וויְאַגֶ'ר 2, ששוגרה ב־1977, תוך זמן דומה - אל האינסוף הבין־גאלאקטי - -

בשיגור השלישי, האחרון (27 באפריל 1992) הִשתתפו כ־15 תחנות שֶל - Wegener Network Laser Ranging - מבר־ניוורא ליד ירושלים - מרכז ומערב אירופה - מזרח ארה"ב. תוך 55 דקות, 33 שניות, שוגרה **סופר קתדרלה**, מיליארד ק"מ גובהה, ללא גג, במהירות האור, בניצב למישור שביל החלב - -

- - -

היעדים הבאים של הפיסול הזה, לקראת שנת 2000 ומעבר לה:

שיגור סופר־קתדרלה 2

לשגר בקיץ של שנת 2000 **מכל תחנות** מודדי הטווח של שתי הרשתות הנוכחיות - אנכית למישור שביל החלב - אל הקוטב הצפוני שלו ואל הקוטב הדרומי שלו - - לתגבר את התחנות האלה במשגרים נוספים, כמו זה של Haystak Observatory, USA; לתאם הצבה 'סולידרית' של 27 צלחות 'השדרה הגדולה' Very Large Array , ניו־מקסיקו, באותו כיוון, בו־זמנית, ועוד - -

פיסול רובוטי על מאדים

בהמשך לפגישות עם ד"ר ג'פרי ברינס: 19.1.1988, 6.6.1990 - לתאם את שילוב ביצוע פסל מדברי בניצב לשפת מצוק וָלֶס מָרִינֶריס על־ידי המארסרוֹבֶר - סביב שנת 2000.

לקראת השיגור הצפוי ב־1998, לתרגל את הרובר כאן בביצוע הפסל, לתעד את התרגול במדבר ארה"ב, לתעד את הביצוע במדבר המאדים - -

פיסול רובוטי על הירח

ג'פרי ברינס מסר לי בפגישתנו האחרונה, שלאשר יוקמו תחנות מחקר על־פני הירח, בעשורים הראשונים של המאה הבאה, יהיה הכרח לבסותן בשקעת אבק כמיגון נגד הקרינה האולטרה־סגולה. להערכתו, יבוצעו עבודות אבק אלו על־ידי דחפורים רובוטיים, או מאוישים. מוצע לבצע במשולב עם מהלך זה פיסול אבק סביבתי - לקבל מנאס"א תכניות עתידיות של תחנות מחקר אלו, לעצב מודלים של פיסול האבק, להתגל כאן את ה'בולדוזרים' בביצוע של הפיסול הזה, לתעד ולתקשר את התרגול כאן ואת הביצוע שם - -

שיגור סופר־קתדרלה 3

אחת לשנתיים מתייצבים מדעי־ירח־מאדים על 'ציר אדריכלי' שאורכו כ־50 מיליון ק"מ. לכשיוקמו בסיסי מחקר על־פני הירח ועל־פני מאדים בעשורים הראשונים של המאה הבאה, יש להניח שיופעלו מהם גם מודדי טווח ליזיר, בני־אותו דור. מוצע לתאם ולשגר בתאריך/ בשעה כזאת, בו־זמנית, בניצב למישור שביל החלב את **סופר־קתדרלה 3** + תיעוד ותקשור גלובָלי - -

שיגור סופר־קתדרלה 4

אחת לשנתיים מתייצבים ארץ־ירח־שמש־מאדים על ציר 'אדריכלי' שאורכו כחצי מיליארד ק"מ. מוצע, בעקבות סופר־קתדרלה 3, לתאם ולשגר סופר־קתדרלה 4 - שני מיליארד ק"מ גוברה - - בניצב למישור שביל החלב - -

- - -

פיסול לָקוֹני, קיומי, של מין אדם אקראי, חולף, החוצה אי־שם את החלל הבין־גאלאקטי - - אל אינסוף היקומים - -

- - -

עזרא אורין
מדרשת שדה־בוקר

מוזיאון ישראל
ירושלים

אקט של פיסול בין-גאלאקטי
שיגור ממצפה בר-גיורא

1. - - הכל הוא אטומים ותהום (אפיקורוס, דמוקריטוס) - - דממה ותהום (לאו-טסו) - - הכל הוא הוה אחד, אינסופי (פרמינידס) - - הכל זורם Panta Rhei (הירקליטוס) - לעולם לא ישוב אותו חלקיק לאותו פולסאר - - לא תקיף אותה ארץ את אותה שמש - - לא תקיף אותה מערכת שמש אותו שביל החלב - -

"כיום מוטרדת הפיסיקה על-ידי שהות הקוואנטים... אחת מדרכי ההסבר שלה היא כי האלקטרון איננו חבר בהתמדה במסלולן שבחלל... אלא מופיע בסידרה של מסלולים אשר בהם הוא נמצא פרקי זמן שונים... קיום זה איננו דומה כלל לקיומם המתמיד של הישים הגשמיים... עלינו לשנות את כל מושגינו על אופי הקיום הגשמי...

אי-התמדה מדהימה... שכל רגיאות של ריטוטי אנרגיה... שיטה מאורגנת של זרימות אנרגיה הפועמת מגיאות לגיאות... שבילו של יש רוטט כזה בחלל מיוצג, איפוא, על-ידי סידרה של "מצבים"... הוא קיים קיום תנודתי על-פני משך הזמן... נפטרנו מן החומר..." (וייטהד).

"החומר איננו קיים. הוא איננו אלא צירופי גלים... הכל הוא צירופי גלים קוסמיים " (שרדינגר).

"...יש לראות חומר ואנרגיה כשני שמות נרדפים, המציינים מציאות פיסיקלית אחת..." (דה-ברויי).

דולומיט, שיש, בזלת, ברונזה, פלדה - הם אטומים ותהום - -

פיסול הוא עיצוב של מסות על-ידי כוחות בחלל ובזמן - הוא עיצוב של אנרגיות ותחום בחלל ובזמן - -

2. האמנות החזותית לא התקדמה הרבה מעבר לפוטוריזם של מרינטי ובוצ'יוני (1909-13). היא פיתחה מימד קינטי אך ורק בתחום המהירויות הנמוכות - לרוחב החזית (סוטו ואחרים).

מלביץ' כותב ב-1919:

"At present moment man's path lies through space.
Suprematism is the semaphore of colour in this endlessness...
White as the true, real, representation of infinity..."

האמנות החזותית לא התקדמה הרבה מעבר למלביץ'. היא ממשיכה להפיק וראיציות עלן הסופרמטיזם - לרוחב החזית (רותקו ואחרים).
הפיסול לא התקדם הרבה מעבר לקונסטרוקטיביזם של טטלין (1920-1914), וממשיך להפיק וראיציות בקנה מידה זה לרוחב החזית (קארו, סמית, שמי, דה-סוברו ואחרים).

ההבקעה של עבודות האדמה התרחשה בסוף שנות ה-60 וראשית ה-70. סמיתסון מייחס את ה"מזה הספירלי" שלו גם לגאלאקסיות ספיראליות ביקום (1970). דה-מריה מתווה במדבר המערבי של ארה"ב ובמערב הסהרה שני קוים שיראו ממבט לורינס. מחלקת הים הגיע אל החוב ללא מוצא.

נ.הריסון הציע לנאס"א לבצע פרוייקט של "זוהר צפוני" מעל סן-פרנציסקו (1974) ונדחה. נאס"א קראה ב-1985 לאמני ארה"ב להציע פרוייקטים למעבורת הצ'לנג'ר, אשר יבוצעו בגבהי האטמוספירה. מצות המרכז למחקרים חזותיים מתקדמים ב-M.I.T. נעצר לפריאחת בורגס דורוש ועוד, זמן לא רב לפני הטרגדיה של המעבורת ב-28.1.86.

הפרוייקט של הר הגעש רודן באריזונה, של טורל, הוגדר על-ידי ראסל כ-"An Earthwork Looks of the Sky" (1986). גם פרוייקט סביבתי זה עדיין מרותק אל פני כדור הארץ.

שנות ה-80 המאוחרות אינן של אוונגארד דינאמי -

"The Late eighties are not the time of dynamic avantgarde. They are a time in which art pauses, reorganzies itself, and recombines existing strategies.
The authenticity of this art cannot be measured by innovations in art historical styles and forms. We have to reconsider which is authentic in art: the permanent transfer of limits or the power and intensity of individual work beyond all art historical linearity. Documenta 8 illuminates this situation".

(M.Schneckenburger, Augest, 1987)

זהו איפיון המצב: סטטוס קוו. לולאות לרוחב החזית -
האמנות ממשיכה להעלות גירה את תולדות האמנות.

הגיעה שעתו של הפיסול לפרוץ - מעבר למרינטי אל מהירויות האור -
מעבר למופשט של מלביץ' אל ישויות סמויות אדירות מימדים החוצות את
החלל הבין-גאלאקטי במהירויות האור -
מעבר לעמוד האינסופי של ברנקוזי-
שיגור מטיל אנרגיה, מיליארד ק"מ אורכו,
בניצב למישור הגאלאקסיה הזאת, במהירות האור - -

3. שדה הפעילות שלי כפסל התפתח משנת 1960 בחמישה שלבים: פיסול
קונבנציונאלי, פיסול אדריכלי, פיסול מדברי-שקטוני, פיסול במערכת
השמש ופיסול בין-גאלאקטי.

בשלב הראשון עבדתי בברזל ובאבן בקני-מידה מקובלים. העבודות
העיקריות מאותה תקופה: פסל פלדה - 3 מ' גובה, המוצב בגן הפסלים
של מוזיאון ישראל, ירושלים; ופסלי פלדה - 1.86 מ' גובה, הנמצאים
באוסף נלסון רוקפלר ושל המוזיאון לאמנות מודרנית, ניו-יורק.

בשלב השני עבדתי בגבס (מודלים לפיסול אדריכלי) ובבטון.
העבודות העיקריות מאותה תקופה הן: אנדרטה במצפה נדות - 14 מ' גובה,
ברמת-הגולן; ופסל "מעלות" - 18 מ' גובה, בירושלים.

בשלב השלישי עבדתי בגבס (בסלעים ממרמים). עבודות אופקיות
בקני-מידה של עשרות עד מאות מ'. העבודות העיקריות מאותו שלב הן:
על-פני שדה צין, על שפת מכתש רמון בנגב, לרגלי ג'בל עריף א-נקה
בצפון-סיני, בגיא ליד תל-חי בגליל העליון ובבקעת אנפורנה, בגובה
של 4000 מ', הימליה נפאל.

בשלב הרביעי קשורות פגישות במעבדות להנעה סילונית בפסדינה 2.8.82,
ובמפקדת נאס"א בוושינגטון 19.1.88 - לגבי היתכנות ביצוע פיסול על-פני
מאדים על-ידי מארס-רובר, על שפת מצוק ולס מרינריס.

את **השלב החמישי**, הנמצא עתה בראשיתו, פתח אקט של שיגור קרן לייזר
סמויה, בניצב למישור שביל החלב, מחצר תל-חי (24 בספטמבר 1987).
אקט שיגור זה, ממצפה בר-גיורא, מהווה מימוש מרחיק-לכת של השלב החמישי.

4. זוהי פרידה של הפיסול מן ההיסטוריה שלו; מן החומרים שבהם עוצב מאז הפרהיסטוריה - לכדי ישויות אנרגיה סמויות, אדירות מימדים, המשוגרות מאנטנות רבות עוצמה, במהירות האור, אל הטווחים הבין-גאלאקטים, אל טווחי זמן אינסופיים - -

קוטר המטיל שישוגר מכאן 15 ס"מ. משך השיגור - שעה.
ההגבהה - אנכית, בניצב למישור הכבידה של שביל החלב, אל מיפתח ביקום הנראה.
אנכי, אנטי-גרביטאי, קתדרלי, אנטי אנטרופי -
יפסיד רבע מכוחו בפריצה מתוך האטמוספירה -
ינטוש את מערכת השמש תוך חמש וחצי שעות -
יחלוף על-פני החללית וויג'ר II, ששוגרה ב-1977, תוך זמן דומה -
אל האינסוף הבין-גאלאקטי - -

פיסול לקוני, קיומי, של מין אדם אקראי, חולף, החוצה אי-שם את החלל
הבין-גאלאקטי - -
אל אינסוף היקומים - -

עזרא אוריון
22.6.89

Beyond Sculpture in the Solar System - an Intergalactic Sculpture

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Ezra Orion

Abstract - Following his article: Sculpture in the Solar System, LEONARDO Vol. 18, 1985, the author assesses the situation of contomporary sculpture; Reports on a lazer beem launch, a miliard km. long, which he sent verticali to the plane of the Milky Way; Reflects on the substence of this energy and void infinity; and propose two more powerfull Launches. He terms these acts and concept "An Intergalactic Sculpture."

1. Sculpture in the Solar System

I am an environmental-desert sculptor, living since 1967 in a desert campus, in the Negev desert, southern Israel. Most of the works I have done these years are in this region or in Northern Sinai. In the years 1981, 1983, I went up with two small expeditions to build a local stone sculptural structure, 4000 m. altidude, in the Annapurna basin, central Himalaya, Nepal. As a theoretical background to these works I developed the concept of Tectonic-Erosional-Aeolic-Vulcanic-Meteoritic Sculpture, which the human sculpture tries to join.

Accordingly I met two sientists in the Jet Propulsion Laboratories, Passadena, on 2nd August, 1982. These were dialogues exploring the fisibility of performing a laconic geometrical sculptural acts by the 1976 Viking Landers 1,2.

The last dialogue was held on 19 January 1988, with NASA's Director of Solar System Exploration Program at NASA headquarter, Washington D.C. It was focused on verious aspects of the future MarsRover Semple return mission.

The launching is schedueled for 1998. After cruising for 10 months and reaching Mars, the return spacecraft will leave the Orbiter one and land on the surface. The MarsRover will get slowly out of it and start one year of scientific sample collecting tour. It was emphasised how extreemly complicated this tele-mission is. Completing it safeley the Rover will unload its harvest of samples into the waiting mother return spacecraft. After its sucsessful takeoff, back to Earth, the

Rover will commance a less-pressured survey and information gathering on the Marsian surface. I suggested that into this tele-robotic survey a sculptural work in Marsian stones will be incorporated: A straight line of 100 m. to the edge of the Vales Marineris cliff.

The answer was: "I am sympathetic to the idea. In theory it is possible, since at that juncture the Rover will have completed much of its exploratory tasks".

I asked whether this sculptural idea is proposed for the first time. The answer was: "Yes, to the best of my knowledge. There is value in the symbolism that could potentially be associated with such a project if it were to be a collaborative effort on the part of several nations. Probably manely with Russians".

Presently, I try to make progress in these directions.

2. Shaping of energies and void

Democritus, as one of the pre-socratian Atomists, states that all is atoms and void. Lau-tsu defined it as Silance and Void.

Whitehead tells us that today Physics is annoyed by the Quantum theory... that this kind of existence has no similarity to the existence of real substences... we have to change totally our notions about the physical existence...
...A constant discontinuity... high and low tides of energy vibrations... we got rid of matter...

According to later physicists, matter does not exist. It is but webs of energy waves... all is webs of cosmic waves (Schrodinger).

We ought to conceive matter and energy as synonyms that identify one physical reality (De-Broglie).

Mass and Energy are synonyms.
Granite, limestone, dolomite, marble, bronze, steel - are atoms-and-void, are webs of energy waves.
Sculpture is shaping of masses by forces through space and time;
it is shaping of energies-and-void through space and time - -

The universe is energies and void. A formless suspention of super energy clusters and void. Human energy-and-void sculpture joins now this totality by advanced Astro-technology.

3. The situation of sculpture

Malevich writes in 1919:

"At present moment man's path lies through space. Suprematism is the samaphore of colour in this endlessness... White as the true, real, representation of infinity..."[2]

"The late eighties are not the time of dynamic avantgarde. They are a time in which art pauses, reorganizes itself, and recombines existing strategies.

The authenticity of this art cannot be measured by innovations in art historical styles and forms. We have to reconsider which is authentic in art: the permanent transfer of limits or the power and intensity of individual work beyond all art historical linearity. Documenta 8 illuminates this situation".[3]

On the contrary. The hour had come for a powerful sculpural launch forward -
Beyond the Futurism of Marineti and Buchionni (1909-1913); Beyond the Constructivism of Tatlin (the model for monoment for the third International, 1919) and of Gabo; Beyond the Endless Column of Brancusi (1937); Beyond Smith, Caro, Shemi, De-Suvero (1960-1988).

Sculpture should launch itself beyond the Earthworks of Smithson, Heizer, Moris, De-Maria, Holt (1968-1977).

Harrison (1974) suggested to NASA to perform a "northren Aurora" above San-Fracisco, and was rejected. NASA invited american artists to propose mini-sculptural projects for the shuttle that will be performed in the atmospherical hights. To this call responded Burges, Davis and others not long before the tragedy of the Challanger on 28.1.86.

The project Roden Vulcano in Arisona of Turrel was defined by Russell "An earthwork looks to the sky" (1986). All these projects are still bounded to planet Earth.

4. Intergalactic Sculpture

The hour had come for a powerful launch forward - not only to the ranges of the solar system, but also beyond them to the intergalactic vastness.

On June 22th 1989, I launched from the Bar-Giora satellite lazer ranging station, west of Jerusalem (connected to NASA's satellite global network), a one milliard km. long lazer beem, aimed vertically to the plane of the Milky way. The launching, 55 minutes, 33 seconds, sent the 15 cm. diameter beem, to cruise at light speed for some four hours before leaving the solar system toward infinity in space and time.

I propose to perform two more intergalactic launches:

From the Galileo Observatory, near Firenze, Italy, from where the first telescope peered for the first time to the meteoritic sculptured surface of the moon; and from the American radio/radar Observatory, Puerto Rico - the biggest in the world.

with these launches sculpture will breakthrough from his Earthy history toward the intergalactic ranges, toward the endlessness - -

An intergalactic sculpture - launching an eternal huge energy entities, might be an existential expression of an ephemeral, microscopic, microchronic Homo-Sapiens - cruises the intergalactic vastness toward infinity of universes - -

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