

x-ray wavelength was small enough, the diameter of the microchannel would define the resolution element. The microchannels would be much narrower than the CCD pixels. Preferably, the pixel pitch would be an integer multiple of the diam-

eter of a microchannel. Hence, one would acquire a set of high-resolution image data by recording the CCD output while scanning (more precisely, stepping) the specimen under the microchannel plate in increments of the microchannel

diameter along both perpendicular axes (x and y) of the pixel pattern.

*This work was done by Yu Wang of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO-20873*

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## Slotting Fins of Heat Exchangers To Provide Thermal Breaks

*Lyndon B. Johnson Space Center, Houston, Texas*

Heat exchangers that include slotted fins (in contradistinction to continuous fins) have been invented. The slotting of the fins provides thermal breaks that reduce thermal conduction along flow paths (longitudinal thermal conduction), which reduces heat-transfer efficiency. By increasing the ratio between transverse thermal conduction (the desired heat-transfer conduction) and longitudinal thermal conduction, slotting of the fins can be exploited to (1) increase heat-transfer efficiency (thereby reducing operating cost) for a

given heat-exchanger length or to (2) reduce the length (thereby reducing the weight and/or cost) of the heat exchanger needed to obtain a given heat-transfer efficiency. By reducing the length of a heat exchanger, one can reduce the pressure drop associated with the flow through it. In a case in which slotting enables the use of fins with thermal conductivity greater than could otherwise be tolerated on the basis of longitudinal thermal conduction, one can exploit the conductivity to make the fins longer (in the trans-

verse direction) than they otherwise could be, thereby making it possible to make a heat exchanger that contains fewer channels and therefore, that weighs less, contains fewer potential leak paths, and can be constructed from fewer parts and, hence, reduced cost.

*This work was done by Timothy D. Scull of United Technologies for Johnson Space Center. For more information, contact the Johnson Commercial Technology Office at (281) 483-3809. MSC-22784*

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## Methane Clathrate Hydrate Prospecting

**Methane hydrate deposits would be detected indirectly through thermal, magnetic, and electric measurements.**

*NASA's Jet Propulsion Laboratory, Pasadena, California*

A method of prospecting for methane has been devised. The impetus for this method lies in the abundance of CH<sub>4</sub> and the growing shortages of other fuels. The method is intended especially to enable identification of subpermafrost locations where significant amounts of methane are trapped in the form of methane gas hydrate (CH<sub>4</sub>·6H<sub>2</sub>O). It has been estimated by the U.S. Geological Survey that the total CH<sub>4</sub> resource in CH<sub>4</sub>·6H<sub>2</sub>O exceeds the energy content of all other fossil fuels (oil, coal, and natural gas from non-hydrate sources). Also, CH<sub>4</sub>·6H<sub>2</sub>O is among the cleanest-burn-

ing fuels, and CH<sub>4</sub> is the most efficient fuel because the carbon in CH<sub>4</sub> is in its most reduced state. The method involves looking for a proxy for methane gas hydrate, by means of the combination of a thermal-analysis submethod and a field submethod that does not involve drilling. The absence of drilling makes this method easier and less expensive, in comparison with prior methods of prospecting for oil and natural gas.

The proposed method would include thermoprospecting in combination with one more of the other non-drilling measurement techniques, which could in-

clude magneto-telluric sounding and/or a subsurface-electrical-resistivity technique. The method would exploit the fact that the electrical conductivity in the underlying thawed region is greater than that in the overlying permafrost.

*This work was done by N. Duxbury of Caltech and V. Romanovsky of the University of Alaska at Fairbanks for NASA's Jet Propulsion Laboratory. For further information, access the Technical Support Package (TSP) free on-line at [www.techbriefs.com/tsp](http://www.techbriefs.com/tsp) under the Physical Sciences category. NPO-30257*