This **Simplified Cross Section**, which is not to scale, shows selected features of a sensor that incorporates recent improvements.

filled with agarose, which is allowed to harden. Then the upper half of the well is filled with a liquid electrolyte (which thereafter remains liquid) and a lipid bilayer is painted over the pinhole. The liquid contains a protein that forms an ion channel on top of the hardened agarose. The combination of enclosure in the well and support by the hardened agarose provides the stability needed to keep the membrane functional for times as long as days or even weeks.

An electrode above the well, another electrode below the well, and all the materials between the electrodes together constitute a capacitor. What is measured is the capacitive transient current in response to an applied voltage pulse. One notable feature of this sensor, in compar-

ison with prior such sensors, is a relatively thick dielectric layer between the top of the well and the top electrode. This layer greatly reduces the capacitance of an aperture across which the ion channels are formed, thereby increasing the signal-to-noise ratio. The use of a relatively large aperture with agarose support makes it possible to form many ion channels instead of only one, thereby further increasing the signal-to-noise ratio and effectively increasing the size of the available ionic reservoir. The relatively large reservoir makes it possible to measure AC rather than DC. This concludes the recapitulation from the cited previous article.

The improvements include the following:
• The microfluidic channels through which agarose is wicked into the lower

halves of the wells are fabricated in a reusable layer of polydimethylsiloxane [PDMS (commonly known as silicone rubber)]. This layer of PDMS forms a hermetic seal with the underlying glass plate and the overlying silicon chip, but can be removed and washed, making the array reusable.
• Before forming the lipid bilayer over the pinholes in the silicon nitride layer, the silicon nitride is coated with a self-assembled monolayer, which serves to stabilize the lipid bilayer, thereby making the array into an even more stable device.
• The lipid bilayer is formed rapidly by means of a spin-coating procedure that can be performed by a worker without special skill.

Simulating Operation of a Complex Sensor Network

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Simulation Tool for ASCTA Microsensor Network Architecture (STAMiNA) ["ASCTA" denotes the Advanced Sensors Collaborative Technology Alliance.] is a computer program for evaluating conceptual sensor networks deployed over terrain to provide military situational awareness. This or a similar program is needed because of the complexity of interactions among such diverse phenomena as sensing and communication portions of a network, deployment of sensor nodes, effects of terrain, data-fusion algorithms, and threat characteristics.

STAMiNA is built upon a commercial network-simulator engine, with extensions to include both sensing and communication models in a discrete-event simulation environment. Users can define (1) a mission environment, including terrain features; (2) objects to be sensed; (3) placements and modalities of sensors, abilities of sensors to sense objects of various types, and sensor false-alarm rates; (4) trajectories of threatening objects; (5) means of dissemination and fusion of data; and (6) various network configurations. By use of STAMiNA, one can simulate detection of tar-

gets through sensing, dissemination of information by various wireless communication subsystems under various scenarios, and fusion of information, incorporating such metrics as target-detection probabilities, false-alarm rates, and communication loads, and capturing effects of terrain and threat.